BOARD OF ADJUSTMENT
TENTATIVE AGENDA

Wednesday, October 21, 2020
4:00 PM

Originating via Zoom From Story County Administration Building (900 6th Street) – Nevada, Iowa

SPECIAL NOTE TO THE PUBLIC: Due to recommendations to social distance in order to help slow the spread of the COVID-19 virus, the capacity of our meeting room is significantly limited. Therefore, public access to the meeting will be provided via Zoom. See login Instructions at bottom of this agenda.

1. CALL TO ORDER:

2. ROLL CALL:

3. APPROVAL OF AGENDA:

4. MINUTES OF PREVIOUS MEETING(S)

   Documents:

   091620 MINUTES.PDF

5. APPROVAL OF FINDINGS OF FACT FROM PREVIOUS MEETING

   Documents:

   CUP03 20 04 20 05 20 STORYCOMM.PDF
   VAR02 20 BALBIANI.PDF
   VAR01 20 FRIEND.PDF
   CUP02 90 8 MARTIN MARIETTA.PDF
   CUP07 18 1 INROADS.PDF

6. PUBLIC COMMENTS
   This is the time for members of the public to offer comments concerning matters not scheduled to be heard before the Board of Adjustment

7. HEARINGS

   7.I. Discussion And Consideration Of CUP06-20 Nevada Wastewater Facility - Amelia Schoeneman

   Documents:

   STAFF MEMO.PDF
   STAFF REPORT.PDF
   APPLICATION AND NARRATIVE.PDF
   FACILITY PLAN.PDF
   PHASE 1 90 PERCENT CONSTRUCTION DOCUMENTS.PDF
   PHASE 2 90 PERCENT CONSTRUCTION DOCUMENTS2.PDF
   PRELIMINARY INTERCEPTOR SEWER REVISED ALIGNMENT.PDF
   PROPERTY VALUE STUDY.PDF

7.II. Discussion And Consideration Of CUP07-20 Cambridge Outfall Pipe - Marcus Amman

Documents:

STAFF REPORT.PDF
NARRATIVE.PDF
POWERPOINT.PDF

8. OTHER BUSINESS

8.I. Election Of Vice Chair For Remainder Of 2020 Calendar Year

8.II. Discussion And Consideration Of A Special Meeting For November 2020 - Amelia Schoeneman

Documents:

STAFF MEMO.PDF

8.III. Discussion And Consideration Of Amendment To Rules Of Procedure - Amelia Schoeneman

Documents:

STAFF MEMO.PDF
BOA RULES OF PROCEDURE.PDF

9. BOARD/STAFF COMMENTS

10. ADJOURNMENT

11. INSTRUCTIONS TO PARTICIPATE IN ZOOM MEETINGS

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- **How to Participate in Meeting Discussions**

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- ***Zoom video conferencing*** – You can access the meeting by either clicking the link found on the agenda, or by opening the Zoom application and entering the meeting ID number on the agenda.
  - Meeting participants will be able to watch and hear the meeting as it takes place.
  - **For portions of the meeting where public input is accepted, you will need to press the "unmute" button to speak, provide your name, address and your comments. Can also press the "raise hand button" to request to speak.**
- **Zoom phone conferencing** – As an alternative to video conferencing, participants may call in to a phone conference using their touch-tone phone. Several call-in telephone numbers are provided on each meeting agenda. Unless otherwise indicated, the number is a long-distance phone number; charges may apply depending on your telephone provider.
  - Once you have dialed the telephone number provided, you will be prompted to enter the Meeting ID number (found on the agenda). During the meeting, you will be able to hear the discussion live, but will not be able to see any content.
  - **For portions of the meeting where public input is accepted, you will need to "unmute" to speak, provide your name, address and your comments. Press *6 on phone to "unmute." Can also press *9 to "raise hand" to request to speak.**

The Board shall adjourn prior to but no later than 11:30 p.m. Any business not brought forth to the Board prior to adjournment shall be tabled to the next regularly-scheduled Board hearing.

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**For further information on these cases, contact the Story County Planning and Development Department at PZWeb@storycounty.com or by phone at (515) 382-7245. Case Files, including exact property locations, may be inspected in the Story County Planning and Development Department located in the Story County Administration Building, 900 6th Street, Nevada, Iowa.

STORY COUNTY
PLANNING AND DEVELOPMENT
STORY COUNTY ADMINISTRATION
900 6TH STREET
NEVADA, IOWA 50201-2087

515-382-7245

"Commitment, Vision, Balance"

MINUTES
STORY COUNTY
BOARD OF ADJUSTMENT

AN AUDIO RECORDING OF THE FULL MEETING MAY BE FOUND IN THE PLANNING AND DEVELOPMENT DEPARTMENT, OR BY VISITING WWW.STORYCOUNTYIOWA.GOV

DATE: September 16, 2020

Steve McGill, Chair (Zoom)	2022
Matthew Neubauer, (Zoom)	2021
Kelli Excell (Zoom)	2023
Nathan Hovick (Zoom)	2024
Elara Jondle (Zoom)	2020

CALL TO ORDER: 4:00 PM *Absent
PLACE: Zoom Meeting Originating From Administration Building

Special Note: Due to recommendations to social distance in order to help slow the spread of the COVID-19 virus, public access to the meeting was provided via conference call to listen and participate in the meeting.

PUBLIC PRESENT BY CONFERENCE CALL: Jane Weingart, Tom Kurt, Bob Ringgenberg, Greg Ervanian, RJ Bower, Brad Perkins, Michael Roth, Chad Schneider, Bill Rosener, Andrew Friend, Doug McCay, Wayne Ruble, N Keller, Ray, Michael Roth, Jordan Cook.

STAFF PRESENT: Jerry Moore, Planning and Development Director (Zoom); Amelia Schoeneman (Zoom); Marcus Amman (Zoom); Stephanie Jones (Zoom), Recording Secretary

ROLL CALL: McGill, Neubauer, Excell, Hovick, Jondle

ABSENT: None

APPROVAL OF AGENDA (MCU)

APPROVAL OF MINUTES

Jerry Moore provided an update about HF 2512 impacting Planning and Zoning Commissions and Board of Adjustments and the need to rehear items from the June 17, 2020 and July 15, 2020 Board of Adjustment meetings.

Motion by Neubauer, Second by Hovick to approve the April 15, 2020, June 17, 2020, and July 15, 2020 minutes. (MCU)
Voting Aye: Neubauer, Hovick, Jondle, Excell, McGill
Voting Nay: None
Vote: (5-0)

APPROVAL OF WRITTEN FINDINGS OF FACT

Moore provided a summary of the staff memo, which explained why action was needed on Written Findings of Fact for CUP08-17 and CUP09-17 and the change to CUP09-17 due to approval of CUP03-19.1.

Motion by Neubauer, Second by Jondle to approve Written Findings of Fact for CUP08-17 Perkins.
Voting Aye: Neubauer, Jondle, McGill, Excell, Hovick
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Excell to approve Written Findings of Fact for CUP09-17 Perkins.
Voting Aye: Neubauer, Excell, Jondle, Hovick, McGill
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Jondle to approve Written Findings of Fact for CUP03-20, CUP04-20, and CUP05-20 Story Comm.
Voting Aye: Neubauer, Jondle, Hovick, Excell, McGill
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Excell to approve Written Findings of Fact for VAR02-20 Balbiani.
Voting Aye: Neubauer, Excell, Jondle, Hovick, McGill
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Jondle to approve Written Findings of Fact for VAR01-20 Friend.
Voting Aye: Neubauer, Jondle, Hovick, Excell, McGill
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Excell to approve Written Findings of Fact for CUP02-20 Izaak Walton League.
Voting Aye: Neubauer, Excell, Jondle, Hovick, McGill
Voting Nay: None
Vote: (5-0)

Motion by Neubauer, Second by Hovick to approve Written Findings of Fact for CUP02-90.6 Martin Marietta.
Voting Aye: Neubauer, Hovick, Jondle, Excell, McGill
Voting Nay: None
Vote: (5-0)

PUBLIC COMMENTS:

Greg Ervanian asked if public comment is allowed pertaining to the vote taken on the Findings of Fact. Ervanian asked if every member of the board received a copy of the letter from his law firm pertaining to CUP09-18 and CUP08-17, the Raspberry Hill CUPs. Moore stated that staff communicated with the County Attorney's office in regard to the letter and was told that it was not something that staff was mandated to provide. The Written Findings of Fact were before the Board of Adjustment because the decision was remanded by court. There were previously not written findings of fact prepared and acted on for the cases. The court ruled that the findings of fact be prepared and the Board of Adjustment take action on them for both cases.

Ervanian stated that he understands Moore was instructed by his council, but feels that his characterization of the district court's order is incorrect. Ervanian stated that the district court annulled and vacated the CUPs and the CUPs acted on today do not exist. The CUPs the district court ordered on were appealed to the Iowa Court of Appeals and affirmed. Ervanian stated that he feels the language from the Iowa Court of Appeals makes it explicitly clear that the district court was correct, that the district court no longer retains jurisdiction over the matter, and that the CUPs are annulled and vacated. Ervanian felt that if the inclusion of the letter had been allowed, the board would have been more informed about the vote that was taken today.

HEARINGS:

CUP03-20, CUP04-20, CUP05-20 StoryComm

Amelia Schoeneman presented a summary of the Staff Report. StoryComm is proposing to erect three communications lattice towers to provide two-way radio communications for Story County emergency services and public works agencies, including Story County, municipalities in Story County and Iowa State University. The proposed towers are as follows:

CUP03-20: A 255-foot lattice communications tower to be located in the southwestern portion of parcel 05-01-100-100 in Franklin Township. The parcel is located at the southeast corner of 550th Avenue and 160th Street. The communications tower will be 400 feet from the right-of-way of 550th Avenue and approximately 474 feet from the south property line.

CUP04-20: A 285-foot lattice communications tower to be located in the southwestern portion of parcel 15-18-100-300 in Indian Creek Township. The parcel is located at the northeast corner of 620th Avenue and 305th Street. The communications tower will be 428 feet from the right-of-way of both 620th Avenue and 305th Street.

CUP05-20: A 265-foot lattice communications tower to be located in the southeastern portion of parcel 03-25-300-200 in Warren Township. The parcel is located on 150th Street. The communications tower will be 398 feet from the right-of-way of 150th Street and 133 feet from the east property line.

Schoeneman stated at the June 17, 2020 meeting these were approved. Additional comments received since the last meeting were from the landowner of CUP03-20 being open to other locations for the tower CUP03-20 and that the proposed location for the tower is best for StoryComm.

Neubauer asked for clarification on the process with readdressing the cases and how the process works. Schoeneman stated that essentially the board is rehearing the cases since there was not a quorum at the June meeting. The public hearing will need to be re-opened and action taken, with the recommendation from staff for the same action.

Andrew Friend stated that since the last meeting, he has become acquainted with the landowner and the landowner is ok with the tower being moved to the southwest corner of the field. Friend shared a proposed site plan for the tower to be moved to. Friend asked that CUP03-20 have a condition to that the tower to be moved to the location to the south that is most favorable by the landowner and both neighbors. Friend offered suggestions for amending the findings in order to approve conditions. Friend clarified that he is not asking StoryComm to move the tower very far and he understands that the timeline will be lengthened and would like the Board of Adjustment to consider the long-term tower location. The timeline and budget concerns are understandable, but short term.

Rob Bowers stated that the landowner did provide a comment about moving the tower location if it is in the best interest of everyone involved. Bowers stated that it is not in the best interest of

StoryComm, or the citizens of Story County. Bower clarified that the tower location was not originally moved in order to change the aesthetics for the other property owner, but it was actually moved because of a water way and being as close to the terraces as possible created the best use of the land. Bowers stated that moving the location would cause potentially a 4-month delay and up to $25,000 in additional costs to the citizens of Story County.

Schoeneman stated that there would be grass landscaping around the site and there is a fence with vinyl slats for screening, which would be 6' tall. McGill asked Bower if moving the tower would affect the communications aspect of the tower. Bower stated it is not anticipated that communications would be affected, but another study would be required to ensure that it would not.

Schoeneman went through the standards of approval for a conditional use permit and staff's findings. The towers exceed the required setbacks. The FAA requires lighting for safety.

Schoeneman reminded the board that the towers are for emergency services and all three towers are important because they form a ring to work with each other to provide the radio operability that first responders need.

Neubauer asked about Mr. Friend's concern with the unsightliness of the tower and asked why that was not in the staff report. Schoeneman stated that the compatibility standard focuses on odor or noise, which could be considered offensive and interfere with the use of adjoining property. The lighting is required for safety by the FAA and does not impact staff's compatibility findings.

Excell asked if the board could ask the applicant to consider alternative lighting and if all three towers had to be approved together. Schoeneman stated that the Board could amend staff's findings.

McGill asked if Friend and Bowers have had communication since the last meeting. Bowers stated that the Board of Directors did receive an email from the Friends after the last meeting and prior to the notification of the June meeting being vacated and were under the assumption the process was done since there had been a previous vote.

Excell asked if all three towers have to be approved as a whole or if two can be approved and the second be worked out and brought back. Schoeneman stated separate action could be taken, but in terms of feasibility that would be a question for Mr. Bowers. Bowers stated that part of the estimated cost moving forward would be to do a study to determine the impact of moving the tower location and then a four-month delay for the regulatory process, which could be a potential problem for emergency responders.

McGill stated that the tower has met all of the requirements according to the law and asked the board what they would like to do.

Excell stated that if there is an option to move the tower that would preserve the value of the Friends property and the long-term financial effect for the Friends that should be considered. Hovick asked if there has been any research done as to the effect on property values. Schoeneman stated that the Assessor did not raise any. Excell asked if departments knew about the height and lighting. Schoeneman clarified that the information is routed to all county departments so they would have known the information on the height and lighting.

McGill stated it would need to be approved as presented or table the item allowing additional time for the applicant and Mr. Friend to come to an agreement.

MOTION: The Story County Board of Adjustment approves the Conditional Use Permit for the StoryComm Communications Tower as put forth in case CUP03-20, as submitted.

Motion by Hovick, Second by Neubauer

Voting Aye: Hovick, Neubauer, McGill Jondle
Voting Nay: Excell
Vote: (4-1)

MOTION: The Story County Board of Adjustment approves the Conditional Use Permit for the StoryComm Communications Tower as put forth in case CUP04-20, as submitted.

Motion by Excell, Second by Neubauer
Voting Aye: Excell, Neubauer, Jondle, Hovick, McGill
Voting Nay: None
Vote: (5-0)

MOTION: The Story County Board of Adjustment approves the Conditional Use Permit for the StoryComm Communications Tower as put forth in case CUP05-20, as submitted.

Motion by Hovick, Second by Excell
Voting Aye: Hovick, Excell, McGill, Neubauer, Jondle
Voting Nay: None
Vote (5-0)

VAR02-20 Balbiani

Schoeneman provided a brief summary. The request is for a variance to the minimum front setback for an attached garage at 27922 Timber Road. The zoning of the subject property is R-1 Transitional Residential, which establishes a minimum front setback of 40 feet. The variance request for an attached garage is proposed to encroach on the front setback, requiring a variance of 7 feet. The attached garage is proposed to have a setback of 33 feet, be 39-feet-by-26 feet, and be located on the west side of the existing dwelling. The purpose of the variance is to preserve two trees on the site. A larger garage that encroaches on the setback would allow for the overhead garage door and driveway to be located further west, away from the trees. Planning and Development staff recommend denial of the variance. Schoeneman stated the Board of Adjustment previously approved a 3' variance.

Motion by Neubauer, Second by Excell to approve the variance for 3 feet to the 40-foot setback.

Voting Aye: Neubauer, Excell, Jondle, Hovick, McGill
Voting Nay: None
Vote: (5-0)

VAR01-20 Friend

Marcus Amman provided a brief summary and stated that the request is for a variance to the minimum front setback for a nonconforming dwelling located in the A-1 District, which establishes a minimum front set back of 50 feet. The variance request is to permit the construction of an attached garage to the single-family dwelling that would encroach on the front setback requiring a variance of 20 feet from 50 feet to 30 feet. The property is located in Section 2 of Franklin Township parcel number 05-02-200-230. Planning and Development Staff is recommending approval of the variance. Due to how the home was originally built, this is the only location that would accommodate the garage.

MOTION: The Story County Board of Adjustment approves the Friend Setback variance request, as requested by the applicant and put forth in case VAR01-20, for a variance to allow the proposed attached garage to have a front setback of 30 feet in the A-1 District.

Motion by Neubauer, Second by Hovick
Voting Aye: Neubauer, Hovick, Jondle, Excell, McGill
Voting Nay: None
Vote: (5-0)

5:10 PM McGill called a five-minute break.
Resumed meeting at 5:15 PM

CUP02-90.8 Martin Marietta

Amman presented the staff report and stated that this request is for a conditional use permit minor modification for a proposed wheel wash located at 831 East Riverside Road, Parcels 06-23-400-255 and 05-24-300-105 (now combined to parcel 05-24-300-110). The existing wheel wash system is no longer sufficient to handle the present volume of customer traffic, and an improved means of addressing track-out is desired. The existing wheel wash was installed in 2004 and is 61 feet long and 12 feet, 8 inches wide. The water and rock material from the existing system is deposited in a nearby "clean-out bunker". The proposed wheel wash is 52 feet long and 14 feet wide. The proposed system will have its water and rock material deposited into a 40,000 gallon recovery tank. The rock material that is recovered from both of these tanks will be used on internal roads or returned to the mine. There is no proposed increase to traffic in the area. The water used in the process is a completely closed loop system meaning no water is being discharged.

Don Maroney was on the call representing Martin Marietta.

Doug Kurt expressed concerns about track out and dust in the area and he has lived in the area for 25 years. Kurt asked if the current wheel wash station would stay in operation while the new one is built. Maroney explained that the existing would stay in operation while the proposed is being built, and after both will be in operation. Kurt asked if both would be in operation 12 months out of the year. Maroney explained that they will be weather permitting (temperature), and that in the winter months when the ground is hard the track out is far less. Kurt stated that it seemed like more track out happens in the winter. Maroney stated that if they need to sweep East Riverside Road they would still have that ability.

Hovick in response to Kurt's response stated that since Martin Marietta was adding additional track out prevention that the discussion was not relevant. McGill agreed.

Moore stated that Martin Marietta applied for an insignificant modification to pave shoulders on their access drive. This is another measure that they are taking to control dust and track out in the area.

Amelia Schoeneman stated that the dust control in road is part of the State of Iowa permit. Maloney stated he is not aware of that.

MOTION: The Story County Board of Adjustment approves the Conditional Use Permit for the addition of a new wheel wash station in addition to the existing wheel wash at the Martin Marietta Ames Mine as put forth in case CUP02-90.8, as submitted, with conditions.

1. **Conditions 1-4 of the approved Conditional Use Permit Case No. CUP02-90 are maintained.**
2. **The applicant shall provide the sound level reading from the property boundary of the closest dwelling on the south side of Riverside Road as well as the property boundary for the dwelling to the west owned by Plowback LLC for a base line reading when the new wheel wash is constructed and operational.**

Motion by Neubauer, Second by Hovick as submitted
Voting Aye: Neubauer, Hovick, Jondle, Excell, McGill

Voting Nay: None
Vote: (5-0)

CUP06-20 Nevada Wastewater Facility

Schoeneman presented the staff report and stated that the Wastewater Treatment Facility is for the City of Nevada and is proposed to be located on parcel 11-31-200-305, on the south side of 270th Street and west of West Indian Creek. The new facility will replace the existing facility, located at 457 S 6th Street, Nevada. The existing waste water treatment facility is approximately 60 years old. It does not have the capacity to support the population growth of the City of Nevada, the expansion of Burke Corporation or Iowa Department of Natural Resource Requirements. The applicant stated that the facility is "not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements" and could not meet separation requirements from inhabitable buildings. The proposed facility will provide a higher level of treatment than the existing wastewater treatment facility. An interceptor sewer is proposed between the existing Wastewater Treatment Facility and the new location—a lift station and force main are proposed to pump effluent from the existing wastewater treatment facility to the proposed wastewater treatment facility, generally along Country Road S-14 (620th Avenue). The project will be completed in multiple phases with completion by November 2023. At their September 2, 2020, meeting, the Planning and Zoning Commission recommend approval of the conditional use permit with conditions.

Excell asked about the effluent being discharged in the floodplain. Hovick stated that the pipe discharges into a creek, which is in the floodplain. Moore stated that a floodplain permit would be needed for the discharge pipe. The DNR will also review. Hovick stated if the DNR or Army Corps denied that the plans would have to be changed. Moore stated that the CUP process is required first before being able to apply for a floodplain permit. Schoeneman stated that if the floodplain permitting resulted in changes in the plan that they would come back to the Board of Adjustment. McGill asked if the route of the sewer, instead of cutting across private property, could be continued in the right-of-way. Schoeneman stated that gravity is needed for the sewer and the grade at the intersection of 270th would require the pipe to be so deep that it would create maintenance issues.

Mike Roth stated that the issue identified is that at the 270th intersection, the topography begins to incline and the current depth of the pipe would get to a 40' depth, which would create challenges for long term maintenance, as well as excavation for construction. The proposed alignment was proposed going across the property with an attempt to obtain permanent easements.

Michael Crow owns property to the east of the proposed facility stated that due to heavy vehicles being on the road that he would like consideration given to paving from the facility west to S-14. Crow felt holding effluent discharge during flooding to avoid flooding properties downstream would also be a good consideration. Roth stated that paving 270th street has not been a consideration as part of this project. Discussions with the county engineer indicated that paving is not required. In regard to floodplain, there has been no consideration given to retaining effluent during a flood. The facility will still function properly during a 100-year flood event. Roth stated that discharging treated effluent into a stream or river is the only approved discharge method in the state and that an effluent discharge would not create flooding. Schoeneman stated that the Iowa DNR has certain permitting requirements based on the use classification of the stream. Roth stated that the DNR has gone through the entire state and classified every receiving stream or water body, which identifies the characteristics and usage. The city would receive a permit for discharge limits from the DNR.

Ray Ringgenberg owns the property north of the proposed facility and had several concerns consisting of: confusion with the notice received prior to the Planning and Zoning Commission meeting; the sewer pipe going across his property and the quality of his farm ground; and manhole placement every 400 feet, which will create obstacles to work around during planting and harvesting. Surveyors were also on his property.

Roth stated that he is unaware of any individuals on Mr. Ringgenberg's property and the property was not surveyed by HR Green. Roth stated that the sewer line can be routed down S-14, but it is not feasible due to the depth of the line. The alignment along S-14 is still under final design and the preliminary alignment is based on the avoidance of obstructions within the right-of-way but also maintaining required separation between existing utilities. Rural water does jog back and forth on both sides of the road and the DNR requires a separation between sewer lines and potable water. McGill asked for clarification if a study is still being done on where the sewer will be placed. Roth stated that yes, it is still being studied. Schoeneman stated that if there were large deviations they would need to come back to the Board of Adjustment. Moore stated switching from the east side to west side that would be insignificant, but changing the location of the sewer on private property would come back to the Board of Adjustment. Roth stated the DNR allows a maximum distance of 800' spacing between manholes.

Schoeneman stated that this is the preliminary alignment and easement acquisitions will be done separately. In 2021, they will be working with property owners to obtain easements.

McGill stated that he has seen the damage pipeline can do to land, and the value of the property could be impacted and granting a permit with preliminary alignment might not be enough to grant the CUP. Schoeneman stated that one option would be to place a condition to come back to the Board of Adjustment after easements are finalized.

Mike Roth stated that multiple alignment options were considered during the facility planning stage. The preferred route was actually to follow West Indian Creek down from the existing plant to the proposed treatment plant. After evaluation, it was not recommended due to a significant impact to environment and private property, maintenance issues, and costs compared to other options. The option presented tonight was the second option, which reduces these impacts. There was no feasible third option in terms of routing the pipe.

McGill stated that when the plan was originally put together it was supposed to go down S-14. He is concerned about the impact of property values. McGill felt that tabling the item for additional discussions with landowners would be appropriate.

Neubauer stated that he understands the challenges and asked how a motion would need to be structured.

Schoeneman stated there is existing case law that states a public improvement can be reviewed but should not be denied. Moore stated the Board could take action to approve with a condition that the location of the sewer be worked out with the property owner and come back to the board.

Jondle stated that she does see the concern with the trunk line sewer layout with the hill.

Excell stated that an extra month of the applicant and property owner taking some extra time for discussions that would be worth it to try to come to an agreement.

McGill stated that he would be in favor of tabling for a more definite route for the sewer, as well as agreements with the private property owner.

Moore asked if the focus for the applicant should be on the use of the right-of-way. McGill stated that discussions with the private property owner in the interim would be appropriate.

MOTION: The Story County Board of Adjustment remands the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-2018, back to the applicant for further review and discussion with private property owners for a sewer plan that is mutually satisfying, and directs staff to place this item on the October 21, 2020, Story County Board of Adjustment agenda.

Motion by Neubauer, Second by Excell
Voting Aye: Neubauer, Excell, Jondle, McGill,
Voting Nay: None
Absent: Hovick (Left meeting at 5:57 PM)
Vote: (4-0)

CUP07-18.1 Inroads, LLC; Mineral Extraction

Schoeneman stated the request is for a minor modification to an existing conditional use permit (07-18) for the extraction of sand and gravel. The subject property is located at 3034 560th Avenue. The mining cell is located in the southwestern 4.6 acres of the 47.24 net-acre parcel. The conditional use permit was originally approved on November 28, 2018, with conditions, including that "landscaping shall be installed by June 1, 2020, in accordance with the submitted restoration plan. Berming and landscaping shall also be completed on the east side of the site matching the extent of extraction by June 1, 2020. Once landscaping is completed, the site shall be inspected by Planning and Development staff for conformance with the submitted restoration plan and prior to releasing bond security." The applicant is requesting a modification to the condition to allow the berm to be located east of the existing mining cell and to not be permanently landscaped pending approval of a future conditional use permit for the second phase of extraction, including the area east of the existing mining cell. If the second phase of extraction is not approved the berm is proposed to be permanently landscaped with nursery stock trees in the location adjacent to the mining cell. If the second phase is approved, the berm will be moved to the eastern side of the site and permanently landscaped. The applicant will increase the amount of the restoration bond until the berm is permanently landscaped. Staff recommends approval of the conditional use permit with conditions.

MOTION: The Story County Board of Adjustment approves the minor modification to the Conditional Use Permit for Mineral Extraction as put forth in case CUP07-18.1 to allow the eastern berm to remain located east of and abutting the mining cell, with the following conditions:

1. **The east berm shall be seeded with temporary seeding meeting Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual and Standards Manual or other professionally accepted design criteria.**
2. **If phase two of extraction is approved, the east berm shall be moved to the east property line prior to the excavation of materials from the ground as part of the second phase of extraction and the berm shall be landscaped within one year of the berm's construction.**
3. **If the conditional use permit for phase two of extraction is not approved, the east berm shall be permanently landscaped with nursery stock trees in the requested location adjacent to the mining cell.**
4. **The applicant shall increase the amount of the restoration bond until the berm is permanently landscaped from $10,000 to $30,000.**

Motion by Jondle, Second by Neubauer
Voting Aye: Jondle, Neubauer, Excell, McGill
Voting Nay: None
Absent: Hovick (Left meeting at 5:57 PM)
Vote: (5-0)

BOARD/STAFF COMMENTS:

Staff: Moore thanked the new members for their effort in absorbing the great deal of information that was presented. Moore plans to present an orientation for new members before the November 18, 2020 meeting. Ethan Anderson will provide training on how the Board of Adjustment is covered for liability while serving as a board member, as well as conflict of

interest information. Examples of various times where staff would need to reach out to the County Attorney for legal assistance on civil matters will also be shared.

Board: Each of the board members provided their background information for introductions.

ADJOURNMENT: 6:53 PM

_____

Approval of Minutes

_____

Title and Date

Prepared by Amelia Schoeneman, Story County Planning and Development Department, 900 6th Street,
Nevada, Iowa 50201 515-382-7245

STORY COUNTY, IOWA
CERTIFICATE OF CONDITIONAL USE PERMIT
AND WRITTEN FINDINGS OF FACT
AMENDING THE PREVIOUSLY RECORDED FINDINGS OF FACT INST. NO. _____

IN THE MATTER OF THE APPLICATION OF: Rob Bowers on behalf of StoryComm, 2591 Osborne Drive, Ames, IA, 50011, for the request for a Conditional Use Permit for three communications towers, located as follows: CUP03-20, Section 01, Franklin Township, parcel number 05-01-100-100; CUP04-20, Section 18, Indian Creek Township, parcel number 15-18-100-300; and CUP05-20, Section 25, Warren Township, parcel number 03-25-300-200	:	**PERMIT NO. CUP03-20, CUP04-20, and CUP05-20**

On September 16, 2020, the Story County Board of Adjustment approved the Conditional Use Permit for the StoryComm Communication Tower as put forth in case CUP03-20, as submitted.

Motion: Hovick
Second: Neubauer
Ayes: Hovick, Neubauer, McGill Jondle
Nays: Excell
Not Voting: None
Absent: None
Vote: (4-1)

AND

Approved the Conditional Use Permit for the StoryComm Communication Tower as put forth in case CUP04-20, as submitted.

Motion: Excell
Second: Neubauer
Ayes: Excell, Neubauer, Jondle, Hovick, McGill
Nays: None
Not Voting: None
Absent: None
Vote: (5-0)

AND

Approved the Conditional Use Permit for the StoryComm Communications Tower as put forth in case CUP05-20, as submitted.

Motion: Hovick
Second: Excell
Ayes: Hovick, Excell, McGill, Neubauer, Jondle

Nays: None
Not Voting: None
Absent: None
Vote: (5-0)

Written Findings of Fact

Case Summary: StoryComm is proposing to erect three communications lattice towers to provide two-way radio communications for Story County emergency services and public works agencies, including Story County, municipalities in Story County and Iowa State University. The proposed towers are as follows:

CUP03-20: A 255-foot lattice communications tower to be located in the southwestern portion of parcel 05-01-100-100 in Franklin Township. The parcel is located at the southeast corner of 550th Avenue and 160th Street. The communications tower will be 400 feet from the right-of-way of 550th Avenue and approximately 474 feet from the south property line or approximately 1,400 feet south of 160th.

The site and most surrounding parcels are in agricultural use. To the northwest is a dwelling over 2,000 feet from the tower site. To the west are two dwellings. One dwelling is located approximately 800 feet northwest of the tower site. The second dwelling is located approximately 600 feet southwest of the tower site.

The applicant indicated that they worked with southwestern's dwellings owner on the tower location and it has a substantial wind break providing screening—the applicant attempted to contact the northwest property owners but were unsuccessful. The northwest property owner provided a comment in opposition. The applicant and staff met with this property owner on their property and discussed why the location was selected (it was originally planned for property in Gilbert but encountered site distance issues with a water tower). It was suggested that StoryComm could move the tower's location on the site. However, the StoryComm working group discussed this and found it wasn't feasible as the site was selected to meet setback requirements and minimize impact to property owner's farming operation.

CUP04-20: A 285-foot lattice communications tower to be located in the southwestern portion of parcel 15-18-100-300 in Indian Creek Township. The parcel is located at the northeast corner of 620th Avenue and 305th Street. The communications tower will be 428 feet from the right-of-way of both 620th Avenue and 305th Street.

The site and most surrounding parcels are in agricultural use. There are three adjacent dwellings. One is 1,200 feet southwest from the proposed site location. One is 900 feet southeast from the tower location. To the west there is a dwelling approximately 700 feet away.

CUP05-20: A 265-foot lattice communications tower to be located in the southeastern portion of parcel 03-25-300-200 in Warren Township. The parcel is located on 150th Street. The communications tower will be 398 feet from the right-of-way of 150th Street and 133 feet from the east property line.

There are two adjacent dwellings. Other adjacent parcels are in agricultural use. To the north is a single-family dwelling is approximately 1,200 feet northwest from the proposed tower location. To the west is a parcel with a dwelling approximately 2,100 feet from the proposed tower site. The owner of the property to the north submitted a comment in opposition to the tower. StoryComm working group members and staff met the property owner on their property after receiving the comment. The tower is as far to the southeast from the dwelling as permitted by setbacks. This location was selected as it provided the required system coverage for the area and avoided interference with the microwave paths from the wind turbines located a half-mile north of the proposed site.

The Planning and Zoning Commission, at their June 16, 2020, meeting, found the proposed towers meet all standards of approval and supplemental standards required for a conditional use permit and recommended approval of the requests.

Amelia Schoeneman, Story County Planner, reviewed the Conditional Use Permit Application, site plans, written narrative and other related submittal materials in accordance to Chapter 90 Conditional Uses of the Story County Land Development Regulations. Schoeneman presented the staff report at the June 17, 2020, Story County Board of Adjustment meeting.

Analysis

1. **Applicable Regulations:** Chapter 90.04: Standards for Approval
   A. **Compatibility. The proposed buildings or use shall be constructed, arranged and operated so as to be compatible with the character of the zoning district and immediate vicinity, and not to interfere with the development and use of adjacent property in accordance with the applicable district regulations. The proposed development shall not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties.**

   Staff Comment: Communication towers and facilities are permitted as a conditional use in the A-1, Agricultural Zoning District if a conditional use permit is granted. The properties on which the towers are proposed to be constructed are large agricultural parcels. A majority of the surrounding land is also in agricultural row crop production.

   These towers will be noticed by the nearby landowners due to the heights necessary to achieve the project goals. Required setbacks from property lines will be met to minimize impacts.

   The tower requested as part of CUP03-20 is on a parcel adjacent to three dwellings. One is 800 feet northwest of the tower site, one is 600 feet southwest of the tower site, and one is over 2,000 feet from the tower site.

   The tower requested as part of CUP04-20 is also on a property adjacent to three dwellings. One is 930 feet southeast from the proposed site location. The other dwelling is 700 feet southwest from the tower location.

   The tower requested as part of CUP05-20 is on a property adjacent to two dwellings. One is approximately 1,200 feet northwest from the proposed tower location, one is approximately 930 feet southeast from the proposed tower location, and one is 2,100 feet west of the proposed tower site.

   The tower compounds also include 20-foot-by-10-foot equipment shelter, an underground 1,000 gallon liquid propane tank, and an emergency generator inside of a metal cabinet for sound attenuation. The generator would produce a sound level of 64 dB. The FAA requires all three towers to be lit as a condition of the FAA Determination of No Hazard to Air Navigation. The towers will have dual lighting controlled by a photo sensor—from dusk to dawn, a top beacon will have a red, flashing light, with steady red side markers. During the day, the top because will flash white and the side markers will also be lit. The tower will be galvanized steel, as required by the supplemental standards for towers. The equipment shelter will also have lighting to illuminate the door—two fixtures with 40 watt LED bulbs are proposed and will be shielded.

   B. **Transition. The development shall provide for a suitable transition, and if necessary, buffer between the proposed buildings or use and surrounding properties.**

   Staff Comment: The tower locations meet all setbacks and separation distance requirements as per the supplemental standards for a conditional use permit for communication towers and facilities.

   The minimum setback requirement for the towers is 150 percent of the tower height from the road right-of-way and residential parcels and 50 percent of the tower height from other property lines.

   The tower requested as part of CUP03-20 is proposed to be 255 feet in height. The 150-percent setback is 382.5 feet and the 50-percent setback is 127.5 feet. The setback from the closest property line (the west line adjacent to 550th Avenue) is 400 feet.

   The tower requested as part of CUP04-20 is proposed to be 285 feet in height. The 150-percent setback is 427.5 feet and the 50-percent setback is 142.5 feet. The setback from the closest property lines (the west and south lines adjacent to 620th Avenue and 305th Street) is 428 feet.

The tower requested as part of CUP05-20 is proposed to be 265 feet in height. The 150-percent setback is 397.5 feet and the 50-percent setback is 132.5 feet. The setback from the closest property lines (south line adjacent to 150th Street and the east line in common with a property in agricultural production) are 398 feet and 133 feet, respectively.

Also, per the supplemental standards, the applicant will be constructing a six-foot-tall chain-link fence around the tower compound with vinyl privacy slats.

C. Traffic. The development shall provide for adequate ingress and egress, with particular attention to vehicular and pedestrian safety and convenience, traffic flow and control, and emergency access.

Staff Comment: The traffic impact of the proposed towers is expected to be minimal. Once construction of the proposed structure is completed, the only traffic that will visit the site is a service technician four times a year.

All towers will have new accesses reviewed by the Story County Engineer. The access drives to the towers will be 12-feet wide and gravel. In front of the tower compound, there will be a 25-foot-50-foot gravel parking area and turnaround area.

All accesses to the towers will be located on County gravel roads.

The tower requested as part of CUP03-20 will have an access from 550th. The Iowa Department of Transportation (DOT) shows a 2015 average daily traffic count for the road of 130 vehicles.

The tower requested as part of CUP04-20 will have an access from 305th. The Iowa DOT shows a 2015 average daily traffic count for the road of 100 vehicles.

The tower requested as part of CUP05-20 will have an access from 150th. The Iowa DOT shows a 2015 average daily traffic count for the road of 10 vehicles. The adjacent dwellings to this tower site take access on 670th Avenue north of 150th Street.

D. Parking and Loading. The development shall provide all off-street parking and loading areas as required by this Ordinance, and adequate service entrances and areas. Appropriate screening shall be provided around parking and service areas to minimize visual impacts, glare from headlights, noise, fumes or other detrimental impacts.

Staff Comment: Each tower will have a 25-foot-by-50-foot gravel parking area and turnaround area adjacent to the tower compound. The subject properties are currently in row crop production.

E. Signs and Lighting. Permitted signage shall be in accordance with the applicable district regulations and shall be compatible with the immediate vicinity. Exterior lighting, if provided, shall be with consideration given to glare, traffic safety and compatibility with property in the immediate vicinity.

Staff Comment: The only signs and lighting that will be included in this development are signs and lighting required by the FAA posted on the compound fence. No advertising of any kind will be located at this development.

The FAA is requiring all three towers to be lit as a condition of the FAA Determination of No Hazard to Air Navigation. The towers will have dual lighting controlled by a photo sensor—from dusk to dawn, a top beacon will have a red, flashing light, with steady red side markers. During the day, the top because will flash white and white side markers will also be lit. The tower will be galvanized steel, as required by the supplemental standards for towers. The equipment shelter will also have lighting to illuminate the door—two fixtures with 40 watt LED bulbs are proposed and will be shielded.

F. Environmental Protection. The development shall be planned and operated in such a manner that will safeguard environmental and visual resources. The development shall not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.

Staff Comment: No excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds, are anticipated.

Landscaping equivalent to 20% of the impervious area is proposed around the drive and compound to provide stormwater absorption, as required by Chapter 88.05 of the Story County Land Development Regulations. SUDAS Type 2 or Type 3 seed mixes are proposed, which would include Ryegrass or Little and Big Bluestem and other grasses. These can grow between two and six feet.

An erosion control plan is required with the zoning permit submittal to minimize erosion during construction, including stabilizing any disturbed area and providing a stabilized construction entrance.

A metal cabinet for sound attenuation proposed for the generator.

If the Board concludes that all the above development criteria will be met, it must recommend approval of the application unless it concludes that, if completed as proposed, there is a strong probability the development will:

1. **not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.**

   Staff Comment: The towers will be built in compliance with the required setbacks from the right-of-way and adjacent property lines. The towers will be partially screened by a six foot fence. The lowest 8 feet of the towers will also have its rungs removed to discourage climbing.

2. **impair an adequate supply (including quality) of light and air to surrounding properties.**

   Staff Comment: The proposed communication towers will be a lattice type towers and will have little to no impact on the supply of light and air to surrounding properties.

3. **unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.**

   Staff Comment: Following the construction of the proposed towers, there will be very little traffic to and from the tower. Traffic will be for maintenance only. The applicant will be required to obtain a new access permit and a 911 address for the proposed towers. The towers are not proposed to be located in the floodplain.

4. **diminish or impair established property values on adjoining or surrounding property.**

   Staff Comment: The Story County Assessor's Office raised no concerns with the request. No impacts on property values are anticipated.

5. **not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.**

   Staff Comment: The C2C plan is oriented toward preserving the county's rural character and high value agricultural land. The communication towers will be located on agricultural land and a small percentage of row crop will be impacted. The remainder of the parcels will continue to be farmed. Approximately 1.2 acres of land will be leased by StoryComm on the parcels—equivalent to 4.5% of the smallest parcel's land area.

D. When indicated in Table 90-1, Table of Conditional Uses, a conditional use shall be subject to the supplemental standards listed below, in addition to the standards for approval set forth in Section 90.04 and development impacts specified in Section 90.05 of this chapter.

Co-Location. Prior to applying for a conditional use permit for construction of a new tower/facility, the applicant shall exhaust all alternatives for co-location on existing towers/facilities. As such, the applicant shall submit evidence demonstrating the following:

Staff Comment: A statement regarding the feasibility of collocating the proposed equipment on an existing tower was provided and a map showing the search rings for a tower within one mile of the selected sites that would support co-location was also submitted. The applicant indicates that "towers greater than 1 mile would require a total redesign of the system and would likely result in a loss of coverage" if equipment were co-located on them instead. There were no towers within the one mile search rings from the selected sites. Further, "the system is designed to provide specific in-building coverage within Story County, Ames and ISU campus and therefore the site locations are critical in providing the proper signal level while minimizing co-site interference, minimizing the number of sites and providing an unobstructed microwave path between site"

Height. The applicant must demonstrate the proposed height of the tower/facility is the minimum necessary to accommodate the proposal's requirements, as documented by a qualified engineer.

Staff Comment: According to the applicant, "The Harris Corp. Private Radio Systems software program, RAPTR (Radio Analysis and Propagation Tool Repository) is a complete system design tool for the analysis and design of land mobile radio systems. The RACOM engineers use RAPTR to design the optimum location and minimum tower and antenna heights necessary to meet the coverage requirements for StoryComm's radio system."

Obstruction of View. The proposed tower/facility will not unreasonably interfere with the view from any publicly owned or managed areas or major view corridors.

Staff Comment: There are no adjacent publicly owned areas to the subject properties. A majority of the adjacent parcels are in agricultural use.

Submittal Requirement: A statement by the applicant as to whether construction of the tower/facility will accommodate co-location of additional antennas for future users and documentation regarding the standards for co-located established in the Ordinance.

Staff Comment: According to the applicant. "The tower is designed with 30% additional capacity and there will be additional room inside the compound. The StoryComm Board will consider applications for co-location on a case-by-case basis."

Submittal Requirement: Copy of the signed lease agreement with the property owner.

Staff Comment: A copy of the signed leases and access easements were provided. The access easements are 30 feet in width for the 12-foot gravel drives. The leases include the 30-foot access easement areas and a 200-foot-by-200 foot area, which includes the 50-foot-by-50-foot tower compound

Comments from the General Public

Two comments were received from adjacent property owners in opposition to the towers requested as part of CUP03-20 and CUP05-20.

The owner of the property west of the tower proposed as part of CUP03-20 is concerned about the impact of the tower on their dwelling's value and view (the tower is 800 feet southeast of the dwelling). The applicant attempted to contact the property owner but was unsuccessful prior to selecting the location. The applicant and staff met with this property owner on their property and discussed why the location was selected (it was originally planned for property in Gilbert but encountered site distance issues with a water tower). It was suggested that StoryComm could move the tower's location on the site. However, the working group discussed this and found it wasn't feasible as the site was selected to meet setback requirements and minimize impact to the farming operation.

The owner of the property to the north of the tower proposed as part of CUP05-20 is concerned about the impact of the tower on the value of their dwelling (1,200 feet northwest of the tower location). StoryComm working group members and staff met the property owner on their property after receiving the comment. The tower is as far to the southeast from the dwelling as permitted by setbacks. Moving the tower further east, as suggested by the property owner,

would require another landowner's permission/interest in leasing space to StoryComm. This location was selected as it provided the required system coverage for the area and avoided interference with the microwave paths from the wind turbines located a half-mile north of the proposed site.

Points considered

1. The communications towers will provide to provide two-way radio communications for Story County emergency services and public works agencies. The StoryComm system is designed to meet the Association of Public Safety Communications Officials Project 25 Phase 2 standards, which will replace proprietary radio technology that limited the interoperability of radio. Currently, the Iowa State University Police, Ames Police, and Story County Sheriff have interoperable radios but they are not interoperable with the other entities that are part of the StoryComm project.
2. The tower requested as part of CUP03-20 is on a parcel adjacent to three dwellings. One is 800 feet northwest of the tower site, one is 600 feet southwest of the tower site, and one is over 2,000 feet from the tower site. This location was selected to minimize the interference with the line of site from dwellings located to the west of the tower across 550th Avenue.
3. The tower requested as part of CUP04-20 is on a property adjacent to three dwellings. One is 1,200 feet southwest from the proposed site location. One is 700 feet west of the tower location. The other dwelling is 930 feet southeast from the tower location.
4. The tower requested as part of CUP05-20 is on a property adjacent to two dwellings. One is approximately 1,200 feet northwest from the proposed tower location and one is 2,100 feet west of the proposed tower site. This location was selected as it provided the required system coverage for the area and avoided interference with the microwave paths from the wind turbines located a half-mile north of the proposed site.
5. All supplemental standards for communications towers are met, including for setbacks and aesthetics.
6. Signs, lighting, and environmental protection measures will meet Story County Land Development Regulations and FAA requirements.
7. Traffic will be limited to maintenance and adequate parking and turnaround area are provided.
8. SUDAS Type 2 or Type 3 seed mixes are proposed around the compound and gravel drive, which would include Ryegrass or Little and Big Bluestem and other grasses. These can grow between three and six feet. A fence with vinyl slates is also proposed for screening. Climbing pegs on the lower eight feet of the tower will be removed.
9. A small percentage of row crop will be impacted. The remainder of the parcels will continue to be farmed. Approximately 1.2 acres of land will be leased by StoryComm on the parcels—equivalent to 4.5% of the smallest parcel's land area.

Public Hearing June 17, 2020
The request was previously heard at the June 17, 2020, meeting.

Andrew Friend stated that he lives NW of the proposed 255-foot lattice communications tower location and feels disadvantaged in the process as the tower being moved for the other neighbor that it made the tower location worse for him. Friend stated that the house view will be looking directly at the tower. Friend stated that he would like to request another meeting between himself and StoryComm and Planning staff to find out if there is a better location for the proposed tower to discuss the inconvenience of the tower location to try to find balance so that both property owners can be satisfied.

Schoeneman stated regarding Friend's concern (CUP03-20), the farmer wanted the tower to be able to farm around the compound area and that there are two terraces that are being considered as well, which make it difficult to move north or south. StoryComm had concerns about moving the location east, which would impact the improvement and the timing of the project. Bowers spoke about the temporary system that is currently being used and will end at the end of June.

Tom Hackett stated that he had conversations with the land owner regarding north or south movement of the proposed tower on the property and they were reluctant. Movement to the east would pose challenges for StoryComm during construction and the long-run with a longer access drive, and more maintenance, water drainage issues. Hackett stated that all factors have been considered and decided the current location met the long term goals for StoryComm and the land owner's preferences.

Neubauer asked for clarification on what guidelines would need to be followed in order to place a condition on CUP03-20. Schoeneman stated the Board would need to amend staff's findings and relate the condition to one or more of the standards for approval. Neubauer asked if the Assessor had any comments about impact on property value. Schoeneman stated there were no comments about impact on property values, but that the Assessor comments that the towers would be exempt as long as there are no for-profit leasing to other providers taking place. McGill stated that if the tower meets all the requirements there is really not a way to not approve the request.

Public Hearing Comments from September 16, 2020

A rehearing of the item was on the September 16, 2020 agenda. HF 2512 was signed by the Governor on June 1, 2020, and requires Planning and Zoning Commission and Board of Adjustment members to be eligible electors and reside within the area regulated by the County Zoning Ordinance (unincorporated area). As the law went into effect immediately, prior to the June meeting of the Board of Adjustment, staff contacted Board members who did not reside in the unincorporated area of Story County to let them know that they could no longer serve on the Board of Adjustment. Due to a recent annexation, staff did not realize Board Member Randy Brekke, who had served on the Board since 2016, no longer resided in the unincorporated area. When this came to staff's attention in August, staff contacted the County Attorney, Ethan Anderson, to determine how the cases heard by the Board including Brekke in June and July were impacted. Anderson advised that the cases be reheard by the Board.

Schoeneman stated at the June 17, 2020 meeting these were approved. Additional comments received since the last meeting were from the landowner of CUP03-20 being open to other locations for the tower CUP03-20 and that the proposed location for the tower is best for StoryComm.

Neubauer asked for clarification on the process with readdressing the cases and how the process works. Schoeneman stated that essentially the board is rehearing the cases since there was not a quorum at the June meeting. The public hearing will need to be re-opened and action taken, with the recommendation from staff for the same action.

Andrew Friend stated that since the last meeting, he has become acquainted with the landowner and the landowner is ok with the tower being moved to the southwest corner of the field. Friend shared a proposed site plan for the tower to be moved to. Friend asked that CUP03-20 have a condition to that the tower to be moved to the location to the south that is most favorable by the landowner and both neighbors. Friend offered suggestions for amending the findings in order to approve conditions. Friend clarified that he is not asking StoryComm to move the tower very far and he understands that the timeline will be lengthened and would like the Board of Adjustment to consider the long-term tower location. The timeline and budget concerns are understandable, but short term.

Rob Bowers stated that the landowner did provide a comment about moving the tower location if it is in the best interest of everyone involved. Bowers stated that it is not in the best interest of StoryComm, or the citizens of Story County. Bower clarified that the tower location was not originally moved in order to change the aesthetics for the other property owner, but it was actually moved because of a water way and being as close to the terraces as possible created the best use of the land. Bowers stated that moving the location would cause potentially a 4-month delay and up to $25,000 in additional costs to the citizens of Story County.

Schoeneman stated that there would be grass landscaping around the site and there is a fence with vinyl slats for screening, which would be 6' tall. McGill asked Bower if moving the tower would affect the communications aspect of the tower. Bower stated it is not anticipated that communications would be affected, but another study would be required to ensure that it would not.

Schoeneman went through the standards of approval for a conditional use permit and staff's findings. The towers exceed the required setbacks. The FAA requires lighting for safety.

Schoeneman reminded the board that the towers are for emergency services and all three towers are important because they form a ring to work with each other to provide the radio operability that first responders need.

Neubauer asked about Mr. Friend's concern with the unsightliness of the tower and asked why that was not in the staff report. Schoeneman stated that the compatibility standard focuses on odor or noise, which could be considered offensive and interfere with the use of adjoining property. The lighting is required for safety by the FAA and does not impact staff's compatibility findings.

Excell asked if the board could ask the applicant to consider an alternative to the lighting and if all three towers have to be approved together. Schoeneman stated that the Board could amend staff's findings.

McGill asked if Friend and Bowers have had communication since the last meeting. Bowers stated that the Board of Directors did receive an email from the Friends after the last meeting and prior to the notification of the June meeting being vacated and were under the assumption the process was done since there had been a previous vote.

Excell asked if all three towers have to be approved as a whole or if two can be approved and the second be worked out and brought back. Schoeneman stated separate action could be taken, but in terms of feasibility that would be a question for Mr. Bowers. Bowers stated that part of the estimated cost moving forward would be to do a study to determine the impact of moving the tower location and then a four-month delay for the regulatory process, which could be a potential problem for emergency responders.

McGill stated that the tower has met all of the requirements according to the law and asked the board what they would like to do.

Excell stated that if there is an option to move the tower that would preserve the value of the Friends property and the long-term financial effect for the Friends that should be considered. Hovick asked if there has been any research done as to the effect on property values. Schoeneman stated that the Assessor did not raise any. Excell asked if departments knew about the height and lighting. Schoeneman clarified that the information is routed to all county departments so they would have known the information on the height and lighting.

McGill stated it would need to be approved as presented or table the item allowing additional time for the applicant and Mr. Friend to come to an agreement.

Board of Adjustment Action on Written Findings of Fact

Date: October 21, 2020

VOTE:	**Ayes**	**Nays**
Excell		
McGill		
Neubauer		
Hovick		
Jondle		

Vote:

Chair: _____

Prepared by Amelia Schoeneman, Story County Planning and Development Department, 900 6th Street, Nevada, Iowa 50201 515-382-7245

STORY COUNTY, IOWA
VARIANCE AND WRITTEN FINDINGS OF FACT
AMENDING THE PREVIOUSLY RECORDED FINDINGS OF FACT INST. NO. _____

IN THE MATTER OF THE APPLICATION OF:	**:**	**CASE NO. VAR02-20**
ERIC AND JUDITH BALBIANI, for the property located at 27922 TIMBER ROAD, KELLEY, IA and described as SECTION: 34 TOWNSHIP: 83 RANGE: 24 LOWMAN'S 2ND SD PARCEL"D" PT LOT 8 SLIDE 284 PG 3 (Parcel ID Number 09-34-460-110), under the ownership of ERIC AND JUDITH BALBIANI	:	

On September 16, 2020, the Story County Board of Adjustment approved Variance Case No. VAR02-20, for 3 feet to the 40-foot setback.

VOTE:	**Ayes:**	**Neubauer, Excell, Jondle, Hovick, McGill**
	Nayes:	**None**
	Absent:	**None**
	Vote:	**(5-0)**

Written Findings of Fact

Case Summary: The request is for a variance to the minimum front setback for an attached garage at 27922 Timber Road. The zoning of the subject property is R-1 Transitional Residential, which establishes a minimum front setback of 40 feet. The variance request for an attached garage that id proposed to encroach on the front setback, requiring a variance of 7 feet. The attached garage is proposed to have a setback of 33 feet, be 39-feet-by-26 feet, and be located on the west side of the existing dwelling. The purpose of the variance is to preserve two trees on the site. A larger garage that encroaches on the setback would allow for the overhead garage door and driveway to be located further west, away from the trees.

Amelia Schoeneman, Story County Planner, and Emily Rizvic, Planning Intern, presented the staff report and reviewed the Variance Application, site plans, written narrative, and staff's recommended findings in accordance to Chapter 92.03 Variances of the Story County Land Development Regulations.

Analysis of Legal Principles

A. Finding of unnecessary hardship

i. The land in question cannot yield a reasonable return if used only for a purpose allowed in that zone;

Staff Comment: The principle of reasonable return asks the Board to consider if, without a variance, a property owner cannot establish any beneficial use on their property.

The variance is being requested to protect two trees on the property by allowing the garage door and driveway to be located further west. The applicant indicates that if the trees were removed, "new trees could be planted but would not provide the energy conservation that the current trees do. These trees are beautiful in the fall and everyone feels this adds value to the property. The new trees would take 15 to 20 years to provide the cooling benefit that the existing trees do, plus the removal of the trees would reduce the character and value of the property. We estimate that the value loss of the trees to be $10 - 15,000, and the cost to remove them will be $5 - 7, 000.00."

However, staff finds that as the alternative exists to remove the trees and construct a smaller attached garage addition, meeting the setback and applicant's needs, reasonable return is established without the variance. If the trees were impacted, the garage addition and interior improvements could occur while meeting setbacks. A smaller garage addition, 32 feet-by-26-feet, would meet the applicant's needs to have garage space that allows for adequate parking of the two vehicles, entry to, and exit from the vehicles and would meet the required setback. This smaller garage would still be 832 square feet (excluding the workshop) and is 57% larger than the existing garage. Further, a smaller garage that meets setback would not prohibit the conversion of the existing attached garage into living space. A smaller garage is not the preferred alternative due to the impact on the two trees.

Further, reasonable return is established on the property as there is an existing dwelling, built in 1960, with a 530 square-foot attached garage, that meets the required setbacks. The property owners purchased the property in its current configuration in 2007.

Board Action: The Board found keeping the cost of removing the trees and cost of replacing the trees did not allow for reasonable return. Further, trees add value to the property and their removal would impact the property value.

ii. The plight of the owner is due to unique circumstances and not to general conditions in the neighborhood which may reflect the unreasonableness of the Ordinance itself; and

Staff Comment: The principle regarding unique circumstances asks the Board to consider if topography or other limiting factors, outside of the property owner's control, create the need for the variance request.

There are unique circumstances requiring the attached garage to be located on the west side of the dwelling and the overhead garage door to be located on the south side of the garage:

- The septic system and water lines are located on the north side of the home.
- The house is already located at the minimum 35-foot rear setback from the east property line. Any garage on this side of the dwelling would re quire a variance for the entire structure. Additionally, the bedrooms are located on the east side of the home and the location of a garage on the east side would not be a logical or desirable flow for the living space versus a location on the west side with garage access through the mudroom and laundry area.
- The applicant indicates that "Aesthetically, placing a garage south of the house impedes the view for which they bought the house, and erodes the character of the home and its value would likely be impacted as well."

As an attached garage would most logically be placed on the west side of the property given these circumstances, the relocation of the driveway so that the entry to the garage was on the west side of the garage, rather than the south, was considered as an alternative to protect the trees. However, it was not possible due to a curve in Timber Road north of the property that creates sight distance issues. The applicant also indicates a lack of maneuverability if a west-facing garage door was proposed with the existing drive location.

The Board must determine if the location of the two trees can be considered a unique circumstance requiring a variance. Again, an attached garage with a south-facing door is proposed. The garage could function if it were 32 feet in width and would meet setbacks but would impact the two existing trees. A width of 39 feet would allow the overhead door and driveway to be located further west away from the trees but would encroach seven feet on the required 40-foot front setback.

In 2002, a similar variance was requested for an adjacent property to the west across Timber Road to reduce the side setback for a detached garage to protect two trees. The Board concluded the trees were not a unique circumstance and remanded the variance for the applicant to redesign the garage to meet setbacks. The garage was constructed meeting the setback in this case. Staff concludes that the trees are not a unique circumstance meeting this criterion.

Board Action: The Board agreed with staff's findings on the unique circumstances requiring the garage to be located on the west side of the dwelling and have a south-facing overhead door. They also found that the age of the house was a unique circumstance when considering the general condition of the neighborhood.

iii. The use to be authorized by the variance will not alter the essential character of the locality.

Staff Comment: The average attached garage size of adjacent dwellings is 675 square feet and sizes range from having no attached or detached garage to a 1,500 square foot garage. The second-largest existing attached garage on an adjacent property is 843 square feet. The proposed garage is 1,014 square feet, excluding the workshop area. The neighborhood is a combination of older subdivisions with similar-sized dwellings and garages, houses in new subdivisions with larger garage sizes, and farmsteads with large accessory structures. The proposed garage would maintain the existing roofline and height of the home. The essential character of the locality would not be altered.

Board Action: None—the Board accepted staff's findings.

B. Granting the variance will not be contrary to the public interest; and

Staff Comment: Following the Story County Land Development Regulations, the public interest in enforcing the bulk requirements associated with an R-1, Transitional Residential District is "to provide a district for single-family detached dwellings between a rural and urban density" (see section 86.07(1)). Similarly, the property is designated as Rural Residential in the Ames Urban Fringe Plan. The public interest in enforcing the policies and principles related to the Rural Residential Area relates to the policy that the designation "includes all single-family residential land uses/developments that involve maximum average net densities of one unit per acres" and to protect the rural character of the area "through residential density requirements, buffering requirements between conflicting land uses and other appropriate transitions from urban to rural areas." The variance will not change the density of the property. However, because the property is zoned R-1, it already has a smaller setback permitted than that of other adjacent properties that are zoned A-R or A-1, where a 50-foot front setback applies. Allowing an even more reduced front setback may set a precedent for the area that could affect the buffering between properties and character.

The public interest in enforcing the bulk requirements in the Story County Land Development Regulations and setbacks relates to building separation and uniform location, providing light and air between buildings, separation from roadways for inhabitant and motorist safety as well as access to utilities and the right-of-way. Timber Road is a gravel, County Road with an average daily traffic (ADT) count of 130. The level of traffic on the roadway or how the property owner's access the road will not change with the variance request. The height of the dwelling will be maintained.

Board Action: The Board found that no members of the public provided comments in opposition and the applicant had stated that the closest neighbor was in support.

C. The spirit and intent of the Story County Development Plan and Story County Land Development Regulations are protected.

Staff Comment: The Story County Comprehensive Plan and the Story County Land Development Regulations have similar spirits/intents to maintain the county's rural character.

The Statement of Intent for the R-1 Transitional Residential Zoning District is:
"The R-1 Transitional Residential District is designed to provide a district for single-family detached dwellings between a rural and urban density. Subdivisions created within the R-1 district may also include community facilities and open space uses, with special provisions to protect the residential character of the District. This District is not intended to permit isolated rural dwellings incompatible with surrounding land uses and not in conformance with the Cornerstone to Capstone (C2C) Comprehensive Plan."

Similarly, the property is designated as Rural Residential in the Ames Urban Fringe Plan, which "includes all single-family residential land uses/developments that involve maximum average net densities of one unit per acre."

The proposed garage will not allow for denser residential development.

However, because the property is zoned R-1 Transitional Residential, it already has a smaller setback permitted than that of other adjacent properties that are zoned A-R or A-1, where a 50-foot front setback applies. Allowing an even more reduced front setback may set a precedent for the area that could after the buffering between properties and character.

Board Action: The Board found that a reduced variance of three feet would not be noticeable and impact the intent of the Story County Development Plan and Story County Land Development Regulations.

Comments from the General Public

Notification letters were mailed to surrounding property owners regarding the variance request on July 9, 2020. No comments were received.

Public Hearing July 15, 2020

The request was previously heard at the July 15, 2020, meeting.

Brekke asked when the house was built and if there were restrictions at that time. Schoeneman stated the house was built in 1960 and current setbacks are met, it's the 39' addition that would not meet setbacks, but that a 32' addition would meet setbacks. Brekke stated that it appeared the proposed variance would be 6' on south end of the addition and 7' on north due to the angle of the property line. Schoeneman stated that the applicant located the property pins and was able to measure on the site rather than using an aerial image. Brekke asked if a variance could be approved for a different amount. Schoeneman stated that would be possible, but the findings would need amended to state why that would meet the findings. Schoeneman stated that by removing the trees the setbacks could be met. McGill asked for clarification on if building a smaller garage, the setbacks would be met. Schoeneman stated that was correct and a plan showing a smaller attached garage was submitted by the applicant that does meet setbacks.

Chaden Halfhill spoke representing the applicant and stated that he is the designer and contractor. Halfhill stated that the existing detached garage is in the north quadrant and using it as a parking garage is not an option because of the septic lateral fields. Halfhill stated that an attempt was made to keep the west-facing door on the addition, but maneuverability was not possible, so the door was moved to the south side of the proposed attached garage. Halfhill said the property owner adjacent to the property has verbally stated they are ok with the proposed request. Halfhill stated that the applicant does not want to damage the tree because it offers a great deal of shade reducing operating costs. Halfhill stated that he liked the suggestion from Brekke to allow a 2' or 3' variance which would be doable for the applicant.

Neubauer asked for clarification of the concept plan for 32' addition with door to the west and if the navigation of the driveway would be an issue. A new culvert was initially considered, but

because of a curve on Timber road they cannot have an access point there. Entering the original driveway with a turn to come into the proposed garage was too difficult to maneuver. That is the reason the door was changed to the south side of the proposed attached garage which then made the existing house and trees an issue for maneuverability.

McGill asked if the old garage area would be converted into living space. Halfhill stated that is correct.

Brekke asked if the trees in the drawing are fairly close to scale on the site plan. Halfhill stated that one tree is larger and he may have reversed which tree is which in the drawing.

McGill asked if this item would need to be tabled or if it could be addressed tonight if an option was given that Halfhill agreed to. Jerry Moore stated that the legal principals would need to be met if a deviation would be made from what staff recommended. Moore asked how it would be known that the trees with their root systems would not be affected. Halfhill stated that if there are roots that go across the footing, it would need to be protected during construction so that the root ball doesn't get compacted with construction traffic. The distance is about 4' from the tree to where the footing would be located and that the roots would be cut cleanly which has been done successfully in the past. Schoeneman stated that the location of the southern footing would still be the same distance from the tree if a variance is granted.

McGill asked if it would be possible to move the 32' concept plan further north. Halfhill stated there is a water line in the area, but it might be doable. McGill stated he is concerned about the legal principals, although there are options if it were to be brought back and agrees that trees do add value to properties.

Moore asked Halfhill to comment on the tree that had already been removed. Halfhill stated that a tree was previously removed that was in the direct way of where the garage was planned to be built, and also that it was dying, but he does not know what was wrong with the tree.

Halfhill asked if the orientation of the house not facing the road provide a special circumstance of the rules that are meant for a front facing view. Schoeneman stated the orientation was looked at and it was not found to impact which property line is considered the front property line, but rather the access location.

Schoeneman stated that if it is tabled to look into a lesser variance request that she does not feel it would alter staff recommendation and denial would still be recommended.

Brekke stated he is not interested in pushing this through, and asked if the Board had amended the findings previously. He would like to keep the trees and changing the amount of the variance request. Schoeneman stated that the board has changed the findings before and that the Board would need to go through and change the findings for each legal principle staff found was not met. Much discussion took place among the Board as they amended staff's findings.

On the first finding that the land in question cannot yield a reasonable return if used only for a purpose allowed in that zone, the Board found keeping the cost of removing the trees and cost of replacing the trees did not allow for reasonable return. Further, trees add value to the property and their removal would impact the property value.

On the second finding that the plight of the owner is due to unique circumstances and not to general conditions in the neighborhood which may reflect the unreasonableness of the Ordinance itself, the Board agreed with staff's findings on the unique circumstances requiring the garage to be located on the west side of the dwelling and have a south-facing overhead door. They also found that the age of the house was a unique circumstance when considering the general condition of the neighborhood.

On the fourth finding that granting the variance will not be contrary to the public interest, the Board found that no members of the public provided comments in opposition and the applicant had stated that the closest neighbor was in support.

On the fifth finding that the spirit and intent of the Story County Development Plan and Story County Land Development Regulations are protected, the Board found that a reduced variance of three feet would not be noticeable and impact the intent of the Story County Development Plan and Story County Land Development Regulations.

Public Hearing Comments from September 16, 2020

A rehearing of the item was on the September 16, 2020 agenda. HF 2512 was signed by the Governor on June 1, 2020, and requires Planning and Zoning Commission and Board of Adjustment members to be eligible electors and reside within the area regulated by the County Zoning Ordinance (unincorporated area). As the law went into effect immediately, prior to the June meeting of the Board of Adjustment, staff contacted Board members who did not reside in the unincorporated area of Story County to let them know that they could no longer serve on the Board of Adjustment. Due to a recent annexation, staff did not realize Board Member Randy Brekke, who had served on the Board since 2016, no longer resided in the unincorporated area. When this came to staff's attention in August, staff contacted the County Attorney, Ethan Anderson, to determine how the cases heard by the Board including Brekke in June and July were impacted. Anderson advised that the cases be reheard by the Board.

Schoeneman provided a brief summary. The request is for a variance to the minimum front setback for an attached garage at 27922 Timber Road. The zoning of the subject property is R-1 Transitional Residential, which establishes a minimum front setback of 40 feet. The variance request for an attached garage is proposed to encroach on the front setback, requiring a variance of 7 feet. The attached garage is proposed to have a setback of 33 feet, be 39-feet-by-26 feet, and be located on the west side of the existing dwelling. The purpose of the variance is to preserve two trees on the site. A larger garage that encroaches on the setback would allow for the overhead garage door and driveway to be located further west, away from the trees. Planning and Development staff recommend denial of the variance. Schoeneman stated the Board of Adjustment previously approved a 3' variance.

Board of Adjustment Action on Written Findings of Fact

Date: October 21, 2020

VOTE:	**Ayes**	**Nayes**
Excell		
McGill		
Neubauer		
Hovick		
Jondle		

Vote:

Chair: _____

Prepared by Emily Rizvic, Story County Planning and Development Department, 900 6th Street, Nevada, Iowa 50201 515-382-7245

STORY COUNTY, IOWA
VARIANCE AND WRITTEN FINDINGS OF FACT
AMENDING THE PREVIOUSLY RECORDED FINDINGS OF FACT INST. NO. _____

IN THE MATTER OF THE APPLICATION OF: **Andrew Friend** **16117 550th Avenue** **Story City, IA 50248** **A variance request for an attached garage to a nonconforming dwelling for the property located at 16117 550th Avenue, Story City, IA and described as being located in Northeast of the Northeast quarter of Section 02 of Franklin Township BEG 522'S NE COR S435.5' W328.1' N430.7' E328.8 to the point of beginning (Parcel ID Number 05-02-200-230), under the ownership of Andrew and Naomi Friend.**	:	**CASE NO. VAR01-20**

On September 16, 2020, the Story County Board of Adjustment approved Variance Case No. VAR01-20 for the request of a 20 foot front setback variance, from 50 feet to 30 feet for an attached garage to a nonconforming single family dwelling.

VOTE:	**Ayes:**	**Neubauer, Hovick, Jondle, Excell, McGill**
	Nayes:	**None**
	Absent:	**None**
	Vote:	**(5-0)**

Written Findings of Fact

Case Summary: The request was for a variance to the minimum front set back for an attached garage to a nonconforming single family dwelling located in the A-1 District, which establishes a minimum front set back of 50 feet. The variance request was to permit the construction of an attached garage to the nonconforming single family dwelling that would encroach on the front setback requiring a variance of 20 feet from 50 feet to 30 feet. Planning and Development Staff recommended approval of the variance request due to the variance request meeting all legal principals.

Marcus Amman, Story County Planner, presented the staff report at the September 16, 2020, Story County Board of Adjustment meeting and reviewed the Variance Application, site plans, written narrative, and staff's recommended findings in accordance to Chapter 92.03 Variance of the Story County Land Development Regulations.

Analysis of Legal Principles

A. Finding of unnecessary hardship

1. The land in question cannot yield a reasonable return if used only for a purpose allowed in that zone;

Staff Comment: The principle of reasonable return asks the Board to consider if, without a variance, a property owner cannot establish any beneficial use on their property.

Due to the year the home was built, its current layout does not match the needs of modern homes. With this home being one of the oldest in the area, it is reasonable to request certain updated to be able to yield a reasonable return if the Friend family were to sell it. When the Friend family applied for the variance for the living space addition to the dwelling, the size of the garage had not been decided yet. It is practical to want to add an attached garage in their location as their dwelling is the only one without an attached garage in the area. There is also a level of protection from the elements by having an attached garage in the area. The cost of moving the lateral and the septic system would likely negate any increase in the dwelling value and the Friend family has received a variance to the required 10 feet setback from septic system to 6 feet. Building to the south is also not feasible due to the lack of an access from the road. Lastly, the Board of Adjustment granted the applicant a variance in 2019 for an addition to the dwelling to ass needed amenities.

2. The plight of the owner is due to unique circumstances and not to general conditions in the neighborhood which may reflect the unreasonableness of the Ordinance itself; and

Staff Comment: The dwelling was constructed in what would become the front setback area in 1930 prior to zoning being adopted in the county. The septic system blocks any construction on the western side of the dwelling. To the south of the dwelling is a well which limits the possibility for expansion directly south along with the new addition. This is one of few dwellings in the area that was built prior to the implementation of the zoning ordinance at a location that currently encroaches the required 50 foot front setback. The Friends did not construct this dwelling. As such the Friend family is in a unique set of circumstances that most of the neighborhood do not experience. The Friends have made other improvements to the property in places where it is feasible while being constrained by the septic system. This supports that the dwelling is a unique circumstance to the property that was not caused by the Friends. The existing access and driveway location ass it also serves as the entrance and exit to the existing detached garage limits placement or the proposed attached garage.

3. The use to be authorized by the variance will not alter the essential character of the locality.

Staff Comment: The property is located on a not heavily trafficked gravel road. The dwelling is located on 550th Ave, a gravel road, with an average daily traffic (ADT) count of 130 from 2015. This compares to the 4,700 ADT on Highway 69 to the west for the same year. The dwelling is also one of the oldest properties within a mile with the nearest dwellings being significantly newer. The nearby dwellings all have attached garages. The property had a barn on it that was located very near the right of way but has been torn down since the last variance request. The location of the proposed attached garage is logical as it will be adjacent to the mudroom which leads to the kitchen. Also the design of the proposed attached garage will match the country style design of the dwelling.

B. Granting the variance will not be contrary to the public interest; and

Staff Comment: Granting the variance would not be contrary to the public interest of the Land Development Regulations to protect public health, safety, and welfare without significant investments/improvements made to the subject property.

There is 30 feet of separation from the proposed attached garage and the front property line and over 56 feet from the proposed addition to the western edge of the road. Speeds of vehicles driving past the pond are likely to be slower as it is a gravel road with a 3 way intersection 660 feet to the north. The closest dwelling is located approximately 1000 feet south of the dwelling and has a large wind break on its north side buffering it from the subject property. The variance would allow the Friend family to add an attached garage to

their dwelling to meet the current needs of the family, without a significant financial impact of moving the dwelling, constructing a new dwelling, or moving the septic system to another part of the property.

C. The spirit and intent of the Story County Development Plan and Story County Land Development Regulations are protected.

Staff Comment: The Story County Comprehensive Plan and the Story County Land Development Regulations have similar spirits/intents to maintain the county's rural character.

The Statement of Intent for the A-1 Agricultural Zoning District is:
"The A-1 District is intended and designed to accommodate land uses compatible with agriculture and to protect agricultural land from encroachment of urban land uses. The County Development Plan designates priority agricultural land as Agricultural Conservation Areas. These areas are intended to preserve rural character by limiting the development of most new non-farm dwellings to large lots. In some instances, the A-1 District permits non-farm residential development on smaller lots in furtherance of the County Development Plan goals and objectives."

The property is designated Agriculture Conservation Area. The primary land use of the subject parcel is the residence which has been on the property since 1930. Due to the location of the property in a rural setting, anticipated lower speeds of vehicles, large agricultural properties and nearby single family dwellings on large parcels, all items contributing to meeting the spirit and intent of the ordinance.
In the A-1 Agricultural Zoning District and Natural Area Designation in the Ames Urban Fringe Plan, however, limited to no development is encouraged. This is due to the potential impact of more intense development, as is illustrated by the issues with parking and capacity of the septic system on the subject property.

Comments from the General Public

Notification letters were mailed to surrounding property owners regarding the variance request on July 8, 2020.

No comments were received from the General Public in regards to the setback variance request.

Notification was provided to the City of Gilbert on July 7, 2020. Gilbert stated no concerns in regards to the proposed front setback variance.

The submittal was also routed and reviewed by Story County Staff on June 25, 2020.

Public Hearing July 15, 2020

The request was previously heard at the July 15, 2020, meeting.

Marcus Amman presented the Staff Report and stated that the request is for a variance to the minimum front set back of a nonconforming dwelling located in the A-1 District, which establishes a minimum front set back of 50 feet. The variance request is to permit the construction of an attached garage to the single family dwelling that would encroach on the front setback requiring a variance of 20 feet from 50 feet to 30 feet. The property is located in Section 2 of Franklin Township parcel number 05-02-200-230. Amman stated that the Planning and Development staff recommend approval of the variance due to all legal principles being met.

Mr. Friend stated that originally he did not think it would be possible for a garage until he learned about the possibility of changing the type of septic system. Mr. Friend also stated that the trees are not in good condition so the decision was made to attempt approval for a garage.

Public Hearing Comments from September 16, 2020

A rehearing of the item was on the September 16, 2020 agenda. HF 2512 was signed by the Governor on June 1, 2020, and requires Planning and Zoning Commission and Board of Adjustment members to be eligible electors and reside within the area regulated by the County

Zoning Ordinance (unincorporated area). As the law went into effect immediately, prior to the June meeting of the Board of Adjustment, staff contacted Board members who did not reside in the unincorporated area of Story County to let them know that they could no longer serve on the Board of Adjustment. Due to a recent annexation, staff did not realize Board Member Randy Brekke, who had served on the Board since 2016, no longer resided in the unincorporated area. When this came to staff's attention in August, staff contacted the County Attorney, Ethan Anderson, to determine how the cases heard by the Board including Brekke in June and July were impacted. Anderson advised that the cases be reheard by the Board.

Marcus Amman provided a brief summary and stated that the request is for a variance to the minimum front set back at a nonconforming dwelling located in the A-1 District, which establishes a minimum front set back of 50 feet. The variance request is to permit the construction of an attached garage to the single-family dwelling that would encroach on the front setback requiring a variance of 20 feet from 50 feet to 30 feet. The property is located in Section 2 of Franklin Township parcel number 05-02-200-230. Planning and Development Staff is recommending approval of the variance and that due to how the home was originally built this is the only location that would accommodate the garage.

There were no public comments or comments from the Board of Adjustment.

Points considered

1. The project is necessary to add amenities that are common and essential for daily living found in most single-family dwellings.
2. Due to the nature of the year that the dwelling was built, 1930, there was no zoning ordinance in place for setbacks.
3. The dwelling currently is located inside the front setback by 18 feet with an approximate front setback of 32 feet.
4. The traffic is limited on 550th AVE with an annual average of 130 trips per day compared to Highway 69's annual average of 4,700 trips per day.
5. The proposed attached garage would be approximately 56 feet from the west edge of 550th AVE. the Board of Adjustment granted the applicant a front yard setback variance in 2019 for an 33 foot variance from the minimum 50 foot setback to 17 feet.
6. The proposed location on the north side of the dwelling is a logical location for an attached garage to the dwelling.
7. The nearest dwelling is over 1,000 feet to the south and has an established wind break between the two dwellings. This dwelling was constructed in 2010 and has a setback of 85 feet and also has an attached garage.
8. The existing character of the area of the property is a mix of few residential dwellings on large lots and adjacent parcels in row crop production.

Board of Adjustment Action on Written Findings of Fact

Date: October 21, 2020

VOTE:	**Ayes**	**Nayes**
Excell		
McGill		
Neubauer		
Hovick		
Jondle		
Vote:		

Chair: _____

Prepared by Marcus Amman, Story County Planning and Development Department, 900 6th Street, Nevada, Iowa 50201 515-382-7245

STORY COUNTY, IOWA
CERTIFICATE OF CONDITIONAL USE PERMIT
AND WRITTEN FINDINGS OF FACT

IN THE MATTER OF THE APPLICATION OF: Martin Marietta, 831 Riverside Road, Ames, IA 50010, for the request of a Conditional Use Permit for the construction of a new wheel wash station and permitting the existing wheel wash station, located on the SW SW of Section: 23 Township: 84 Range: 24, Franklin Township, (Parcel ID Number 05-24-300-110.	**:**	**PERMIT NO. CUP02-90.8**

On September 16th, 2020, the Story County Board of Adjustment approved the Conditional Use Permit CASE NO. CUP02-90.8 for the request of a Conditional Use Permit for the Martin Marietta existing and proposed wheel wash station with conditions.

1. **Conditions 1-4 of the approved Conditional Use Permit Case No. CUP02-90 are maintained.**
2. **The applicant shall provide the sound level reading from the property boundary of the closest dwelling on the south side of Riverside Road as well as the property boundary for the dwelling to the west owned by Plowback LLC for a base line reading when the new wheel wash is constructed and operational.**

VOTE:	**Ayes:**	**McGill, Neubauer, Excell, Hovick, Jondle**
	Nayes:	
	Absent:	
	Vote:	**(5-0)**

This meeting was held virtually due to recommendations to limit gatherings to no more than ten (10) people in order to help slow the spread of the COVID-19 virus. Public access to the meeting was provided via conference. An audio recording of the Board of Adjustment meeting was posted on the County's website www.storycountyiowa.gov.

Written Findings of Fact

Case Summary: This request is for a conditional use permit minor modification for the use of an existing wheel wash and a proposed wheel wash located at 831 East Riverside Road, Parcel 05-24-300-110. The existing wheel wash system is no longer sufficient to handle the present volume of customer traffic, and an improved means of addressing track-out is desired. The existing wheel wash was installed in 2004 and is 61-feet long and 12-feet, 8-inches wide. The water and rock material from the existing system is deposited in a nearby "clean-out bunker". The water is recirculated as it is a closed loop system, no water drained to the ground with the exception of what may possibly splash off. The proposed wheel wash is 52-feet long and 14-feet wide. The proposed system will have its water and rock material deposited into a 40,000 gallon recovery tank. The rock material that is recovered from both of these tanks is and will be used on internal roads or returned to the mine. There is no proposed increase to traffic in the area. The water used in the process is a completely closed loop system meaning no water is being discharged. Planning and Development staff recommend approval of the conditional use permit with conditions:

1. Conditions 1-4 of the approved Conditional Use Permit Case No. CUP02-90 are maintained.
2. The applicant shall provide the sound level reading from the property boundary of the closest dwelling on the south side of Riverside Road as well as the property boundary for the dwelling to the west owned by Plowback LLC for a base line reading when the new wheel wash is constructed and operational.

Marcus Amman, Story county Planning and Development Planner, reviewed the Conditional Use Permit Application, site plans, written narrative and other related submittal materials and responses from the applicant to County staff comments in accordance to Chapter 90 Conditional Uses of the Story County Land Development Regulations. Amman presented the staff report at the September 16th, 2020, Story County Board of Adjustment meeting.

Conditional Use Permit Analysis

A. **Applicable Regulations:** Chapter 90.04: Standards for Approval
The Planning and Zoning Commission shall review the proposed development for conformance to the following development criteria:

1. **Compatibility.** The proposed buildings or use shall be constructed, arranged and operated to be compatible with the character of the zoning district and immediate vicinity, and not to interfere with the development and use of adjacent property in accordance with the applicable district regulations. The proposed development shall not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties.

Applicant Comment: *The subject properties are zoned Heavy Industrial (HI) and Agricultural (A-1) and the wheel washes are compatible with the character of the zoning districts and immediate vicinity.*

Staff Comment: The subject properties are zoned Heavy Industrial and A-1 Agricultural/R-1 Transitional Residential District. These districts both allow for mining activities to take place with the A-1 requiring a conditional use permit. The land use of the east 15 acres consisting of the office, scale, wheel wash and drive was recently changed from Rural Transitional Residential Area to General Industrial Area in support of a parcel line adjustment to match up land uses consistent with the mining operation and support in changing the taxation of the balance of the parcel from commercial to agricultural classification. The main changes to the property would be the addition of another wheel wash station in addition to the existing one. There are no County records that indicate the existing wheel wash station was applied for so this permit would encompass permitting that one as well. The wheel wash stations are at minimum 1,200 feet from the nearest dwelling. No agricultural land will be taken out of production for either proposal.

2. **Transition.** The development shall provide for a suitable transition, and if necessary, buffer between the proposed buildings or use and surrounding properties.

   Applicant Comment: *Significant setbacks and existing vegetation provide a suitable transition and buffer between the existing mining site and surrounding properties.*

   Staff Comment: The closest dwelling to the wheel wash station is a minimum of 1,200 feet. The wheel wash stations are ground based with the tallest portion being 16 feet, part of which is below grade. These stations are unlikely to be seen from other properties. Due to their size, location, existing vegetation, and distance from any property lines.

3. **Traffic.** The development shall provide for adequate ingress and egress, with particular attention to vehicular and pedestrian safety and convenience, traffic flow and control, and emergency access.

   Applicant Comment: *No change in access is proposed with regard to the current request. The existing mine site has access via East Riverside Road and North Dayton Avenue. The existing site access is sufficient with regard to pedestrian safety, traffic flow and control, and emergency access and no*

additional access is necessary.

Staff Comment: Traffic will likely continue at similar levels and will not impact traffic levels as the proposed uses are not increasing or impacting production. This will assist in the efficiency of cleaning trucks before they go out for deliveries. The collected rock material will be used for internal drives or returned to the mine.

4. **Parking and Loading.** The development shall provide all off-street parking and loading areas as required by this Ordinance, and adequate service entrances and areas. Appropriate screening shall be provided around parking and service areas to minimize visual impacts, glare from headlights, noise, fumes or other detrimental impacts.

   Applicant Comment: *No changes to parking or loading are proposed with this request. Adequate off-street parking has been provided and the layout of the parking has been designed to reduce impacts.*

   Staff Comment: No additional parking is proposed or required. While the County has not adopted a noise ordinance, anticipated noise levels with the proposed wheel wash may be between 74 db and 80 db at a distance of five feet. These levels will likely drop when observed from adjacent property lines.

5. **Signs and Lighting.** Permitted signage shall be in accordance with the applicable district regulations and shall be compatible with the immediate vicinity. Exterior lighting, if provided, shall be with consideration given to glare, traffic safety and compatibility with property in the immediate vicinity.

   Applicant Comment: *No changes to signage or lighting are proposed with this request. All signage shall conform to applicable regulations. Exterior lighting shall comply with the requirements of Section 88.09, Site Lighting.*

   Staff Comment: No signs or lighting are proposed.

6. **Environmental Protection.** The development shall be planned and operated in such a manner that will safeguard environmental and visual resources. The development shall not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.

Applicant Comment: *No adverse environmental impacts are anticipated from this proposal.*

Staff Comment: There is no adverse environmental impacts anticipated as the water is reused in the wheel wash process. There are no chemicals or detergents added to the water for this process. The system is designed as a closed loop system. No water is discharged from the wheel wash stations. The water for the wheel wash station will come from an existing pond on site that was created in the 1970's when the former quarry was open.

No work is proposed in the floodplain.

B. If the Commission concludes that all the above development criteria will be met, it must recommend approval of the application unless it concludes that, if completed as proposed, there is a strong probability the development will:

1. **not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.**

Staff Comment: The wheel wash stations are to help mitigate the dust generated from leaving the mine and no surface processing activities are proposed for the area. This use is providing a safeguard to the health, safety, and general welfare of those that live in the area as well as those traveling through the area. The main change is that there will be an additional wheel wash station in use. The goal is to help reduce the amount of dust and dirt being tracked out onto Riverside Road cleaner for a longer period of time.

Almost all nearby dwellings are over 1,200 feet from the wheel wash stations.

The parcel adjacent and north of the wheel wash station is owned by Erin Hornung. There is a dwelling on the parcel that is approximately 4,000 feet from the wheel wash locations. The property line is bounded by the South Skunk River.

Two parcels to the west of the wheel wash station are owned by Plow Back LLC. The lots are approximately 26 acres and one contains a single-family dwelling that is 2,000 feet from the wash station. A large row crop area provides a buffer between the wheel wash and the dwelling.

To the south of the wheel wash station are several properties owned by Scott & Kasey Strosahl, Alan & Susan Nacin, and Tony Nacin. There is approximately 8 acres between those three owners. There are three dwellings, the closest being approximately 1,260 feet to the south of the wheel wash station.

To the east of wheel wash stations are parcels owned by Bishop Farms and EI Sargent. These parcels include the mine production as well as row crop production. The nearest dwelling to the east is approximately 5,700 feet.

2. **impair an adequate supply (including quality) of light and air to surrounding properties.**

   Staff Comment: The wheel wash stations are to help mitigate the dust generated from leaving the mine and no surface processing activities are proposed for the area. The use will help keep dust from the mine out of the air as the trucks are leaving the area. This will help protect the air in the surrounding area. There is no impairment anticipated to the light in the area as these systems are ground based.

3. **unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.**

   Staff Comment: Traffic will likely continue at similar levels.

4. **diminish or impair established property values on adjoining or surrounding property.**

   Staff Comment: The Story County Assessor's Office raised no concerns with this item from the review of the requested Conditional Use Permit application. No negative impacts on property values are anticipated. Wheel Wash Stations are to help keep the dust down in the area. The stations are not likely to be seen from adjacent properties or public roads.

5. **not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.**

   Staff Comment: The properties are designated as Rural Transitional Residential Area and General Industrial Area in the Ames Urban Fringe Plan Future Land Use Map. The goal of this designation supports the

subsurface mineral extraction in the Agricultural/Subsurface Mining land use designation. Areas where surface mining activities occur, such as the processing plant at the Martin Marietta Ames Mines, are designated as General Industrial in the Ames Urban Fringe Plan. The land use of the east 15 acres consisting of the office, scale, wheel wash and drive was recently changed from Rural Transitional Residential Area to General Industrial Area in support of a parcel line adjustment to match up land uses consistent with the mining operation and support in changing the taxation of the balance of the parcel from commercial to agricultural classification.

As no surface processing activities are to occur the proposal is compatible with the future land use for the area.

Conceptual Review
Application materials were routed to the Interagency Review Team on September 1, 2020. Some of the County staff review comments were as follows:

Interagency Review – September 1, 2020
Comments from the Assessor's Office
No comment
Comments from the Auditor's Office
No comment
Comments from the Engineer's Office
No comment
Comments from the Emergency Management's Office
No comment
Comments from the Environmental Health's Office
No comment

The following were relevant comments documented by the Interagency Review Team:

Planning and Development Department Comments and applicant responses after CUP Submittal:

1. How many trucks can be cleaned per day currently? *Up to 800+/- trucks can go through the existing wash without traffic flow restrictions.*
2. Who built the existing wheel wash station? *The existing equipment was fabricated in-house using Martin Marietta personnel.*
3. How many trucks can be cleaned with the addition of the proposed wheel wash? *The new wheel wash is designed to handle up to 1400 trucks per day.*
4. How often are the tanks cleaned to return rock to the internal roads or to the mine? *The new wheel wash has a designed scraper conveyor that runs continually to pull solids out of the tanks. The solids will be managed as time permits, likely daily. The*

current wash uses a flow-through drop-out bay that gets scooped every 15 days or so.

5. Do the wheel wash stations fall under the existing NPDEP? *Wheel washes are considered part of the industrial processes that can be used on a mine or quarry site.*
6. Do the wheel wash stations need any permitting from the IDNR? *No.*
7. How long is the same water reused? *Indefinitely; it is a closed loop system.*
8. When the water is done being reused where does it discharge to? *No process water is discharged off-site; the system is closed-loop. There may be some residual moisture on the truck frame or in the removed mud, which is added to normal yard cleanup material. It is either hauled into the mine or used to build traffic control berms internal to the stockpile area.*
9. Does the existing system reuse water or does it draw from the pond? *Process water from the existing system is piped to a nearby bunker, where the majority of the clay and silt-size particles settle out. The process water then returns the source pond (in an old quarry pit), where it becomes available for re-use. It's a closed loop system.*
10. How much rock material is collected in a year from the existing wheel wash station? *Very little rock comes off the trucks. Martin Marietta has not measured the amount of sedimentation in the former quarry pit (central pond) that return water has generated; approximately 9 cy of mud are scooped from the bunker every two weeks, which is about 225 cy/yr. That is highly variable and dependent upon weather and traffic patterns.*
11. How loud are the stations? *We believe that the manufacturer had indicated 74 db but we were unable to verify on short notice. We asked our staff to make sound measurements on a similar system at our Randolph mine in Kansas City and they determined the sound level to be approximately 80 db, including ambient/background sound levels, at a distance of less than 5 feet.*
12. Will they operate 24/7 like the rest of the mine? *Use of the wheel wash occurs only when the scale is open for business and we are receiving customer traffic*.
13. How much water does it take to clean truck tires and wheels? *The amount of water required is dependent upon the soil particle size and type, as well as the wash design. The new wheel wash we are adding is designed to use 1660 gallons of water per wash, which is nearly all captured and reused. A small amount of makeup water will be supplied from the former quarry pit (central pond).*
14. How often and how much water do you have to pull from your existing pond? *Please indicate the location of pond used for the source water. The turbine pump pulls water continuously for use by the water truck to keep dust down on the yard, and for the wheel wash. The turbine pump does not run at optimum presently, and the flowrate is approximately 500 gpm. Please indicate the location of the pond used for the source water. The pond used in conjunction with the wheel wash is located roughly 585' northeast of the existing wheel wash.*
15. Will this pond be used for both wheel wash systems? *Yes.*

16. Is the pond naturally occurring or was it created by Martin Marietta? *The pond is the remaining portion of the former open quarry that operated at this location until the underground mine was established in the late 1970s.*
17. What percentage of water used for cleaning is able to be captured and reused? *The only loss would be that which remains on the vehicle and evaporative loss. Approximately 98% is reused, and will vary depending upon the final tuned flow and pressure that works ideally for the soiling we see on our trucks.*
18. What percentage of dust reduction is accomplished by using a wheel wash station? The wheel wash system is intended to remove small clay and silt size particles of limestone mud clinging to customers trucks/tires, thereby reducing track-out onto Riverside Road. The system does not reduce dust directly; rather, it is intended to eliminate track-out of particles which may then become airborne. Our desire is that by adding this second wheel wash, we can reduce the track out from the location and perhaps eliminate the need to have a street sweeper clean Riverside, except for very rare occasions.
19. How long does it take to construct the new station? *The new system should be complete in no more than 2 weeks after construction commences. We are hoping to complete installation and be using the system by early November 2020.*
20. What maintenance is required on the stations and how often is it conducted? *The new system includes an automatic lubrication system, so that it is continually maintained and no shut down is required for routine maintenance. The new system includes a 40,000 gallon tank for removing solids from the water before being recirculated. The solids are then conveyed out of the tanks and placed on internal roads, or returned to the mine. The wash deck and spray nozzles will be regularly inspected to maintain functional status.*
21. What is the life span of the stations? *While we anticipate the occasional need to replace pumps, nozzles, and other wear parts, it is expected that the wash stations will last indefinitely.*
22. Are all trucks exiting the mine required to go through the wheel wash stations? *Please confirm that you intend to continue using both the existing and new wheel wash systems. Generally, yes, all truck traffic will pass through the wheel wash in route to the scale. It is our intention to use both systems – the old system will serve as a back-up should the new system be shut down for repairs, or if a substantial internal traffic backup occurs.*
23. From review of aerials it appears that after both wheel wash stations is more gravel before exiting the mine access. How much gravel/dust material is collected before the trucks exit the site? Is there a future plan to pave the remaining drive that is currently gravel? *The entire exit loop is paved from north of the proposed wheel wash to the exit. Our intention is to reconfigure internal traffic flow to have trucks travel on pavement only from the bend in the entrance road all the way onto Riverside.*

24. With the existing and new wheel wash systems, do the trucks move through the system or are the trucks stationary? *The trucks pass through the wheel wash in route to the scale; the wash is stationary.*
25. Please submit a copy of the shop drawings for the existing wheel wash system identified in the application submittal. *Submitted.*
26. What are your plans or metrics for monitoring and/or measuring the success of the proposed new wheel wash system? *It is hoped that the new system will reduce track-out to the degree that it is no longer necessary to operate a street sweeper on Riverside Road. We will be monitoring the amount of traffic through each wash, the appearance of the truck wheels as they proceed toward the exit, and the frequency/volume of solids recovered from the new wash system. We expect an adjustment period for optimizing the wash that may need to be readjusted in spring of 2021; we also anticipate having a transitional time period as we get truck and delivery drivers accustomed to the new traffic pattern.*

Other Communication from County Staff
Auditor's Office:
No Comment

Public notification letters were mailed to surrounding property owners within a quarter-mile of the site on September 9, 2020, regarding the Conditional Use Permit application.

No comments had been received at the time of completion of the staff report.

Comments from Cities within Two Miles
Application materials were routed to the cities of Ames and Gilbert as cooperators in the Ames Urban Fringe Plan.

On September 3, 2020, the City of Gilbert stated they have no opposition to the proposal.
On September 8, 2020, the City of Ames stated they have no opposition to the proposal.

Comments from the General Public:
Prior to the Board of Adjustment meeting, there were not any comments from the public.

Comments from the Board of Adjustment at their September 16th, 2020 meeting:
This meeting was also held virtually due to recommendations to limit gatherings to no more than ten (10) people in order to help slow the spread of the COVID-19 virus. Public access to the meeting was provided via conference. An audio recording of the Board of Adjustment meeting was posted on the County's website www.storycountyiowa.gov.

In summary, Amman presented the staff report and stated that Martin Marietta is proposing to construct a new wheel wash station, in addition to the existing wheel wash station. The wheel wash stations are closed loop system, without any chemicals or detergents added. The use fits within the area. The purpose of the wheel wash is to keep track out down on to East Riverside Road. The anticipated noise for the system is 74 dB. Martin Marietta provided sound readings at the south property line of 75 dB and at the west property line it was 70dB. This was with the existing wheel wash system operating.

Don Maroney was on the call representing Martin Marietta.

There was one comment from the public. Doug Kurt expressed concerns about track out and dust in the area and he has lived in the area for 25 years. Kurt asked if the current wheel wash station will stay in operation while the new one is built. Maroney explained that the existing will stay in operation while the proposed is being built, and after both will be in operation. Kurt asked if both will be in operation 12 months out of the year. Maroney explained that they will be weather permitting (temperature), and that in the winter months when the ground is hard the track out is far less. Kurt stated that it seemed like more track out happens in the winter. Maroney stated that if they need to sweep East Riverside Road they will still have that ability.

Hovick in response to Kurt's response stated that since Martin Marietta was adding additional track out prevention that the discussion was not relevant. McGill agreed.

Moore, stated that Martin Marietta applied for an insignificant modification to pave shoulders on their access drive. Stating that this is another measure that they are taking to control dust and track out in the area. Amelia Schoeneman stated that the dust control in road is part of the State of Iowa permit. Maloney stated he is not aware of that.

Points to Consider for the Conditional Use Permit Request

1. The wheel wash station will help keep dust in the area down and assist with reducing dust and mud from being tracked out onto Riverside Road.
2. No environmental impacts are anticipated.
3. The closest dwellings are 1,200 feet from the wheel wash station.
4. The systems are ground based and not likely to be seen from other properties or public roads.
5. No new access is being proposed.
6. Water in the system is reused and the rock material is used on internal drives or returned to the mine.
7. No chemicals or detergents are used in the process.

The Board of Adjustment approved the Conditional Use permit CUP02-90.8 as put forth (vote 5-0), for the request of a Conditional Use Permit for the Martin Marietta existing and proposed wheel wash station with conditions.

1. **Conditions 1-4 of the approved Conditional Use Permit Case No. CUP02-90 are maintained.**
2. **The applicant shall provide the sound level reading from the property boundary of the closest dwelling on the south side of Riverside Road as well as the property boundary for the dwelling to the west owned by Plowback LLC for a base line reading when the new wheel wash in constructed and operational.**

Board of Adjustment Action on Written Findings of Fact

Date: October 21st, 2020

VOTE:	**Ayes**	**Nays**
McGill		
Neubauer		
Excell		
Hovick		
Jondle		

Vote:

Chair: _____

Prepared by Emily Rizvic, Story County Planning and Development Department, 900 6th Street, Nevada, Iowa 50201 515-382-7245

STORY COUNTY, IOWA
VARIANCE AND WRITTEN FINDINGS OF FACT
AMENDING THE PREVIOUSLY RECORDED FINDINGS OF FACT INST. NO. _____

IN THE MATTER OF THE APPLICATION OF: **InRoads, LLC** **4224 Hubbell Avenue** **Des Moines, Iowa** **A minor modification to an existing conditional use permit (07-18) for the property located at 3034 560th Avenue, Ames, IA and described as being located in the Southwest of the Southwest Section: 18 Township: 83 Range: 23 (Parcel ID Number 10-18-300-300), under the ownership of Tanam Real Estate, LLC.**	**:**	**CASE NO. CUP07-18.1**:

On September 16, 2020, the Story County Board of Adjustment the minor modification to the Conditional Use Permit for Mineral Extraction as put forth in case CUP07-18.1 to allow the eastern berm to remain located east of and abutting the mining cell, with the following conditions:

1. **The east berm shall be seeded with temporary seeding meeting Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual and Standards Manual or other professionally accepted design criteria.**
2. **If phase two of extraction is approved, the east berm shall be moved to the east property line prior to the excavation of materials from the ground as part of the second phase of extraction and the berm shall be landscaped within one year of the berm's construction.**
3. **If the conditional use permit for phase two of extraction is not approved, the east berm shall be permanently landscaped with nursery stock trees in the requested location adjacent to the mining cell.**
4. **The applicant shall increase the amount of the restoration bond until the berm is permanently landscaped from $10,000 to $30,000.**

VOTE:	**Ayes:**	**Jondle, Neubauer, Excell, McGill**
	Nayes:	**None**
	Absent:	**Hovick**
	Vote:	**(4-0)**

Written Findings of Fact

Case Summary: The request is for a minor modification to an existing conditional use permit (07-18) for the extraction of sand and gravel. The subject property is located at 3034 560th Avenue. The mining cell is located in the southwestern 4.6 acres of the 47.24 net-acre parcel. The conditional use permit was originally approved on November 28, 2018, with conditions, including that "landscaping shall be installed by June 1, 2020, in accordance with the submitted

restoration plan. Berming and landscaping shall also be completed on the east side of the site matching the extent of extraction by June 1, 2020. Once landscaping is completed, the site shall be inspected by Planning and Development staff for conformance with the submitted restoration plan and prior to releasing bond security." The applicant is requesting a modification to the condition to allow the berm to be located east of the existing mining cell and to not be permanently landscaped pending approval of a future conditional use permit for the second phase of extraction, including the area east of the existing mining cell. If the second phase of extraction is not approved the berm is proposed to be permanently landscaped with nursery stock trees in the location adjacent to the mining cell. If the second phase is approved, the berm will be moved to the eastern side of the site and permanently landscaped. The applicant will increase the amount of the restoration bond until the berm is permanently landscaped. Staff recommends approval of the conditional use permit with conditions.

Amelia Schoeneman, Story County Planner, presented the staff report at the September 16, 2020, Story County Board of Adjustment meeting and reviewed the conditional use permit application, site plans, written narrative, and staff's recommended findings in accordance to Chapter 90.04 of the Story County Land Development Regulations.

Analysis of Legal Principles

1. **Applicable Regulations:** Chapter 90.04: Standards for Approval

The Board of Adjustment shall review the proposed development for conformance to the following development criteria:

A. **Compatibility.** The proposed buildings or use shall be constructed, arranged and operated to be compatible with the character of the zoning district and immediate vicinity, and not to interfere with the development and use of adjacent property in accordance with the applicable district regulations. The proposed development shall not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties.

Applicant Comment: *The proposed use of a mineral extraction location is consistent with the adjacent property on two of the property lines. InRoads CUP does not interfere with the development and use of adjacent property in accordance with the applicable district regulations. Since the development is the same type of operation as neighboring properties, the development is not unsightly, obnoxious nor offensive in appearance to abutting or nearby properties. Berms are not present on the neighboring property lines; screening berms are only to the extent of the extraction limits on surrounding properties with mineral extraction taking place.*

Staff Comment: The request to change the location and landscaping timeline for the east berm has the greatest impact on the properties to the east. The berm on the west side of the mining cell will be landscaped in early September.

The adjacent property to the east is in row crop production. Interstate 35 is also located .2 miles to the east. Given that the berm is located east of the pit, instead of on the east property line, some screening is still provided and adequately buffers the mining cell. The location of the berm is not anticipated to interfere with the use of the adjacent properties.

The applicant also identified that the berm in the current location provides a better buffer between the row crop production on the property and the extraction operation. This makes the proposed location more compatible with the character of the zoning district and area where the major land use is agricultural.

Finally, the applicant indicates the berm would be in a better location for restoration of the site if the second phase is not approved. Requiring the berm to be located on the east property line instead of adjacent to the mining cell would be less appropriate for restoration of the site if the second phase of extraction is not approved and the mining cell is limited to its current size.

Staff recommends a condition that if the conditional use permit for phase two of extraction is not approved, the berm is permanently landscaped with nursery stock trees in the requested location adjacent to the mining cell. A condition on the previously approved conditional use permit requires that "the extraction use shall cease by December 31, 2021, and the site be restored based on the restoration plan if no modifications to the conditional use permit for phase two of extraction are approved. Once restoration is completed, the site shall be inspected by Planning and Development staff for conformance with the submitted restoration plan and prior to releasing bond security."

B. Transition. The development shall provide for a suitable transition, and if necessary, buffer between the proposed buildings or use and surrounding properties.

Applicant Comment: *There will not be any transition between any buildings since there are not any buildings constructed. The suitable transition will be an aggregate pad on which to set stockpiles, the processing plant area, and farmland beyond the landscaped berm. It would not make sense to have a berm, then farmland, then the extraction area- there needs to be a berm between the farmland and the extraction area for a natural transition and protection of the mined cell.*

Staff Comment: Landscaping is proposed to be installed on the berm located to the west of the mining cell by early September. Landscaping will be nursery-stock sized trees. The condition placed on the previous conditional use permit for extraction also intended to have the east berm permanently landscaped. The landscaping of the berms while extraction is occurring presents an opportunity to have established vegetation for when the use ceases and site is restored. At the time of the previous application, the applicant indicated the second phase of extraction would last two to seven years. Currently, the applicant anticipates it could last for 20 years, if approved. This longer extraction timeframe provides a greater timeline for the landscaping to mature than previously anticipated. Staff recommends a condition that if the conditional use permit for phase 2 is not approved, the berm is permanently landscaped with nursery stock trees in the requested location adjacent to the mining cell. The conditional use permit for phase one of extraction expires December 31, 2021. Alternatively, if phase two of extraction is approved, staff recommends a condition that the east berm be moved to the east property line prior to extraction at the depth/extent of extraction approved occurring and that the berm is landscaped within one year of the berm's construction. Through these conditions, the berm may be without permanent landscaping for one to two years. The one to two years when the berm is not permanently landscaped will not have a major impact on the transition to other properties. Again, the berm in the current location provides a better buffer between the row crop production on the property and the extraction operation. This provides a better transition to the agricultural uses on adjacent properties to the east.

C. Traffic. The development shall provide for adequate ingress and egress, with particular attention to vehicular and pedestrian safety and convenience, traffic flow and control, and emergency access.

Applicant Comment: *The location of the berm helps with farm traffic on site and acts as a buffer between the farmland and the extraction site.*

Staff Comment: No new traffic would be created by the change in the location of the berm. The applicant indicates the berm in its current location better separates mining and farming traffic on the site. Staff recommends a condition that if phase two of extraction is approved, the east berm be moved to the east property line prior to extraction at the depth/extent of extraction approved occurring and that the berm is landscaped within one year of the berm's construction. The area that is farmed will change when the limits of extraction are expanded in phase two.

D. Parking and Loading. The development shall provide all off-street parking and loading areas as required by this Ordinance, and adequate service entrances and areas. Appropriate screening shall be provided around parking and service areas to minimize visual impacts, glare from headlights, noise, fumes or other detrimental impacts.

Applicant Comment: *The berm does not affect parking and loading.*

Staff Comment: The berm does not impact parking and loading.

E. Signs and Lighting. Permitted signage shall be in accordance with the applicable district regulations and shall be compatible with the immediate vicinity. Exterior lighting, if provided, shall be with consideration given to glare, traffic safety and compatibility with property in the immediate vicinity.

Applicant Comment: *The property does not need to be lighted during normal working hours.*

Staff Comment: No signs or lighting are proposed.

F. **Environmental Protection.** The development shall be planned and operated in such a manner that will safeguard environmental and visual resources. The development shall not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.

Applicant Comment: *The berm located to the limits of extraction helps protect the water body from flood or runoff water. The berm is already in its desired location so it will not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other hazardous or nuisance conditions. The berm has been planted with grass seed to hinder the development of weeds.*

Staff Comment: Staff recommends a condition that the east berm is seeded with temporary seeding meeting Iowa Statewide Urban Design and Specifications (SUDAS) Design Manual and Standards Manual or other professionally accepted design criteria.

2. **If the Board concludes that all the above development criteria will be met, it must recommend approval of the application unless it concludes that, if completed as proposed, there is a strong probability the development will:**

A. **not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.**

Staff Comment: There are no adjacent single-family dwellings to the site. Hallett Materials is located to the north of the site, which is a similar use.

B. **impair an adequate supply (including quality) of light and air to surrounding properties.**

Staff Comment: The berm will not impact the quality of air or lighting on the property.

C. **unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.**

Staff Comment: No new traffic would be created by the change in the location of the berm. The applicant indicates the berm in its current location better separates mining and farming traffic on the site. Staff recommends a condition that if phase two of extraction is approved, the east berm be moved to the east property line prior to the excavation of materials from the ground as part of the second phase and that the berm is landscaped within one year of the berm's construction. The area that is farmed will change when the limits of extraction are expanded in phase two.

D. **diminish or impair established property values on adjoining or surrounding property.**

Staff Comment: The Story County Assessor's Office raised no concerns with this item from the review of the requested Conditional Use Permit application. No negative impacts on property values are anticipated.

E. **not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.**

Staff Comment: Other criteria ask the board to consider the use's compatibility with current land use. This criterion asks the Board to consider future land use. This site is within the Rural Urban Transition Area designation in the Ames Urban Fringe Plan Land Use Framework Map. Policies for this area include:

> *RUTA Policy 4: Permit interim development to occur in a manner that will support long-term urbanization of the Ames Urban Fringe.*

The first stage of extraction is proposed to last three years or until 2021 and a condition is recommended by the Planning and Zoning Commission limiting the permit to phase one. The applicant indicates the sand and gravel would be used in construction projects and specifically, to produce asphalt and concrete. InRoads, LLC, is a paving business and the extraction use would provide them with ingredients for the production of asphalt and concrete. No specific projects were identified in the application that would use the materials.

The Story County Cornerstone to Capstone Comprehensive Plan includes a strategy to focus resources on high-priority natural areas including working "with the City of Ames to explore and prioritize the Hallett materials extraction site located SW of I-35/US 30 interchange for potential reuse and revitalization."

The berm on the east side of the site was part of the submitted restoration plan. The restoration plan proposed landscaping on the east and west berms to be installed by June 1, 2020, after one season of the berm settling. Landscaping was to be nursery-stock sized trees. Requiring permanent landscaping would result in established vegetation for when the use ceases and site is restored. At the time of the conditional use permit request for mineral extraction, the applicant indicated the second phase, if approved, could support extraction for two to seven years. Currently, the applicant anticipates it could last for 20 years, if approved. This longer extraction timeframe provides a greater timeline for the landscaping to mature than previously anticipated.

The applicant indicated that the cost of the landscaping was $20,000. The applicant provided bond for $30,000, which was to be reduced to $10,000 after landscaping was completed. The applicant will increase the amount of the restoration bond until the berm is permanently landscaped from $10,000 to $30,000. This is recommend as a condition.

3. **Burden of Persuasion.**

    1. **The burden of persuasion as to whether the development, if completed as proposed, will comply with the requirements of this Chapter is at all times on the applicant.**
    2. **The burden of presenting evidence to the Board of Adjustment sufficient enough for it to conclude that the application does not comply with the requirements of this Chapter is upon the person or persons recommending such a conclusion, unless the information presented by the applicant warrants such a conclusion**

Comments

The item was routed for Interagency Review on Tuesday, September 1, 2020.

Planning and Development:

1. Are you still intending to apply for the second stage of extraction? If so, when? *Yes. Winter of 2020/Spring of 2021. I have many of the studies and testing done for the entire site.*
2. If the second stage of extraction is approved, how long will extraction take place for? *I would request up to 20 years of sand extraction, but it depends on sales volume. You previously indicated two to seven years, depending on size and quality. Size and quality are exceeding even our "best case scenario" expectations. I would call this sand deposit exceptional (depth, gradation, & consistency).*
3. What kind of trees will be planted when the berm is moved to the eastern side of the site? *We will plant whatever trees you want. Most likely similar to the trees we are planting on the berm this week, if acceptable.*

Engineer Comments:

No comments.

Environmental Health Comments:

No comments.

Auditor Comments:

No comments.

Comments from the General Public

Public notification letters were mailed to surrounding property owners within a quarter-mile of the site on September 4, 2020, regarding the Conditional Use Permit application.

No comments were received.

Comments from Cities in the Ames Urban Fringe Plan

Ames

Application materials were routed to the City of Ames on September 3, 2020. No comments had been received at the time of completion of this staff report.

Gilbert

Application materials were routed to the City of Gilbert on September 3, 2020. No comments had been received at the time of completion of this staff report.

Points to Consider

1. The berm in the existing location east of the mining cell provides a better buffer between the row crop production on the property and the extraction operation. It also provides a buffer between the mining cell and Interstate 35.
2. The existing location of the berm is a better location for restoration of the site if the second phase of extraction is not approved. Requiring the berm to be located on the east property line instead of adjacent to the mining cell would be less appropriate for restoration of the site if the second phase of extraction is not approved and the mining cell is limited to its current size.
3. The conditional use permit for phase one extraction expires December 31, 2021.
4. Staff recommends a condition that if the conditional use permit for phase two of extraction is not approved, the berm is permanently landscaped with nursery stock trees in the requested location adjacent to the pit.
5. If the conditional use permit for phase two of extraction is approved, staff recommends a condition that the east berm be moved to the east property line as soon as the limits of extraction are expanded and that the berm is landscaped within one year of the berm's construction.
6. At the time of the previous application, the applicant indicated the second phase of extraction would last two to seven years. Currently, the applicant anticipates it could last for 20 years, if approved. This longer extraction timeframe provides a greater timeline for the landscaping to mature than previously anticipated.
7. The applicant provided a bond for $30,000, which was to be reduced to $10,000 after landscaping was completed. The applicant will increase the amount of the restoration bond until the east berm is permanently landscaped from $10,000 to $30,000. This is recommend as a condition.

Public Hearing Comments from September 16, 2020

Schoeneman stated the request is for a minor modification to an existing conditional use permit (07-18) for the extraction of sand and gravel. The subject property is located at 3034 560th Avenue. The mining cell is located in the southwestern 4.6 acres of the 47.24 net-acre parcel. The conditional use permit was originally approved on November 28, 2018, with conditions, including that "landscaping shall be installed by June 1, 2020, in accordance with the submitted restoration plan. Berming and landscaping shall also be completed on the east side of the site matching the extent of extraction by June 1, 2020. Once landscaping is completed, the site shall be inspected by Planning and Development staff for conformance with the submitted restoration plan and prior to releasing bond security." The applicant is requesting a modification to the condition to allow the berm to be located east of the existing mining cell and to not be permanently landscaped pending approval of a future conditional use permit for the second phase of extraction, including the area east of the existing mining cell. If the second phase of extraction is not approved the berm is proposed to be permanently landscaped with nursery stock trees in the location adjacent to the mining cell. If the second phase is approved, the berm will be moved to the eastern side of the site and permanently landscaped. The applicant will increase the amount of the restoration bond until the berm is permanently landscaped. Staff recommends approval of the conditional use permit with conditions.

Board of Adjustment Action on Written Findings of Fact
Date: October 21, 2020

VOTE:	Ayes	Nayes
Excell		
McGill		
Neubauer		
Hovick		
Jondle		
Vote:		

Chair: _____

Story County Planning and Development
6th Street, Nevada, Iowa, 50201
Ph. 515-382-7245 Fax 515-382-7294
www.storycountyiowa.gov

MEMORANDUM

TO: Story County Board of Adjustment
FROM: Amelia Schoeneman, Interim Planning and Development Director
RE: CUP06-20—Nevada Wastewater Treatment Facility
DATE: October 21, 2020

Request Summary

CUP06-20 is a request for a conditional use permit for a new Wastewater Treatment Facility for the City of Nevada, located on parcel 11-31-200-305, on the south side of 270th Street and west of West Indian Creek. The new facility will replace the existing facility, located at 457 S 6th Street, Nevada. The existing wastewater treatment facility is approximately 60 years old. It does not have the capacity to support the City of Nevada's population growth or the expansion of Burke Corporation. It also is not feasible to modify the facility to meet Iowa Department of Natural Resource requirements. The applicant stated that the facility is "not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements" and could not meet separation requirements from inhabitable buildings. The proposed facility will provide a higher level of treatment, both quality and quantity, than the existing wastewater treatment facility.

A sewer is also proposed between the existing Wastewater Treatment Facility and the new location, generally along Country Road S-14 (620th Avenue). The project will be completed in multiple phases with final completion in November 2023.

At their September 2, 2020, meeting, the Planning and Zoning Commission recommend approval of the request with the following conditions:

1. A stormwater management plan meeting the requirements in Section 88.05 of the Story County Land Development regulations shall be submitted with the zoning permits for the facility.
2. Upon completion of the property value study, if the consultant finds property values will be negatively impacted, the permit is brought back to the Board of Adjustment for consideration and the applicant presents options to address any negative findings.
3. The applicant shall work with County Conservation on native landscaping to ensure compatibility with the Jennette Heritage Area and to develop a management plan to maintain the site in functional native environmental systems.
4. Planning and Development staff shall inspect all site, building, and other wastewater treatment plant improvements during the construction phase of the project.

September 16, 2020, Meeting

The Board heard the request at their September 16, 2020, meeting and tabled the request, directing the applicant to work with the property owner of the land where the sewer was proposed to be permanently located to come to a mutual agreement on the sewer's location.

The alignment of the sewer proposed at the September 16, 2020, meeting involved routing the sewer from the existing wastewater treatment facility in the City of Nevada to the new location. A lift station was proposed to pump effluent from the existing wastewater treatment facility. A force main was proposed to be located in the Highway 30 right-of-way and extend to Country Road S-14 (620th

Avenue). Effluent was proposed to be subsequently conveyed via a gravity interceptor sewer in the right-of-way of S-14. Due to the depth that would be required to maintain the gravity flow at the intersection of 270th and S-14, the sewer was proposed to cross onto private property northeast of the intersection. The applicant indicated that the sewer would be at a 40-foot depth if it was located in the right-of-way at the intersection, which would create challenges for long-term maintenance and construction.

The owner of the property where the sewer was proposed to be permanently located, Ray Riggenberg, objected to the alignment during the public hearing. Mr. Riggenberg was concerned about the impact of the sewer on the quality of his farmland and the ability to work around manholes.

Revised Sewer Alignment

The applicant copied staff on a letter dated September 23, 2020, asking Mr. Riggenberg to contact the applicant to discuss his concerns. Staff was also copied on a subsequent email to Mr. Riggenberg stating that the alignment would be revised so that the sewer was located in the 270th-Street right-of-way instead of on his property. The applicant has provided this revised sewer alignment for the Board's consideration. Staff routed the revised alignment to the County Engineer. While he expressed concerns about the impact on traffic at the intersection, he stated that he will review the construction plans when available and that it appears possible. A notice letter with the revised alignment was mailed to property owners within a quarter mile on October 9, 2020.

Mr. Riggenberg raised concerns with the alignment of the sewer on the east side of S-14 where the rural water line is located. The sewer is proposed to cross from the west to the east side of the S-14 right-of-way at 260th Street. The rural water line continues on the west side of the right-of-way for an additional half-mile before crossing. Maintaining the sewer on the opposite side of the road as the rural water would require three crossings of S-14. The County Engineer requested the number of crossings be limited. The sewer is required to maintain a setback from water lines when on the same side of the road.

If there are large deviations in the proposed sewer alignment such as permanently crossing onto private property, the conditional use permit shall come back to the Board of Adjustment for modification. Insignificant modifications such as changing the alignment of the sewer in the right-of-way from the east side of S-14 to the west shall be reviewed by staff.

Staff Recommendation

The Board of Adjustment may consider the following alternatives for the conditional use permit request. The action recommended by staff and the Planning and Zoning Commission (alternative 2) is bolded.

1) The Story County Board of Adjustment approves the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, as submitted.
2) **The Story County Board of Adjustment approves the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, with the following conditions:**
    a. **A stormwater management plan meeting the requirements in Section 88.05 of the Story County Land Development regulations shall be submitted with the zoning permits for the facility.**
    b. **The applicant shall work with County Conservation on native landscaping to ensure compatibility with the Jennette Heritage Area and to develop a management plan to maintain the site in functional native environmental systems.**

   c. **Planning and Development staff shall inspect all site, building, and other wastewater treatment plant improvements during the construction phase of the project.**

3) The Story County Board of Adjustment denies the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, as submitted.
4) The Story County Board of Adjustment remands the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-2018, back to the applicant for further review and/or modifications and directs staff to place this item on the November 18, 2020, Story County Board of Adjustment agenda.

Staff Report

Story County
Board of Adjustment

Date of Meeting:
September 16, 2020

Case Number CUP06-20

APPLICANT: Michael Roth, HR Green
5525 Merle Hay Road, Suite #200
Johnston, Iowa, 50131

On Behalf of the City of Nevada
1209 6th Street
Nevada, IA 50201

STAFF PROJECT MANAGER: Amelia Schoeneman, Planner

SUMMARY: The request is for a conditional use permit for a new Wastewater Treatment Facility for the City of Nevada, proposed to be located on parcel 11-31-200-305, on the south side of 270th Street and west of West Indian Creek. The new facility will replace the existing facility, located at 457 S 6th Street, Nevada. The existing waste water treatment facility is approximately 60 years old. It does not have the capacity to support the population growth of the City of Nevada, the expansion of Burke Corporation or Iowa Department of Natural Resource Requirements. The applicant stated that the facility is "not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements" and could not meet separation requirements from inhabitable buildings. The proposed facility will provide a higher level of treatment than the existing wastewater treatment facility. An interceptor sewer is proposed between the existing Wastewater Treatment Facility and the new location—a lift station and force main are proposed to pump effluent from the existing wastewater treatment facility to the proposed wastewater treatment facility, generally along Country Road S-14 (620th Avenue). The project will be completed in multiple phases with final completion by November 2023. At their September 2, 2020, meeting, the Planning and Zoning Commission recommend approval of the conditional use permit with conditions.

Property Information

PROPERTY OWNER

City of Nevada
1209 6th Street
Nevada, IA 50201

GENERAL PROPERTY LOCATION

Lot 1 of the Orchard View Subdivision

PARCEL IDENTIFICATION NUMBER(S)

11-31-200-305

CURRENT ZONING

A-1 Agricultural

LAND USE FRAMEWORK MAP DESIGNATION

Agricultural Conservation Area and Natural Resource Area

CITIES WITHIN TWO MILES

None

Background

This request is for a conditional use permit a new Wastewater Treatment Facility for the City of Nevada. Public water supply and sewage treatment facilities are allowed in the A-1 Agricultural Zoning District in accordance with the requirements of Chapter 90, Conditional Uses, of the Story County Land Development Regulations and with the granting of a conditional use permit by the Board of Adjustment.

Site and Current Land Use

The proposed location is on a 122.62 net-acre lot that is part of the Orchard View Subdivision, approved in 2017. The property is currently in row crop production. The parcel has frontage on 270th Street and is located one mile east of S-14/620th and a third-of-a-mile west of 19th Street, approximately two and one-quarter mile south of the City of Nevada. The Iowa Department of Transportation Traffic Counts from 2015 show 140 vehicles per day on 270th between 620th/S-14 and 19th Street. West Indian Creek runs on the east side of the property and is the receiving stream for the wastewater plant's effluent discharges. More information on the proposed treatment process and discharge will be provided later this staff report.

Need for a New Wastewater Treatment Facility

The new wastewater treatment facility will replace the existing wastewater treatment facility, located at 457 S 6th Street in Nevada. The existing wastewater treatment facility is approximately 60 years old. It no longer has the capacity to support the population growth of the City of Nevada, the expansion of Burke Corporation, or meet current Iowa Department of Natural Resources requirements. Burke Corporation is currently expanding (work will be completed in 2021) and will be hauling the excess waste to be treated at the Ames Wastewater Treatment Facility until the new Nevada wastewater treatment facility is

completed. Nevada also anticipates population growth at a rate of .75% annually, which is anticipated to exceed the capacity of the existing wastewater treatment facility by 2027.

Beyond capacity issues, the applicant states that existing wastewater treatment facility is "not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements" and could not meet separation requirements from inhabitable buildings (1,000 feet). The Iowa Nutrient Reduction Strategy has set more stringent limits for Total Nitrogen and Phosphors Removal and the existing wastewater treatment facility would require major modifications to meet these requirements. The existing wastewater treatment facility also does not provide disinfection, which is required to meet new Iowa Department of Natural Resources permit limits. The proposed facility will provide a higher level of treatment, meeting the stricter effluent limits, than the existing facility.

Operation Details

The new facility is planned as follows. An interceptor sewer is proposed between the existing wastewater treatment facility and the new location—a lift station and force main are proposed to pump effluent from the existing wastewater treatment facility to Country Road S-14 (620th Avenue) under and Highway 30 and through the Highway 30 right-of-way. Effluent is subsequently conveyed via a gravity interceptor sewer to the new site. The preference is to use the right-of-way of S-14 for the sewer. The concept alignment drawing also shows part of the sanitary sewer on private property near the proposed wastewater treatment facility. Due to the depth that would be required of the sewer at the intersection of 270th and S-14, the preferred alternative for the sewer would cross onto private property northeast of the intersection. Work related to easement acquisition for the interceptor is planned for spring of 2021. The construction of the sewer is not planned until 2022, with completion in 2023. The existing wastewater treatment facility will continue to be used until the proposed facility is completed.

At the proposed wastewater treatment facility, the effluent will first be treated through screening and grit removal inside of a headworks building. The screened waste and grit will be washed, which helps control odor as it removes the organic material. The waste will then be stored inside the building until disposal and the grit will be stored on a covered pad until disposal. The effluent will then go through an aeration process in oxidation ditches to remove organics and nutrients and minimize odor during treatment. The sludge is then settled from the effluent in clarifiers before being sent to the UV building for disinfection. The sludge is treated through aerobic digestion in covered tanks and will be applied to farm fields for fertilizer annually. Aerobic digestion also limits odors. The land application will generate additional traffic above normal levels—84 trips (entries and exits) may be generated a day for a three week period. Haul routes will be:

> Route 1: 270th Street west to 620th Avenue/County Road S14/NE 72nd Street; 620th Avenue/County Road S14/NE 72nd Street, south to 280th Street; 280th Street east to 630th Avenue; 630th Avenue south to 287th Street; 287th Street east to 640th Avenue; north on 640th Avenue.
>
> Route 2: 270th Street east 640th Avenue; south on 640th Avenue.

A proposed new outfall structure is planned to discharge treated effluent into West Indian Creek and is approximately three miles south of the existing outfall. The outfall structure will be the only portion of the wastewater treatment facility located in the floodplain and will require a floodplain permit.

The facility will also include a 134-foot-by-61-foot administration and vehicle storage building, including an operations and control room, offices, and an employee breakroom and locker rooms. Four employees are anticipated per shift. The total number of daily trips anticipated is 24. Ten parking spaces are proposed and one space will be van accessible to comply with ADA requirements. Under the Story County Land Development Regulations, 16 maximum parking spaces would be permitted for the building, which includes office and warehouse uses. Three trees will be planted in the parking area—one tree is required for every five parking spaces.

All structures and other parts of the facility will exceed the 50-foot required setback from property lines for conditional uses. The Iowa Department of Natural Resources requires that the wastewater treatment facility has a separation distance of 1,000 feet from any inhabitable structure and a 400-foot separation from private wells.

A paved drive, 24-feet in width is proposed. The drive will be gated. Provisions will be made at the entrance gate to allow emergency vehicle access at all times. The drive will extend directly south from the 270th Street right-of-way on the western side of the site and the gate will be approximately 330 feet south of the right-of-way. A four-foot-by-eight-foot monument sign will be installed at the access on 270th street. A light pole will be installed at the entrance point as well as along the drive. All buildings will be located near the southwestern portion of the site. The buildings will also be lit with security lights. Past the gate, the drive will curve to the southeast. The administration building will be located approximately 600 feet south of the right-of-way and 110 feet east of the westernmost property line. The headworks (33-feet-by-64-feet) and solids processing buildings (32-feet-by-35-feet) are located to the southeast of the administration building. The drive then continues to the southeast and becomes a loop road with the oxidation ditches in the center. The biosolids pumping building (25-feet-by-32-feet) and storage are on the west side of the loop. The secondary treatment building (28-feet-by-46-feet—includes a restroom, office, lab, and pump room), chemical storage building, the clarifiers, and UV disinfection building (41-feet-by-30-feet) are proposed to be located on the southeastern end. The chemical storage building will contain ferric chloride and a carbon supplement (Micro-C), which are non-hazardous. Secondary containment for 110% of the largest tank capacity will be provided. The UV disinfection building will be the southeastern-most building and over 500 feet from the nearest external property line. The sanitary sewer will extend from the UV disinfection to discharge into West Indian Creek. Construction is anticipated to begin in July of 2021. The loop road provides access to all buildings by vehicle and has been reviewed by the Nevada Fire Chief.

The site will be fenced and the fenced-in area will be approximately 17.5 acres. The construction and grading limits are approximately 50 acres and, again, are outside of the floodplain with the exception of the sewer pipe that discharges the treated effluent into West Indian Creek after treatment. The areas outside of the wastewater treatment facility are planned to be landscaped with native grasses. Story County Conservation requests a management plan be developed to maintain the site in functional native environmental systems. Plantings may include native hardwoods and shrubs, and native local ecotype warm season grasses and forbs. Story County Conservation is willing to assist with development of seed lists.

The applicant indicates that the existing grade of the site will allow the facility to be built out of sight of adjacent properties. The existing elevation of the north property line on the western portion of the site

is between 960 and 954 feet above sea level. The property slopes to the southeast, towards West Indian Creek. The grading plans show that the west property line, west of the facility will have an elevation of 960 feet above sea level. The facility will be located at 950 to 915 feet above sea level, falling to the southeast. West Indian Creek is at an elevation of approximately 902 feet above sea level. The elevation rises east of the creek. Existing treelines along West Indian Creek east of the wastewater treatment facility will be maintained to provide screening on the east side of the facility. Two 10-foot tall berms are also proposed to provide screening of the north and west sides of the facility. The north berm is proposed to be located east of the site entrance, near the right-of-way of 270th Street, to provide screening from 270th Street. The west berm is proposed to be located south of the administration building and will screen the other facility buildings and processes from the properties to the west and potentially S-14/620th.

A draft stormwater management plan has been submitted and the project will require a National Pollutant Discharge Elimination System (NPDES) form the Iowa DNR for erosion control. A final stormwater management plan will be submitted with the zoning permit. The draft stormwater management plan includes two detention ponds.

According to the applicant, the project will be completed in multiple phases. Grading is anticipated to start this fall as the first phase of the project, with final completion by November 2023.

Future Land Use

The subject property is designated as Agricultural Conservation Area and Natural Resource Area (approximately the same area as the floodplain) on the C2C Comprehensive Plan Future Land Use Map.

Principle 3 of the C2C plan for Agricultural Conservation Areas is to "encourage high-value agricultural lands to remain as agricultural and discourage non-agricultural development of such lands. Direct future non-agricultural development toward the designated Urban Expansion, Rural Residential, Rural Village, and Commercial Industrial Area designations on the Future Land Use Map."

The selected site has a low corn suitability rating (CSR2) due to soils, slopes, and flooding in the area. The weighted average CSR for the site is 55. The average CSR for Story County is 77.6 (https://www.extension.iastate.edu/soils/suitabilities-interpretations). The city was limited to sites that could discharge into West Indian Creek, met the 1,000 foot separation requirement from dwellings, was large enough to accommodate the facility, and had a willing seller.

Principal 2 of the C2C plan for Natural Resource Areas to mitigate impacts of proposed development contiguous to areas identified as Natural Resource Areas.

Other policies for Natural Areas include:

> *NA Policy 3: Mitigate negative impacts to Natural Areas, including, but not limited to: agricultural chemical application, animal confinement and feeding, agricultural irrigation, miscellaneous agricultural activities like manure and fuel storage, outdated and non-functioning on-site wastewater systems, underground storage tanks, and nutrient-loaded urban stormwater run-off.*

Surrounding Land Use
There are 34 parcels within one-quarter mile of the subject property. Of these parcels, 11 contain single-family dwellings.

North
There is one parcel adjacent to the north of the subject property and on the same (south) side of 270th Street as the subject property. It is 4.5 net-acres and contains a dwelling. It is owned by Willie and Donna See, who sold the subject property to the City of Nevada. The city has a waiver to the 1,000-foot buffer with the Sees, although it appears the separation distance is met as the dwelling is 1,650 feet from the headworks building.

On the north side of 270th street and adjacent to the subject property are three large agricultural parcels ranging from 8.7 to 30.3 net-acres in size. There is also a 4.10 net-acre parcel that contains a single-family dwelling. These parcels are all zoned A-1 Agricultural.

East
The parcels to the east of and adjacent to the subject property include a 40-acre parcel in agricultural production. There are also two smaller parcels (8.29 and 10.87) net-acres that are outlots in the Orchard View Subdivision. Willie and Donna See own all three parcels.

South
To the south of and adjacent to the subject property are two 40-acre parcels. They are zoned A-1 Agricultural and contain agricultural production and trees along the floodplain. They are part of the Berry Patch Farm.

West
The parcels to the west of and adjacent to the subject property include two large agricultural parcels (40 and 28.58 net-acres). Also adjacent is a 166.62-acre parcel owned by Story County Conservation that is part of the Jennett Heritage Area.

While not adjacent, to the northeast of the subject property and south of 270th are several parcels with single-family dwellings. Two are lots that were platted in 1979 as part of the Wilderness Addition Subdivision and are zoned R-1 Residential. These lots are .83 and .84 acres and will be 1,710 feet from the nearest portion of the wastewater treatment facility. To the east of the Wilderness Addition is a parcel zoned A-1 Agricultural, 2.42 gross acres in size, and which contains a single-family dwelling. The dwelling will be 1,650 feet from the nearest portion of the wastewater treatment facility. To the south of the Wilderness Addition is a 4.82 net-acre parcel with a dwelling that will be 1,450 feet northeast of the nearest portion of the wastewater treatment facility.

There two dwellings to the east of the subject property that take access on 19th Street that are located on 9.66 and 4.95 net-acre parcels. These will be 2,130 feet and 1,880 feet from the nearest portion of the wastewater treatment facility, respectively.

Analysis

1. **Applicable Regulations:** Chapter 90.04: Standards for Approval

The Board of Adjustment shall review the proposed development for conformance to the following development criteria:

1. **Compatibility.** The proposed buildings or use shall be constructed, arranged and operated so as to be compatible with the character of the zoning district and immediate vicinity, and not to interfere with the development and use of adjacent property in accordance with the applicable district regulations. The proposed development shall not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties.

   Applicant Comment: The proposed WWTF site is currently classified as an A-1 Agricultural Zone. According to Table 90-1 of Story County's Code of Ordinances, "public water or sewage treatment facilities" are permitted conditional uses of this zone with the approval of a conditional use permit. The WWTF is designed to be compatible with the current Agricultural Zoning classification of the site. All structures of the proposed WWTF will adhere to Story County land develop regulations including the Bulk Requirements found under the A-1 Agricultural Zone requirements. The total site property area is approximately 122.6 acres. The enclosed fenced portion of WWTF will only encompass approximately 17.5 acres of the site property. All structures will be placed with a minimum 50 ft setback from all property lines and no structure will exceed 40 feet in height.

   The proposed wastewater treatment facility will have no interference with the development and use of adjacent properties. The majority of adjacent properties are classified as A-1 Agricultural Zones. The wastewater treatment facility will have no impact to agricultural classified zones. The remaining adjacent properties are classified as: (1) Agricultural Dwelling Zone and (1) Residential Zone. According to IDNR regulations, new WWTF's must maintain a 1,000-foot separation between inhabitable structures and wastewater treatment processes unless written permission is obtained from owners of inhabitable structures within the 1,000-foot separation distance. The proposed site allows greater than the required 1,000-foot separation to all inhabitable structures. The City of Nevada purchased the site property from the owner of the nearest inhabitable structure and have received certified permission for construction of the WWTF within 1,000-feet of that property. See Appendix A for that certification. Property owners are permitted to develop within the 1,000-foot separation distance once the WWTF is constructed, and thus the facility will have no impact to the neighboring properties' development. See Figure 1 on the next page for a site separation map of the proposed WWTF processes to inhabitable structures. As can be seen in Figure 1, the majority of the facility's 1,000-ft site separation is contained within the City of Nevada owned property. This is a great improvement from the existing Nevada WWTP, which is located within several hundred feet of residential properties. One of the greatest benefits of this site is its separation from other properties. Due to the large area of land the City of Nevada was able to purchase, this facility is ideally located as far as feasible from developed and/or residential areas. Given the location of the plant, it is not anticipated there will be any impact to adjacent properties' values or development ability. A similar WWTF is currently being constructed in Warren County, Iowa. An appraisal was performed with findings that the proposed WWTF would not diminish or impair established property values in adjoining or surrounding properties. See Appendix B for a formal appraisal of surrounding properties to the proposed Nevada WWTF. Formal appraisals are currently being assessed and will be provided as soon as available.

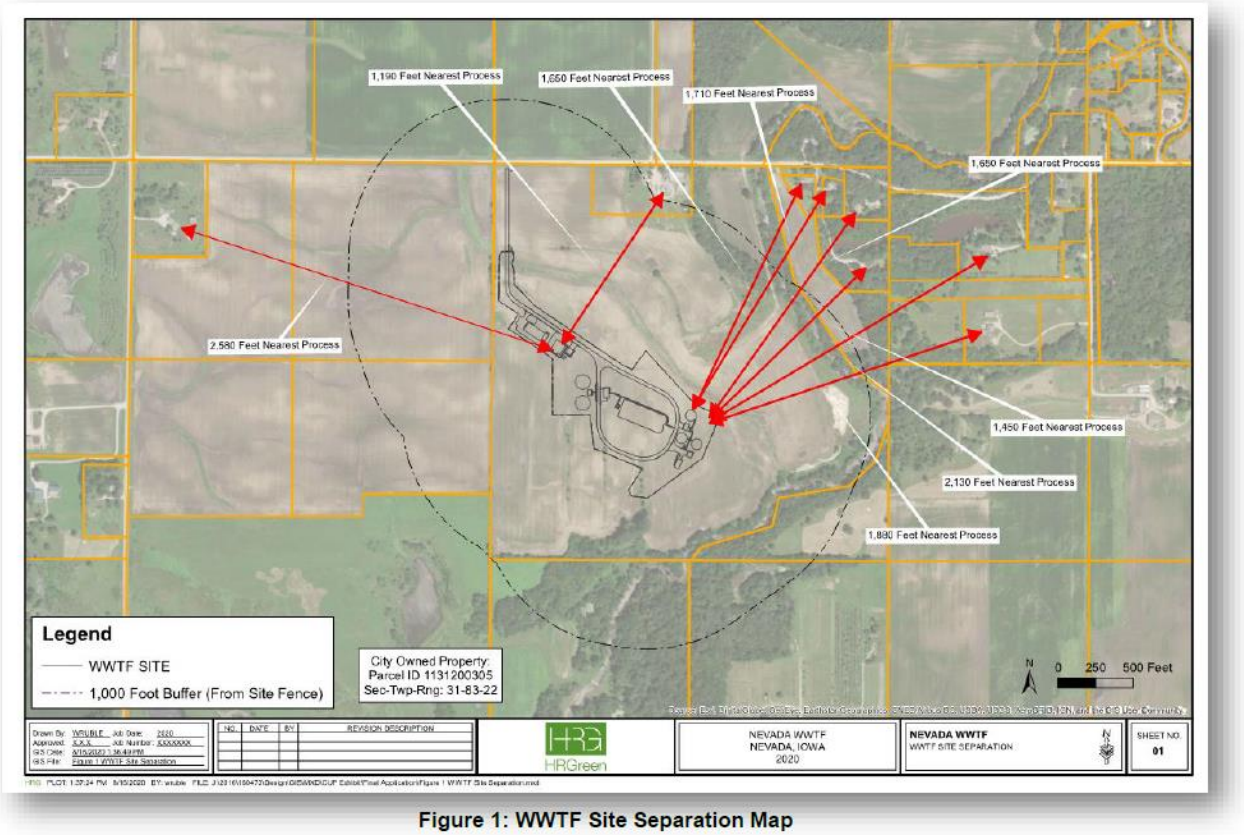


Figure 1: WWTF Site Separation Map

The proposed WWTF will not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties. Another major benefit to the WWTF site location is its ability to screen the proposed WWTF from view of adjacent properties. The natural site grade allows for the facility to be built on a natural slope. This natural slope will allow the majority of the facility to be built below the natural line of site from properties to the north and west. To assist with visual screening, landscaped berm(s) are proposed to be constructed to the north of the site to provide screening from 270th Street. Other landscaped berm(s) are proposed to be constructed on the west side of the site to provide screening from the west properties and County Road S14. The southwest side of the site is abutted by the Jennet Heritage Area which serves as a public hunting area owned by Story County. This property serves as another visual barrier to privately owned properties. The south and east sides of the property are abutted by West Indian Creek which serves as both a physical and visual barrier to adjacent properties due to the established tree line that has formed around the floodplain. The site will also follow all applicable Story County development standards. The combination of visual screening and adherence to development standards will ensure a facility that will not be unsightly to nearby properties. See Figure 2 below for a site plan showing visual screening from adjacent properties.

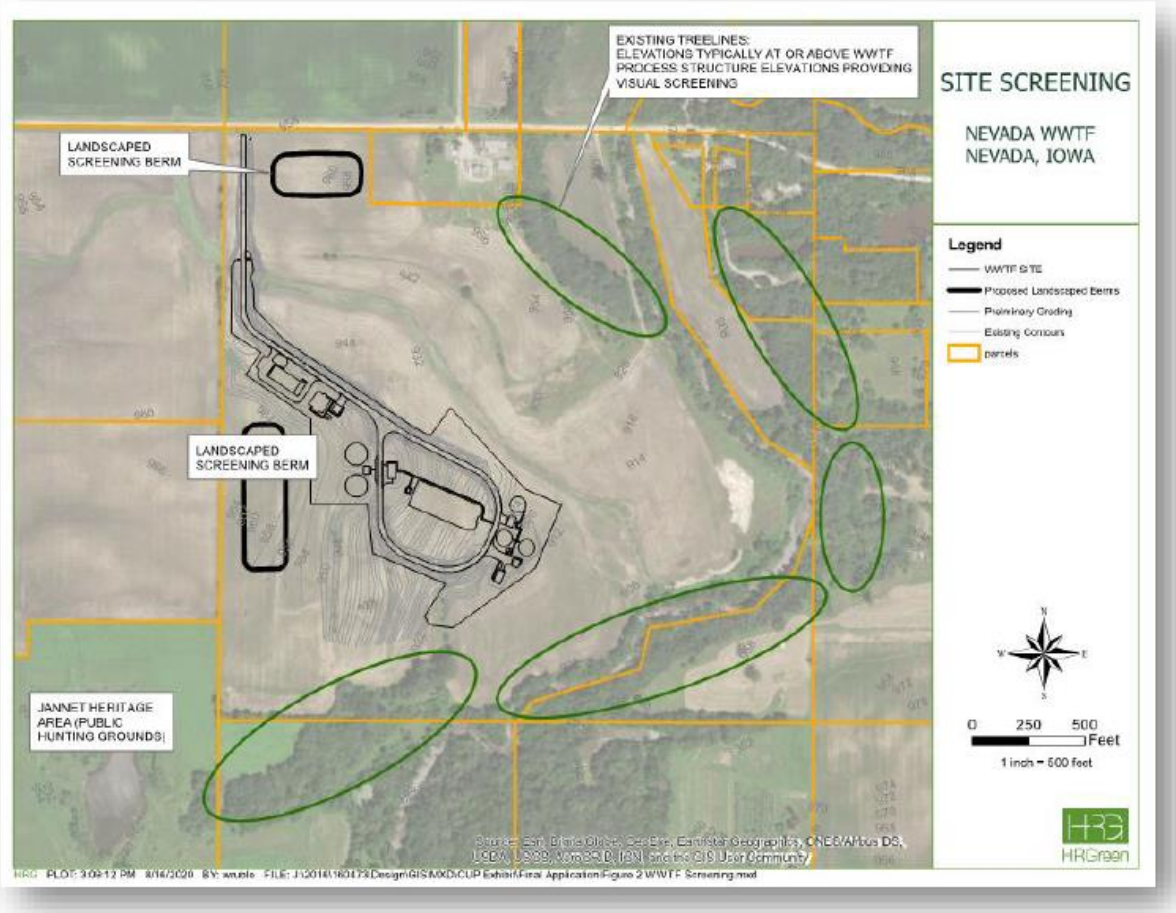


Figure 2: Site Screening

<u>Staff Comment:</u> The buildings and use of the property are proposed to be arranged in the southwestern portion of the site. This provides over 1,000 feet of distance from all adjacent dwellings to the buildings/processes. The UV disinfection building and administration building are the closest buildings to property lines. The administration building is proposed to be located approximately 600 feet south of the right-of-way and 110 feet east of the westernmost property line. The UV disinfection building is proposed to be the southeastern-most building and over 500 feet from the nearest external property line. The properties adjacent to the west and south are in agricultural use and the proposed wastewater treatment facility will not interfere with their use. There is also a property to the southwest that is the location of the Jennette Heritage Area, owned by Story County Conservation. To ensure compatibility with the Jennette Heritage Area, the Planning and Zoning Commission recommended a condition that the applicant work with County Conservation to develop a management plan to maintain the site in functional native environmental systems.

The processes themselves have also been designed to reduce possible odor. At the facility, the effluent will first be treated through screening and grit removal inside of a headworks building. The screened waste and grit will be washed, which helps control odor as it removes the organic material. The waste will then be stored inside the building until disposal and the grit will be

stored on a covered pad until disposal. The effluent will then go through an aeration process in oxidation ditches to remove organics and nutrients and minimize odor during treatment. The sludge is then settled from the effluent in clarifiers before being sent to the UV building for disinfection. The sludge is treated through aerobic digestion in covered tanks and will be applied to farm fields for fertilizer annually. Aerobic digestion also limits odors.

The construction of the sewer from the existing wastewater treatment facility to the proposed site may present a temporary inconvenience to property owners whose property abuts the right-of-way of S-14 where the sewer is installed. The right-of-way will be restored.

2. **Transition.** The development shall provide for a suitable transition, and if necessary, buffer between the proposed buildings or use and surrounding properties.

   Applicant Comment: As previously stated, the WWTF site and location is designed to provide both visual and physical barriers from adjacent properties. The facility maintains maximum separation distances possible from inhabitable structures following IDNR regulations. In addition to visual, physical, and distance barriers to adjacent properties, the areas outside the physical WWTF on the site are planned to be planted with native grasses and landscaping. This will provide a visually appealing buffer between the facility and adjacent properties.

   Staff Comment: The applicant indicates that the existing grade of the site will allow the facility to be built out of sight of adjacent properties. They also chose this site because it wasn't a highly developed area and separation distances required by the Iowa DNR from dwellings could be met. Existing treelines east of the facility will be maintained to provide screening. Two 10-foot tall berms are also proposed to provide screen on the north and west sides of the facility. The north berm is proposed to be located east of the site entrance, near the right-of-way of 270th Street, to provide screening from 270th Street. The west berm is proposed to be located south of the administration building and will screen the other facility buildings and processes from the properties to the west and potentially S-14/620th.

3. **Traffic.** The development shall provide for adequate ingress and egress, with particular attention to vehicular and pedestrian safety and convenience, traffic flow and control, and emergency access.

   Applicant Comment: The WWTF development will provide adequate ingress and egress to the site. The site will include a single entrance location from 270th Street. The entrance drive is located approximately 900 feet from the nearest driveway with a line-of-site exceeding the required 500 feet in each direction. The entrance drive will have a security gate that will control access into and out of the facility. This gate is anticipated to remain open during normal business hours. A security camera will be placed at the entrance gate so plant staff can monitor access. A gravel pull off will be located outside of the entrance gate so vehicles may turn around should they attempt to enter the facility after hours. There will also be controlled access via a card access system at the gate for operators or contractors. The gate can also be opened remotely by operators to let visitors enter the facility should the gate be closed. Provisions will be made at the entrance gate to allow emergency vehicle access at all times. The entrance drive will circulate

traffic directly past the facility's Administration Building where visitor and employee parking will be located.

After passing the Administration Building, the entrance drive will split into a "loop road" that will circulate traffic around the facility in an oval orientation. The entrance drive and loop road will be a 24' wide, 7" thick portland cement concrete road designed to be able to circulate tanker trucks and emergency vehicles. The road will have a maximum grade of 5% to allow adequate circulation of the design vehicles. A speed limit of 15 mph will be posted before the loop road for the protection of pedestrians and vehicles. The entrance and loop road will serve as emergency and fire access to all site structures. The design has been reviewed for compliance with the International Fire Code by the City of Nevada's Fire chief. See Figure 3 on the following page for the site paving plan. The proposed WWTF is not anticipated to increase traffic greatly along 270th Street. See Appendix C for projected traffic volumes of the proposed WWTF.

Staff Comment: Access is proposed from 270th Street. The Iowa Department of Transportation Traffic Counts from 2015 show 140 vehicles per day on 270th between 620th/S-14 and 19th Street. As an administration building is proposed on the site, traffic levels will slightly increase. Four employees are anticipated per shift. The total number of daily trips anticipated is 24. Land application of the sludge will generate additional traffic above normal levels—84 trips (entries and exits) may be generated a day for a three week period. The County Engineer reviewed the proposed traffic volumes and had no concerns about the impact on the County road condition.

A paved drive, 24-feet in width is proposed to serve the site. The drive is proposed to be a loop drive to provide access to all proposed buildings. The plan has been reviewed by the Nevada Fire Chief.

During construction of the facility and sewer from the existing wastewater treatment facility to the proposed, traffic may also temporarily increase.

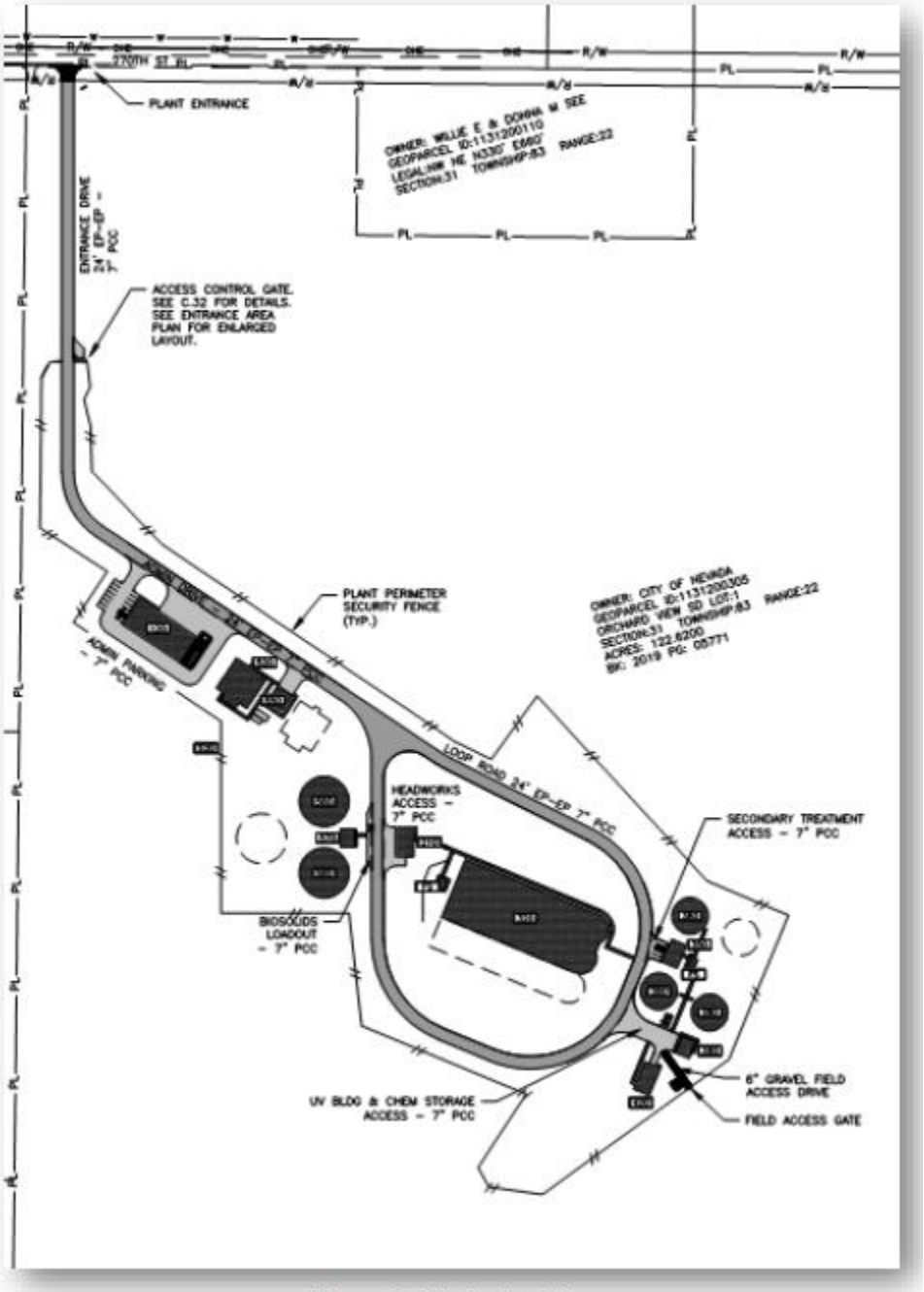


Figure 3: Site Paving Plan

4. **Parking and Loading.** The development shall provide all off-street parking and loading areas as required by this Ordinance, and adequate service entrances and areas. Appropriate screening shall be provided around parking and service areas to minimize visual impacts, glare from headlights, noise, fumes or other detrimental impacts.

   Applicant Comment: A single designated parking lot will be provided at the Administration Building for employee, visitor, and accessible parking. At minimum one (1) van accessible parking

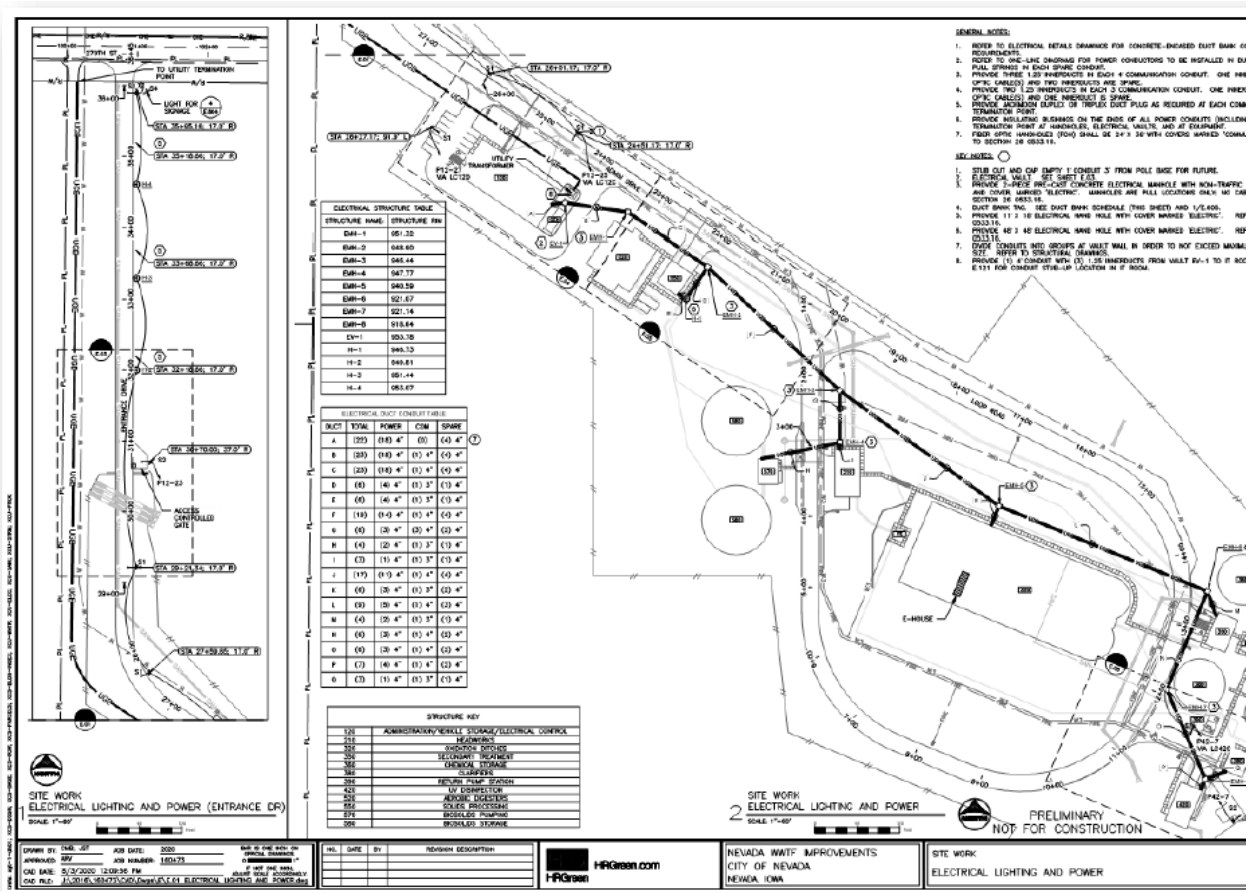
space will be provided in accordance with American Disabilities Act regulations. At minimum, an additional ten (10) parking spaces will be provided for visitor and employee parking. There is no parking ratio designation for wastewater treatment facilities in Story County's Code of Ordinances, so it was assumed "Manufacturing Plants" to be a reasonable and similar designation. Manufacturing plants require one (1) parking space for every three (3) employees on the largest working shift. The proposed WWTF is anticipated to have four (4) employees on site during the largest shifts. The proposed ten (10) parking spaces should be more than sufficient based on this criterion. (Note: staff worked with the applicant to apply the maximums allowed for office and warehouse uses instead of manufacturing plants). Each remaining building will have a driveway for employee, contractor, or delivery access. These driveways will also serve as access for emergency and fire vehicles. These site buildings are only intended for employee, contractor, and delivery use and thus the driveways will not be designated as parking lots. Per Story County regulations, a minimum of three (3) trees will be planted at the Administration Building parking lot to comply with the requirement of one (1) tree planted for every ten (10) parking spaces. These trees will be planted along the west side of the parking lot and will also serve as a screening barrier. The total impervious area on site is approximately 3.4 acres. According to Story County Regulations an equivalent to 20-percent of a site's impervious surface must be planted as landscaped area. As previously stated, all disturbed areas of the site outside of the wastewater treatment facility will be restored to native vegetation. This area will account for greater than 20-percent of the sites impervious surfaces as landscaped area.

Staff Comment: Ten parking spaces are proposed and one space will be van accessible to comply with ADA requirements. The parking area will be outside of the administration building Under the Story County Land Development Regulations, 16 maximum parking spaces would be permitted based on the size and use of the administration for the building, which includes office and warehouse uses. Three trees will be planted in the parking area—one tree is required for every ten parking spaces.

5. **Signs and Lighting.** Permitted signage shall be in accordance with the applicable district regulations and shall be compatible with the immediate vicinity. Exterior lighting, if provided, shall be with consideration given to glare, traffic safety and compatibility with property in the immediate vicinity.

   Applicant Comment: A single landscaped monument sign will be located at the plant entrance to display the site as the City of Nevada's Wastewater Treatment Facility. The proposed sign's surface area will equal 32 square feet to meet the A-1 Zoning limitation. The sign will be lit by a single ground mounted flood light directed at the monument sign to provide visual aid to employees and visitors. See drawing C.33 of the "Phase 2" construction documents for a detail of the proposed sign. Site lighting will comply with all requirements of Section 88.09 of Story County's Code of Ordinances. A single light pole will be located beside the plant entrance drive, just inside of the property line, to light the plant entrance off 270th Street. Site lighting poles will be placed along the plant's entrance drive from the security gate up to the Administration Building to provide safe access for employees. Site lighting poles will also be placed in the parking area west of the Administration Building, the access drive north of the UV Building, and at the south plant entrance gate. The three clarifier tanks and two biosolids storage tanks will have light poles mounted on top of them. Each building will also have building mounted exterior security

lights. See Figure 4 on the following page for the overall site lighting and power plan. Additional drawings are provided in the "Phase 2" construction documents.



Staff Comment: The proposed monument sign will require a sign permit prior to its construction. Signs cannot be lit in the A-1 Agricultural Zoning District and the applicant has indicated they will remove the flood light, meeting requirements.

Regarding the street lights, staff has communicated that all lighting must be under 1,800 lumens or shielded so that light does not escape above a horizontal plane through the lowest portion of the luminaire to meet County requirements.

6. **Environmental Protection.** The development shall be planned and operated in such a manner that will safeguard environmental and visual resources. The development shall not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.

Applicant Comment: The proposed WWTF is designed and operated in such a manner that environmental and visual resources will be safeguarded. The treatment facility will be located on property that is currently being farmed as row-crops. As such, there will be little to no

environmental impact due to the construction of the WWTF. The disturbed site area that will not be part of the WWTF will be restored to natural vegetation. The WWTF design will also include storm water management practices to prevent erosion to the site and surrounding water bodies in compliance with Story County regulations. Further information regarding the storm water management and erosion control plans will be provided in the "Permitting and Development Compliance" section of this report. A wetland delineation of the site has been performed and found that no wetlands will be impacted for construction of this project. Story County's Code of Ordinances also requires that no more than 15-percent of the sites naturally occurring resources may be removed. See Figure 5 for a map of the site plan and the site's naturally occurring resources, floodplain, and wetlands. Less than 15-percent of the site's naturally occurring resources will be impacted by the construction of the facility. Refer to Appendix D for the wetland delineation report.

The proposed WWTF will also follow all IDNR regulations and comply with all State and Federal guidelines regarding wastewater treatment and discharge. As previously mentioned, the Facility Plan for the WWTF has been reviewed and approved by the Iowa DNR. An Antidegradation Analysis has also been submitted and approved for the facility. The Waste Load Allocation (WLA) provides water quality-based permit limitations for the discharge of the treated wastewater into West Indian Creek. The proposed WWTF will have to comply with all discharge limitations as detailed in the WLA and subsequent discharge permit. The existing WWTF currently discharges into West Indian Creek. The proposed WWTF will provide a benefit to the environment as it will provide a higher level of treatment than what the existing facility provides and discharge several miles downstream of the current facility which will result in less total impacted stream length to West Indian Creek. The WLA is provided in Appendix E.

The proposed WWTF will not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution, or other undesirable or nuisance conditions. The WWTF's largest noise contributors will be equipment used for the wastewater treatment processes (i.e. aeration blowers, standby emergency generator, and pumps). The site's aeration blowers and standby emergency generator will be in noise attenuating enclosures that will be required to keep noise below specified thresholds. All pumps will be located within site buildings and structures that will contain/mitigate noise. Other exterior located equipment, equipment motors, and typical facility operations will not generate excessive noise. In general, the site will not generate any noise more than what would be expected in a typical A-1 Agricultural zone. The facility will not generate any vibration, dust, or smoke except during construction activities. Construction activities will obtain all necessary permits as required at local, state, and federal levels.

As previously stated, the WWTF will follow all Story County regulations regarding site lighting. As such, the site will not create an excessive amount of glare. The site's piping, tanks, and structures are designed according to applicable codes and standards. All wastewater will be contained throughout the treatment process and will not result in any impact to existing groundwater. As previously stated, the treated effluent to be discharged into West Indian Creek will meet all discharge limitations and will provide an increased level of treatment as compared to the existing wastewater treatment facility. On-site chemicals are stored inside an enclosed building with containment areas each providing 110-percent of the stored chemical volume. There will be two (2) chemicals stored in bulk on-site for the treatment of the wastewater as

necessary. Both chemicals, ferric chloride and a carbon supplement (Micro-C), are non-hazardous. These chemicals should not pose any risk to the existing groundwater.
As with any wastewater treatment facility, there will be odor on the facility site. This odor has been mitigated during the design by choosing methods and processes that are known to reduce odor or produce less odor. The largest odor producing process in wastewater treatment is from the treatment of the raw sewage. The raw sewage in the proposed WWTF will be treated through screening and grit removal in the Headworks building. Screening is the process of removing inorganic material from the wastewater such as rags, paper, plastic, metals, and other debris. Grit removal is the process of removing finer, largely inorganic, particles from the wastewater. The removed grit material will have a similar consistency to sand. The grit removal and screening will occur within the enclosed headworks building to contain the odor of the raw wastewater influent. The screened waste will be washed to remove organics and also help reduce odor while it is stored. It will be stored in dumpsters within the headworks building until disposal. The grit will also be washed to remove organics and reduce odor. The grit will be conveyed and stored on a covered pad outside of the headworks building. As the grit is inorganic and washed, it will be relatively odorless. The screened raw wastewater will then be treated for organic and nutrient removal through an extended aeration process using a dual Oxidation Ditch layout. This process involves aerating and mixing the wastewater to allow microorganisms to remove organics and nutrients from the wastewater. The aerated treatment process minimizes odors while treating wastewater. The process is designed to have adequate detention times for constituent removal without allowing for the formation of odor-causing compounds (e.g. hydrogen sulfide) due to excessive detention time in the process. Once the wastewater has been treated for nutrient and organic removal, the remaining solids are settled out as “sludge” in clarifiers before the treated wastewater is sent to the UV building for disinfection. These last two processes are known to be odorless as the organic material has been removed. The “sludge” that was settled in the clarifiers is typically treated through anaerobic or aerobic digestion. This facility will use aerobic digesters for the treatment of the waste sludge. Aerobic digestion is completed in an environment that limits the formation of odor-causing compounds. As such, the process is relatively odorless.

Additionally, the aerobic digestion process will incorporate covers over the tanks which will provide a secondary benefit of containing the minimal amount of odors produced during digestion. Once the sludge has been treated, the stabilized liquid material it is stored in large tanks and eventually applied to farm fields as a liquid fertilizer. With the use of design considerations as described above, this WWTF will not produce excessive odor. The facility will not generate odor more than what would be expected of the current site or surrounding sites as an Agricultural use.

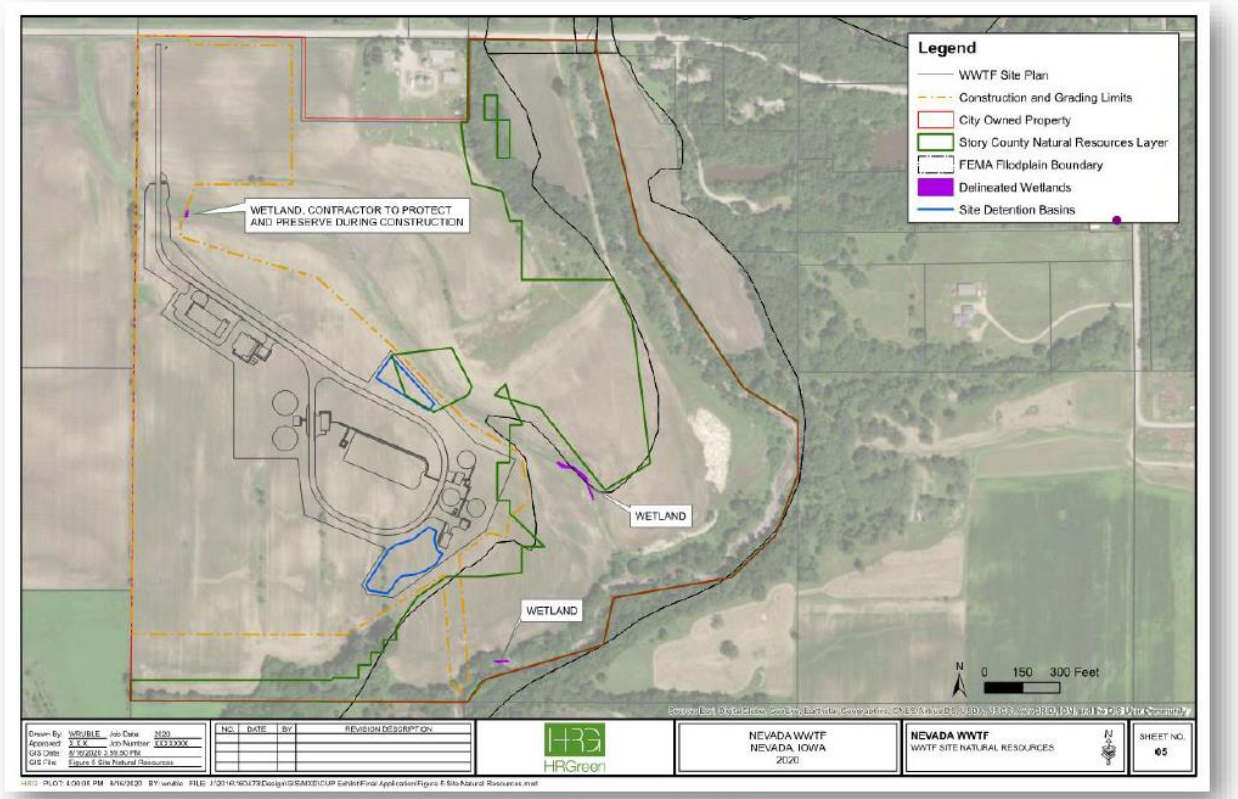


Figure 5: Site Natural Resources

<u>Staff Comment:</u> The result of the project will be an improvement in the effluent discharge into West Indian Creek. The existing system is "not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements" and could not meet separation requirements from inhabitable buildings. The Iowa Nutrient Reduction Strategy has set more stringent limits for Total Nitrogen and Phosphors Removal and the existing facility would require major modifications to meet these requirements. The existing facility also does not provide disinfection, which is required to meet Iowa DNR permit limits for discharge. The proposed facility will provide a higher level of treatment, meeting the stricter effluent limits, than the existing facility. As the proposed discharge is three miles south of the existing discharge, fewer miles of the West Indian Creek will be impacted with treated affluent with this project.

Regarding existing vegetation and stormwater control, 17.5 acres of the 122.62 net-acre property will be occupied by the facility. The remainder will be restored to native landscaping.

The Iowa DNR will oversee the NPDES permit for erosion control during construction. The applicant submitted a draft stormwater management plan. The submittal of a final stormwater management plan with the zoning permit was recommended as a condition by the Planning and Zoning Commission. The draft stormwater management plan includes two detention ponds.

2. If the Board concludes that all the above development criteria will be met, it must recommend approval of the application unless it concludes that, if completed as proposed, there is a strong probability the development will:

1. **not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.**

   Staff Comment: All structures and other parts of the facility will exceed the 50-foot required setback from property lines for conditional uses. The Iowa Department of Natural Resources requires that the facility has a separation distance of 1,000 feet from any inhabitable structure and a 400-foot separation from private wells. The applicant will meet these requirements. The site was chosen as development is limited in the area and these requirements could be met.

2. **impair an adequate supply (including quality) of light and air to surrounding properties.**

   Staff Comment: The processes have been designed to reduce possible odor. At the facility, the effluent will first be treated through screening and grit removal inside of a headworks building. The screened waste and grit will be washed, which helps control odor as it removes the organic material. The waste will then be stored inside the building until disposal and the grit will be stored on a covered pad until disposal. The effluent will then go through an aeration process in oxidation ditches to remove organics and nutrients and minimize odor during treatment. The sludge is then settled from the effluent in clarifiers before being sent to the UV building for disinfection. The sludge is treated through aerobic digestion in covered tanks and will be applied to farm fields for fertilizer annually. Aerobic digestion also limits odors. Street lights and security lights on buildings are proposed. All lighting must be under 1,800 lumens or shielded so that light does not escape above a horizontal plane through the lowest portion of the luminaire to meet County requirements.

3. **unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.**

   Staff Comment: Minimal increases in traffic are anticipated with this project. The County Engineer raised no concerns with the level of traffic generated. The Nevada Fire Chief reviewed the plans for the interior drive and approved the loop road design to provide access to emergency vehicles. Only the effluent discharge will be constructed in the floodplain.

4. **diminish or impair established property values on adjoining or surrounding property.**

   Staff Comment: The closest dwelling to the proposed project is 1,450 feet to the north east. The Story County Assessor's Office raised no concerns with this item from the review of the requested conditional use permit application. No negative impacts on property values are anticipated. The applicant indicated they have requested a property value study that is not completed. The Planning and Zoning Commission recommended a condition that upon completion of the study, if the consultant finds property values will be negatively impacted, the permit is brought back to the Board of Adjustment for consideration and the applicant presents options to address any negative findings.

5. **not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.**

   Staff Comment: The subject property is designated as Agricultural Conservation Area and Natural Resource Area (approximately the same area as the floodplain) on the C2C Comprehensive Plan Future Land Use Map.

   Principle 3 of the C2C plan for Agricultural Conservation Areas is to "encourage high-value agricultural lands to remain as agricultural and discourage non-agricultural development of such lands. Direct future non-agricultural development toward the designated Urban Expansion, Rural Residential, Rural Village, and Commercial Industrial Area designations on the Future Land Use Map."

   The selected site has a low corn suitability rating (CSR2) due to soils, slopes, and flooding in the area. The CSR is based on the U.S. Department of Agriculture's Natural Resource Conservation Service's current soil survey for Story County. A CSR rating can range in value from 5-100 where a rating of 100 is the most productive soil and five (5) is the least productive. The weighted average CSR2 for the site is 54. The average CSR2 for Story County is 77.6 (The selected site has a low corn suitability rating (CSR) due to soils, slopes, and flooding in the area. The CSR is based on the U.S. Department of Agriculture's Natural Resource Conservation Service's current soil survey for Story County. A CSR2 rating can range in value from 5-100 where a rating of 100 is the most productive soil and five (5) is the least productive. The weighted average CSR for the site is 55. The average CSR for Story County is 77.6 (https://www.extension.iastate.edu/soils/suitabilities-interpretations). It can thus be concluded that the proposed site is not a high-value agricultural area compared to other areas of the county and does not violate Principle 3 of the C2C plan for Agricultural Conservation Areas.

   Principal 2 of the C2C plan for Natural Resource Areas to mitigate impacts of proposed development contiguous to areas identified as Natural Resource Areas. Less than 15% of the natural areas on the site will be impacted. Only the effluent discharge/sewer will encroach on the floodplain. The areas on the site unoccupied by the wastewater treatment facility will be restored to native landscaping.

   While conserving agricultural lands in Story County is a primary goal of the C2C Plan, there are uses such as wastewater facilities that have specific siting requirements that are better accommodated in rural areas. The cities of Roland, Zearing, Gilbert, and Ames (which also serves Kelley) all have their wastewater treatment facilities located in the unincorporated areas of Story County. All other cities except Nevada have their facilities inside their corporate boundaries but located on the boundary with the unincorporated area. Nevada's existing facility. The City of Nevada grew to the south of the wastewater treatment plant after its construction in the 1960s. The city was limited to sites that could discharge into West Indian Creek, met the 1,000 foot separation requirement from dwellings, was large enough to accommodate the facility, and had a willing seller.

   Other policies for Natural Areas include:

NA Policy 3: Mitigate negative impacts to Natural Areas, including, but not limited to: agricultural chemical application, animal confinement and feeding, agricultural irrigation, miscellaneous agricultural activities like manure and fuel storage, outdated and non-functioning on-site wastewater systems, underground storage tanks, and nutrient-loaded urban stormwater run-off.

The proposed wastewater treatment plant will meet more stringent effluent limitations than the existing plant, which also discharges into West Indian Creek.

3. **Burden of Persuasion.**

   1. **The burden of persuasion as to whether the development, if completed as proposed, will comply with the requirements of this Chapter is at all times on the applicant.**
   2. **The burden of presenting evidence to the Board of Adjustment sufficient enough for it to conclude that the application does not comply with the requirements of this Chapter is upon the person or persons recommending such a conclusion, unless the information presented by the applicant warrants such a conclusion.**

Comments

The following comments are part of the official record of the proposed City of Nevada **Wastewater Treatment Facility CUP06-20.** If necessary, conditions of approval may be formulated based off these comments.

A Conceptual Review meeting for the proposed Conditional Use Permit request was held on Thursday, May 7, 2020. The applicant spent the last three months further working on and revising plans and documentation in response to County staff comments. After conceptual review, the complete application submittal was also forwarded to the members of the Interagency Review Team. Some of the County staff review comments were as follows:

County Conservation Comments
I request that the balance of the site not used for the treatment facility be placed in native vegetation and a management plan be developed to maintain the site in functional native environmental systems. Plantings may include native hardwoods and shrubs, and native local ecotype warm season grasses and forbs. Story County Conservation is willing to assist with development of seed lists.

The Jennett Heritage Area contains remnants of native mesic tallgrass prairie. The presence of this prairie heightens the importance of establishment and management of a proper prairie re-creation on the WWTF site.

Engineer's Comments:
The projected traffic impacts to 270th do not appear to be that great so our gravel road should hold up fine.

Planning and Development Selected Comments

1. Signs are not permitted to be lit in the A-1 Agricultural District. One alternative would be a street light above the sign. The light, if greater than 1,800 lumens, must have a cutoff so no light is emitted above a horizontal plane through the lowest direct light-emitting part of the light.
2. Story County's parking requirements are maximums for the number of spaces permitted. Institutional uses are allowed one space per person on duty during a normal shift. The proposed ten-space parking lot exceeds this requirement.
3. Please provide the size of the parking spaces and aisle. A 90-degree two-way aisle is required to be 26 feet wide. Spaces are required to be nine feet wide and 17.5 feet deep.
4. The stormwater management plan will be required to have the required and proposed capacity of the proposed detention ponds and the summary of the required and post-development discharge rates.
5. The water quality volume is required to be treated through infiltration practices. Will the detention pond provide infiltration?
6. In addition to a floodplain permit, a zoning permit will be required for all structures including fencing and the proposed sign before construction.

Comments from the General Public

Public notification letters were mailed to surrounding property owners within ¼ mile of the site and sewer route on August 27, 2020, regarding the Conditional Use Permit application.

No comments had been received at the time of completion of this staff report. Planning and Development received two email inquiries and two for information about the project.

Points for Consideration

1. The existing facility no longer has the capacity to support the population growth of the City of Nevada, the expansion of Burke Corporation, or meet IDNR requirements. It also does not meet the 1,000 foot separation distance requirement from dwellings.

2. The approved subdivision plat by the Board of Supervisors in 2017 for this property was the first stage in the wastewater treatment plant project.

3. In selecting a site for the new facility, the city was limited to sites that could discharge into West Indian Creek, met the 1,000 foot separation requirement from dwellings, was large enough to accommodate the facility, and had a willing seller. Also, the selected site has a low corn suitability rating (CSR2) due to soils, slopes, and floodplain.

4. The new facility will provide disinfection, which is required to meet more stringent Iowa DNR permit limits, and meet the more stringent Iowa Nutrient Reduction Strategy limits for Total Nitrogen and Phosphors Removal.

5. The buildings and use of the property are proposed to be arranged in the southwestern portion of the site. This provides over 1,000 feet of distance from all adjacent dwellings to the buildings/processes. The slopes and proposed berms will also assist in buffering the proposed wastewater treatment plant from adjacent properties.

6. Two adjacent parcels contain dwellings. Other adjacent parcels are in agricultural production. One contains the Jennette Heritage Area. The Planning and Zoning Commission recommended a condition that the applicant to work with County Conservation on native landscaping to ensure compatibility with the conservation area.

7. The property is designated as Agricultural Conservation Area and Natura Resource Area by the C2C Plan. The selected site has a low corn suitability rating (CSR2) due to soils, slopes, and flooding in the area. The remainder of the site not occupied by the facility will be restored to native landscaping.

8. The processes used to treat the wastewater are designed to reduce odor.

9. Access is proposed from 270th Street. The Iowa Department of Transportation Traffic Counts from 2015 show 140 vehicles per day on 270th between 620th/S-14 and 19th Street. As an administration building is proposed on the site, traffic levels will slightly increase. Four employees are anticipated per shift. The total number of daily trips anticipated in 24. Land application of the sludge will generate additional traffic above normal levels—84 trips (entries and exits) may be generated a day for a three week period. The County Engineer reviewed the proposed traffic volumes and had no concerns about the impact on the County road condition.

10. A paved drive, 24-feet in width is proposed to serve the site. The drive is proposed to be a loop drive to provide access to all proposed buildings. The plan has been reviewed by the Nevada Fire Chief.

11. A new outfall structure is proposed to discharge treated effluent into West Indian Creek and is approximately three miles south of the existing outfall. The outfall structure will be the only portion of the facility in the floodplain and will require a floodplain permit. Fewer miles of the West Indian Creek will be impacted with treated affluent with this project.

12. The proposed monument sign will require a sign permit prior to its construction. Signs cannot be lit in the A-1 Agricultural Zoning District and the applicant has indicated they will remove the flood light, meeting requirements.

13. Regarding the street lights, staff has communicated that all lighting must be under 1,800 lumens or shielded so that light does not escape above a horizontal plane through the lowest portion of the luminaire.

14. The applicant submitted a draft stormwater management plan. The Planning and Zoning Commission recommend a condition that the final stormwater management plan be submitted with the zoning permit.

15. The applicant indicated they have requested a property value study that is not completed. The Planning and Zoning Commission recommended a condition that upon completion of the study, if the consultant finds property values will be negatively impacted, the permit is brought back to the Board of Adjustment for consideration and the applicant presents options to address any negative findings.

16. The project submittal shows the applicant's recommended routing of the sanitary sewer line. During the next phase of the project, the applicant will work with and obtain necessary permits from the Iowa Department of Transportation and Story County Engineering/Secondary Road to construct the sanitary sewer within the road right-of-way, including a possible easement from a private land owner to construct a portion of the sanitary sewer on private property.

Planning and Zoning Commission Meeting and Recommendation

The Planning and Zoning Commission has several questions for staff and the applicant and heard from several members of the public at their September 2, 2020, meeting.

Chair Cheryl Moss asked staff about the property value study and what would occur if the property value study was not completed until construction had begun. Staff stated that the applicant anticipates the study will be completed by late September or early October. Grading work is proposed to begin in November.

The Commission opened the public hearing. Michael Crow, who owns a lot to the east of the proposed wastewater treatment facility, expressed concerns about the location as he would like to construct a dwelling on the property in the future. Crow also had concerns about the notice, which was mailed August 27, due to mail delays. He received the notice on August 31. Crow asked about the possibility of paving 270th to reduce dust and asked if there was a comparative study between the odor from the existing facility and the proposed facility. He noted he hadn't noticed an odor from the existing facility when in lived in Nevada several decades ago.

Staff addressed the question on road paving. The County Engineer reviewed the proposed traffic volumes and had no concerns about the impact on the County road condition. Staff is not aware of any paving plans for 270th Steet, The typical daily traffic will be 24 trips—when sludge is being applied annually, there will be 84 trips a day for a three-week period.

Moss asked if dust control had been considered. Staff stated that they had asked the applicant about their dust control plans. Michael Roth, HR Green, spoke on behalf of the City of Nevada as the applicant and noted that if dust control was required during the sludge application period, it would be part of the contract for that work. Roth also noted that the city will be using the same sludge application sites as it does presently and using the same haul routes.

Crow asked if the traffic generated by the land application of sludge would be east- or west-bound. Roth indicated that it would mostly be west-bound given the grade and bridge to the east on 270th.

Roth also answered the question about the odor study. An odor study has not been completed. However, HR Green has done work at the existing facility, and based on their knowledge from that work,

there are no known odor complaints. The processes to be used in the proposed facility are not the same at the existing facility and have a very lower odor generation potential. They do not anticipate odor in excess of the existing facility.

Stephanie Jones, Recording Secretary, noted that one member of the public had been trying to get into the meeting but had called the Board of Adjustment Zoom number instead of the Planning and Zoning Commission number. Amelia Schoeneman, Planner, was working to conference them into the meeting.

Robert Riggenberg was conferenced into the meeting. His family owns the property to the north of the proposed facility. He stated that he was unable to connect to the Zoom meeting. He asked if the interceptor sewer would be in the road right-of-way. Schoeneman stated it would be, however, northeast of the intersection of S-14 and 270th, the sewer was proposed to cross onto private property. Roth stated that the trunk sewer would begin a half mile south of Highway 30 and continue in the right-of-way of S-14 until a half-mile north of 270th. The trunk sewer will either be on the east or west right-of-way of S-14, as needed to avoid utility conflict. Half of a mile north of 270th Street, the sewer is proposed to be routed to the east through private property for a half-mile. The sewer will then extend south to the proposed facility. The use of private property is needed due to the topography of 270th Street. The grade rises at the intersection and the sewer line would be required to be too deep for maintenance and require a very large open-cut installation.

Riggenberg asked if there would be a manhole every 400 feet when the sewer was not adjacent to a road. Roth stated that because it was a larger sewer, the Iowa DNR would allow up to 800-foot spacing between manholes.

Riggenberg asked if the sewer would run on the property line. Roth confirmed that was the intent.

Riggenberg asked where the dirt would be located when the sewer was being constructed. Roth stated that they would acquire temporary easements with property owners to allow material to be stored on their properties.

Riggenberg asked how wide the easement would be. Roth stated they did not have a width identified for the temporary construction easements.

Roth stated that the preliminary layout of the sewer shows it on the west side of S-14 prior to crossing the road on to private property. Riggenberg stated that the west side had four building sites (dwellings) in the last mile and a half. Roth stated that the dwellings may result in a change in the route.

Riggenberg asked if the public hearing was legal as it was limited to 10 people and Zoom was unavailable. Jerry Moore, Planning and Development Director, stated that conference calls and Zoom had been used for all public meetings and hearings since March as part of the County's response to the COIVD-19 pandemic. Further, the public can submit letters, emails, and meet staff outside the building to make a comment. Moore stated he had several phone conversations with Riggenberg about the proposal. Riggenberg stated that Zoom was unavailable and he had tried to connect numerous times and received a message that the meeting had not started.

Staff clarified that Zoom was available and being used for the public hearing, however, it appeared some callers had called the Board of Adjustment Zoom number instead of the Planning and Zoning Commission number. Further, the limit of 10 people is on the public meeting room in the Story County Administration Building to adhere to social distancing guidelines to limit the spread of COVID-19, not on the number of participants in the Zoom call. The public meeting room was not being used for the meeting and the building is not open to the public due to COVID-19.

The Planning and Zoning Commission Recommended approval (vote 4-0) of the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility with the following conditions:

1. A stormwater management plan meeting the requirements in Section 88.05 of the Story County Land Development regulations shall be submitted with the zoning permits for the facility.

2. Upon completion of the property value study, if the consultant finds property values will be negatively impacted, the permit is brought back to the Board of Adjustment for consideration and the applicant presents options to address any negative findings.

3. The applicant shall work with County Conservation on native landscaping to ensure compatibility with the Jennette Heritage Area and to develop a management plan to maintain the site in functional native environmental systems.

4. Planning and Development staff shall inspect all site, building, and other wastewater treatment plant improvements during the construction phase of the project.

Alternatives for the Board of Adjustment

The Board of Adjustment may consider the following alternatives for the conditional use permit request:

1) The Story County Board of Adjustment approves the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, as submitted.

2) **The Story County Board of Adjustment approves the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, with the above conditions.**

3) The Story County Board of Adjustment denies the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-20, as submitted.

4) The Story County Board of Adjustment remands the Conditional Use Permit for the City of Nevada Wastewater Treatment Facility as put forth in case CUP06-2018, back to the applicant for further review and/or modifications and directs staff to place this item on the October 21, 2020, Story County Board of Adjustment agenda.

Story County Planning and Development
900 6th Street, Nevada, Iowa 50201
(515) 382-7245 — pzweb@storycountyiowa.gov — www.storycountyiowa.gov

CONDITIONAL USE PERMITS

1. Property Owner*

(Last Name) City of Nevada
(First Name)
(Address) 1209 6th Street
(City) Nevada (State) IA (Zip) 50201
(Phone) 515-382-5466 (Email) kwright@cityofnevadaiowa.org

2. Applicant (if different than owner)

(Last Name) Roth
(First Name) Michael
(Address) 5525 Merle Hay Road, Suite #200
(City) Johnston (State) IA (Zip) 50131
(Phone) 515-657-5304 (Email) mroth@hrgreen.com

3. Property Address 270th Street (Orchard View Subdivision, Lot 1) Parcel ID Number(s) 1131200305

4. Certification and Signature

I/we certify that the information and exhibits submitted are true and correct to the best of my knowledge and that in filing this application I am acting with the knowledge, consent and authority of the owners of the property. Pursuant to said authority, I hereby permit County officials to enter upon the property for the purpose of inspection.

***Acknowledgement of property owner is required and may occur via email or by signature of this application.**

Property Owner Signature Kevin Wright **Date** 8/14/20 **Applicant Signature** Michael Roth **Date** 8/14/20

There are 3 types of CUP Modifications: insignificant, minor, and major. The Director of Planning and Development makes the determination of the type. Insignificant modifications are reviewed by the director. Minor modifications are reviewed by the Board of Adjustment. Major modifications are considered new conditional use applications and follow the same review process as a new conditional use permit application.

☑ New Conditional Use Permit

Proposed Conditional Use: Wastewater Treatment Facility

Submittal Requirements:

- ☑ Attend conceptual review meeting (prior to submittal of CUP application, see conceptual review application and deadline on Planning and Development website)
- ☑ Filing Fee (required prior to processing): $275
- ☑ Site development plan
- ☑ Written narrative explaining justification for proposed conditional use permit and conformance to the standards for approval in Section 90.04 of the Story County Code of Ordinances.

☐ Conditional Use Permit Modification

Previous CUP and Number: _____

Submittal Requirements:

- ☐ Filing Fee (required prior to processing) : $50 (If determined to be a minor modification by the Planning and Development Director, the fee amount is $175.)
- ☐ Site development plan
- ☐ Written narrative explaining modification of approved conditional use permit and response to the standards for approval in Section 90.04 of the Story County Code of Ordinances.

Receipt No. _____
Receipt Amount _____

Conditional Use Permit Narrative

WWTF Improvements – Conditional Use Permit

City of Nevada, Iowa

August 2020

Prepared By:

HRGreen

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1. INTRODUCTION

1.1. Background

The current City of Nevada's Wastewater Treatment Facility (WWTF) is located at the northeast corner of the intersection of US 30 and 6th Street in Nevada and treats the residential, commercial and industrial wastewater flows that are collected and conveyed through the City's sanitary sewer collection system. The existing collection system consists of approximately 30 miles of sanitary sewer, 550 manholes, one lift station, and one equalization basin. The City's two permitted Significant Industrial Users (SIUs), Burke Corporation and the former DuPont Cellulosic Ethanol Plant, discharge to the City's collection system. The City continues to improve and rehabilitate the collection system and reduce wet weather flows received at the WWTF.

The existing WWTF has served the City for approximately 60 years and has been modified many times to accommodate expansion and upgrades. However, it does not have sufficient capacity for: 1) planned industry expansion by the Burke Corporation, which is projected to be completed by 2021 and will double its wastewater discharge, and; 2) projected population growth within the design period. The existing WWTF configuration is not readily amenable to be modified to provide additional effluent disinfection and nutrient removal requirements currently required by the Iowa Department of Natural Resources (IDNR). Additionally, the facility is near the end of its life due to infrastructure age.

The City considered options to renovate and expand the existing WWTF and build a new facility. Due to many reasons, including space constraints and separation from inhabitable buildings at the existing location, the decision was made to build a new facility on another site.

1.2. Site Selection

In early 2015, the City of Nevada began the search for a sufficiently sized parcel of land south of Nevada along the West Indian Creek corridor to accommodate the construction of a new WWTF. A site was sought that would allow discharge to West Indian Creek, be readily accessible, and provide adequate separation from inhabitable buildings. In early 2017, the City of Nevada purchased a123.5-acre parcel of farmland approximately three miles south of the existing Wastewater Treatment Facility along West Indian Creek for this purpose. This parcel is located along 270th Street southwest of the intersection with West Indian Creek. A minor subdivision was required to create the parcel to be purchased by the City, which was approved by Story County.

To accommodate the increased wastewater discharge from Burke Corporation, a construction start date for the new treatment facilities on this site is planned for November 2020, with completion by the end of 2023.

1.3. Facility Plan

A Facility Plan, which was completed by HR Green, Inc. in August 2019, was developed based on the requirements of the IDNR Design Standards. The existing loads and flows were reviewed, and design flows and loads were

established for the future residential projected population; non-Burke industrial loading limits, and the SIU Burke design loadings from their expansion.

A Waste Load Allocation (WLA) was developed for West Indian Creek as the proposed receiving stream adjacent to the new site. The WLA limits along with the Iowa Nutrient Reduction Strategy goals were used to evaluate wastewater treatment technologies considered in the report.

Two interceptor sewer alternatives and two WWTF alternatives were evaluated in detail. No evaluations of the existing collection system were included. The City of Nevada is currently implementing improvements to the existing collection system to reduce I&I flows.

Interceptor Sewer

The interceptor sewer alternatives propose to either:

S1) follow West Indian Creek with a gravity sewer before being pumped with a lift station to the headworks of the proposed WWTF, or

S2) to use a lift station and force main to pump flow from the existing WWTF site to Country Road S14 and subsequently conveyed via a gravity interceptor sewer to the new site.

The recommended interceptor sewer between the existing and new WWTF sites is Alternative S2, which locates the lift station at the existing WWTF site; force main along US Highway 30 to the intersection of County Road S14; and gravity interceptor sewer along County Road S14 to the new WWTF site. This route was chosen due to the following:

- Most economical
  - Avoids canyon-like corridor along West Indian Creek and the accompanying construction challenges
  - Shallower gravity sewer through most of the corridor
- Fewer permanent and temporary easements required
- Accessibility for construction and future operation/maintenance
- Avoids wooded corridor along creek

Wastewater Treatment

The main objective of the WWTF alternatives evaluation was to find an economical solution (capital and life-cycle costs) that best met the City's qualitative criteria:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically Enhanced Biological Phosphorus Removal (EBPR)

The evaluations for preliminary, primary, secondary, solids treatment, solids processing, biosolids storage, and effluent disinfection treatment processes were focused during a conceptual design workshop with the City at the beginning of this planning effort. Secondary treatment systems with nutrient removal capability were the only alternatives evaluated. Evaluated alternatives were:

1) Five-stage Bardenpho (P1), and
2) Three-stage Oxidation Ditch (P2).

Primary treatment was eliminated from both alternatives due to the negative impact on secondary treatment to achieve EBPR. The same preliminary treatment and disinfection processes were used for both alternatives' (P1 and P2) as these processes are not influenced by the secondary treatment system. Use of ultraviolet (UV) disinfection was ultimately chosen for both alternatives based on the City's preferences.

Solids treatment is most influenced by the type(s) of sludge produced. Due to no primary treatment processes, only waste activated sludge (WAS) from the secondary treatment system must be stabilized/treated. This resulted in evaluation of two different aerobic digestion processes for solids treatment. Post digestion dewatering was not evaluated due to the City's continued preference for liquid biosolids storage and disposal. Continued land application of biosolids was anticipated, influencing biosolids storage requirements for a minimum of 180 days of storage.

The recommended WWTF alternative is Alternative P2, Three-stage Oxidation Ditch, because of the best relative ability to meet the previously stated qualitative criteria.

1.4. Design

The City of Nevada entered into Agreement with HR Green, Inc. to design the Wastewater Treatment Facilities and the Interceptor Sewer in October 2019. It is anticipated the design will be complete by Fall 2020. The WWTF and the Interceptor Sewer will be bid as separate projects. It is anticipated the WWTF will be bid in two construction contracts, Fall 2020 (Phase 1) and in early 2021 (Phase 2), respectively. The Interceptor Sewer will be bid in Fall 2021. The WWTF will be completed and in operation by the end of 2023. The Interceptor Sewer should be completed in about a year.

<u>Opinion of Probable Cost</u>
The opinion of probable construction cost for the recommended WWTF and Interceptor Sewer is approximately $51,250,000.00.

1.5. Application Documents

The following documents will be included as part of the Conditional Use Permit that are not included as an appendix to this narrative:

1) Phase 1 90% Construction Documents
2) Phase 2 90% Construction Documents (site and applicable structure drawings only). Entire 90% set may be provided upon request.
3) Preliminary Interceptor Sewer Alignments
4) Facility Plan

2. NARRATIVE

2.1. Compatibility

The proposed WWTF site is currently classified as an A-1 Agricultural Zone. According to Table 90-1 of Story County's Code of Ordinances, "public water or sewage treatment facilities" are permitted conditional uses of this zone with the approval of a conditional use permit. The WWTF will is designed to be compatible with the current Agricultural Zoning classification of the site. All structures of the proposed WWTF will adhere to Story County land develop regulations including the Bulk Requirements found under the A-1 Agricultural Zone requirements. The total site property area is approximately 122.6 acres. The enclosed fenced portion of WWTF will only encompass approximately 17.5 acres of the site property. All structures will be placed with a minimum 50 ft setback from all property lines and no structure will exceed 40 feet in height.

The proposed wastewater treatment facility will have no interference with the development and use of adjacent properties. The majority of adjacent properties are classified as A-1 Agricultural Zones. The wastewater treatment facility will have no impact to agricultural classified zones. The remaining adjacent properties are classified as: (1) Agricultural Dwelling Zone and (1) Residential Zone. According to IDNR regulations, new WWTF's must maintain a 1,000-foot separation between inhabitable structures and wastewater treatment processes unless written permission is obtained from owners of inhabitable structures within the 1,000-foot separation distance. The proposed site allows greater than the required 1,000-foot separation to all inhabitable structures. The City of Nevada purchased the site property from the owner of the nearest inhabitable structure and have received certified permission for construction of the WWTF within 1,000-feet of that property. See **Appendix A** for that certification. Property owners are permitted to develop within the 1,000-foot separation distance once the WWTF is constructed, and thus the facility will have no impact to the neighboring properties' development. See **Figure 1** on the next page for a site separation map of the proposed WWTF processes to inhabitable structures.

As can be seen in **Figure 1**, the majority of the facility's 1,000-ft site separation is contained within the City of Nevada owned property. This is a great improvement from the existing Nevada WWTP, which is located within several hundred feet of residential properties. One of the greatest benefits of this site is its separation from other properties. Due to the large area of land the City of Nevada was able to purchase, this facility is ideally located as far as feasible from developed and/or residential areas. Given the location of the plant, it is not anticipated there will be any impact to adjacent properties' values or development ability. A similar WWTF is currently being constructed in Warren County, Iowa. An appraisal was performed with findings that the proposed WWTF would not diminish or impair established property values in adjoining or surrounding properties. See **Appendix B** for a formal appraisal of surrounding properties to the proposed Nevada WWTF. Formal appraisals are currently being assessed and will be provided as soon as available.

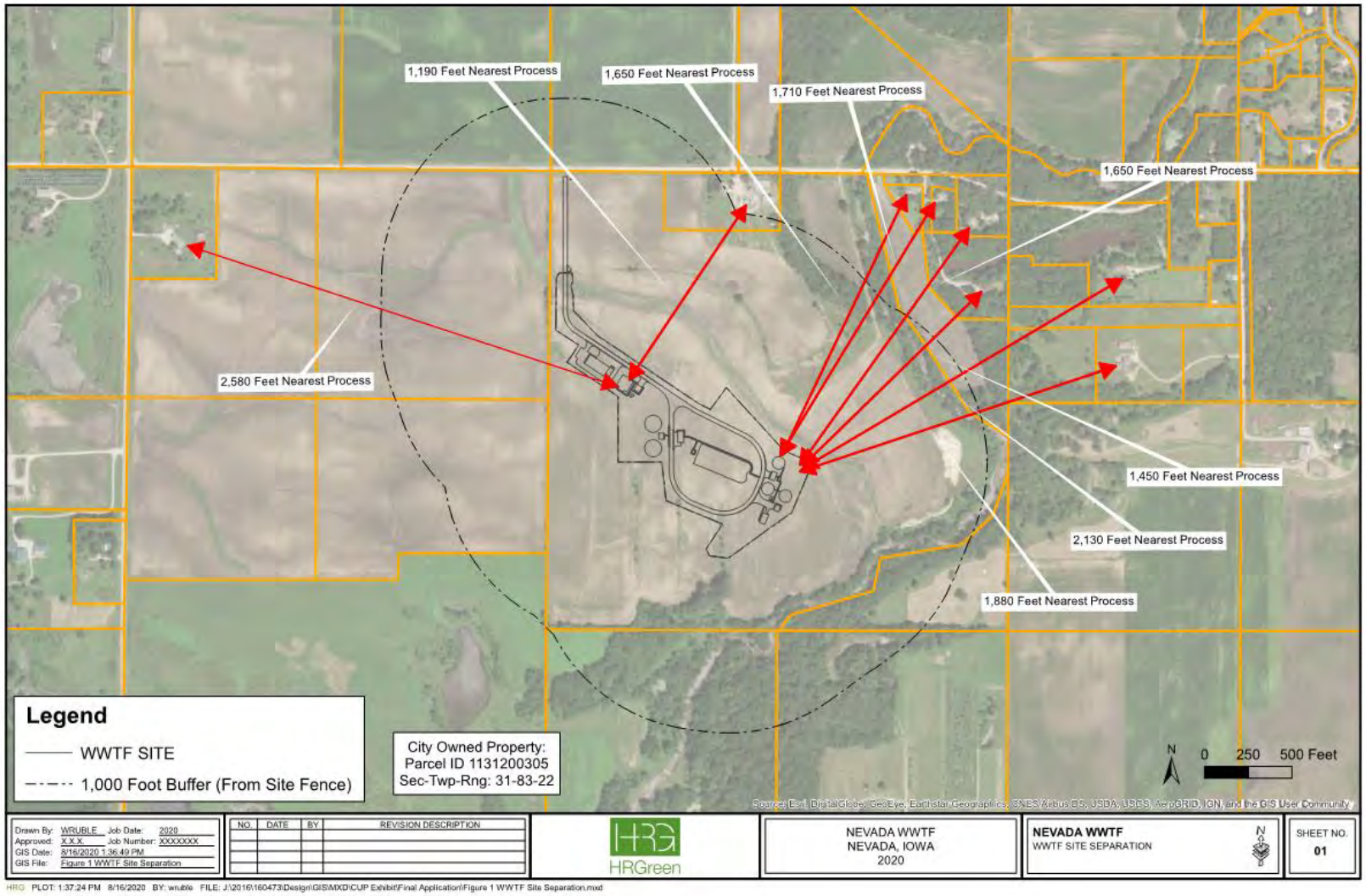


Figure 1: WWTF Site Separation Map

The proposed WWTF will not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties. Another major benefit to the WWTF site location is its ability to screen the proposed WWTF from view of adjacent properties. The natural site grade allows for the facility to be built on a natural slope. This natural slope will allow the majority of the facility to be built below the natural line of site from properties to the north and west. To assist with visual screening, landscaped berm(s) are proposed to be constructed to the north of the site to provide screening from 270th Street. Other landscaped berm(s) are proposed to be constructed on the west side of the site to provide screening from the west properties and County Road S14. The southwest side of the site is abutted by the Jennet Heritage Area which serves as a public hunting area owned by Story County. This property serves as another visual barrier to privately owned properties. The south and east sides of the property are abutted by West Indian Creek which serves as both a physical and visual barrier to adjacent properties due to the established tree line that has formed around the floodplain. The site will also follow all applicable Story County development standards. The combination of visual screening and adherence to development standards will ensure a facility that will not be unsightly to nearby properties. See **Figure 2** below for a site plan showing visual screening from adjacent properties.

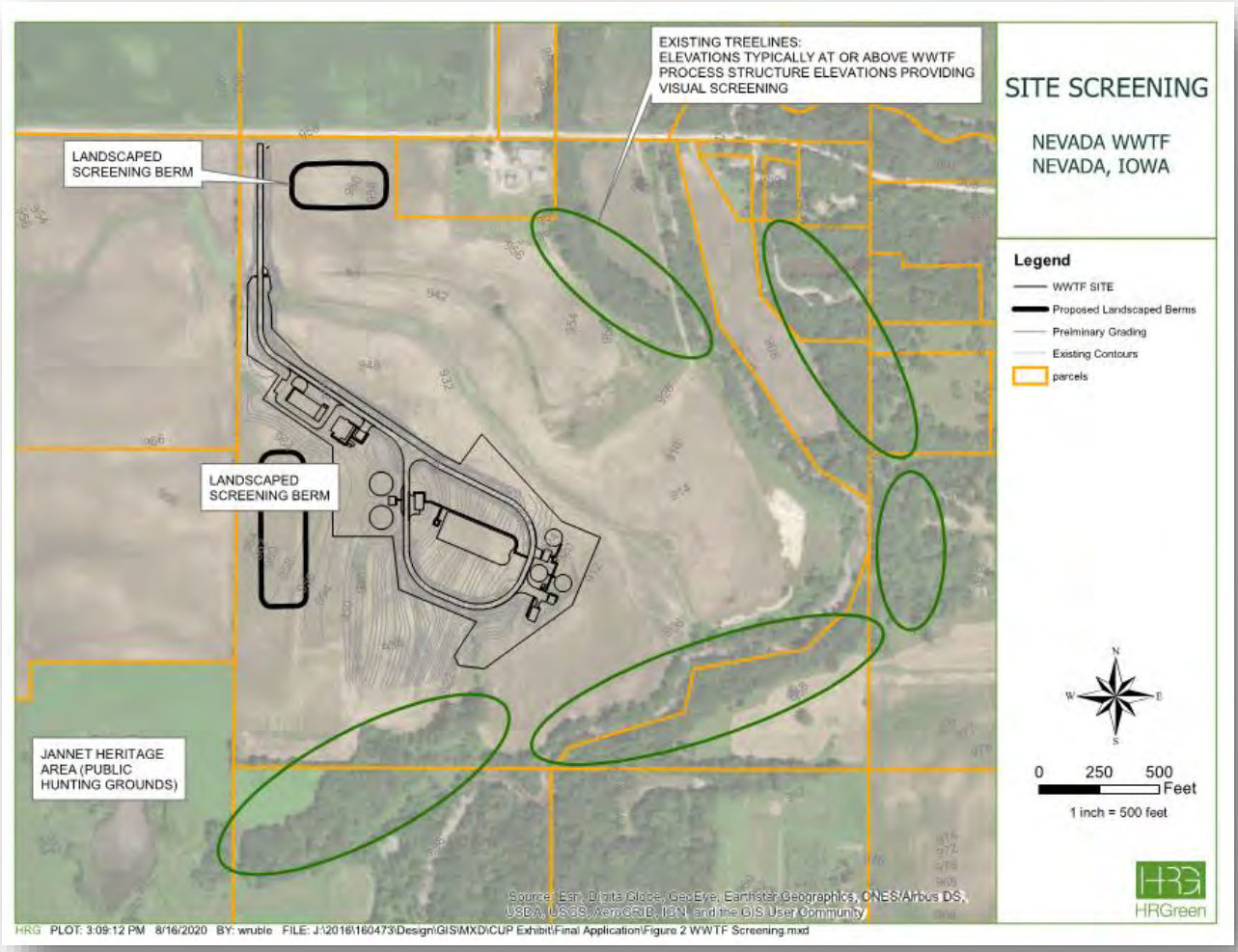


Figure 2: Site Screening

2.2. Transition

As previously stated, the WWTF site and location is designed to provide both visual and physical barriers from adjacent properties. The facility maintains maximum separation distances possible from inhabitable structures following IDNR regulations. In addition to visual, physical, and distance barriers to adjacent properties, the areas outside the physical WWTF on the site are planned to be planted with native grasses and landscaping. This will provide a visually appealing buffer between the facility and adjacent properties.

2.3. Traffic

The WWTF development will provide adequate ingress and egress to the site. The site will include a single entrance location from 270th Street. The entrance drive is located approximately 900 feet from the nearest driveway with a line-of-site exceeding the required 500 feet in each direction. The entrance drive will have a security gate that will control access into and out of the facility. This gate is anticipated to remain open during normal business hours. A security camera will be placed at the entrance gate so plant staff can monitor access. A gravel pull off will be located outside of the entrance gate so vehicles may turn around should they attempt to enter the facility after hours. There will also be controlled access via a card access system at the gate for operators or contractors. The gate can also be opened remotely by operators to let visitors enter the facility should the gate be closed. Provisions will be made at the entrance gate to allow emergency vehicle access at all times. The entrance drive will circulate traffic directly past the facility's Administration Building where visitor and employee parking will be located.

After passing the Administration Building, the entrance drive will split into a "loop road" that will circulate traffic around the facility in an oval orientation. The entrance drive and loop road will be a 24' wide, 7" thick portland cement concrete road designed to be able to circulate tanker trucks and emergency vehicles. The road will have a maximum grade of 5% to allow adequate circulation of the design vehicles. A speed limit of 15 mph will be posted before the loop road for the protection of pedestrians and vehicles. The entrance and loop road will serve as emergency and fire access to all site structures. The design has been reviewed for compliance with the International Fire Code by the City of Nevada's Fire chief. See **Figure 3** on the following page for the site paving plan.

The proposed WWTF is not anticipated to increase traffic greatly along 270th Street. See **Appendix C** for projected traffic volumes of the proposed WWTF.

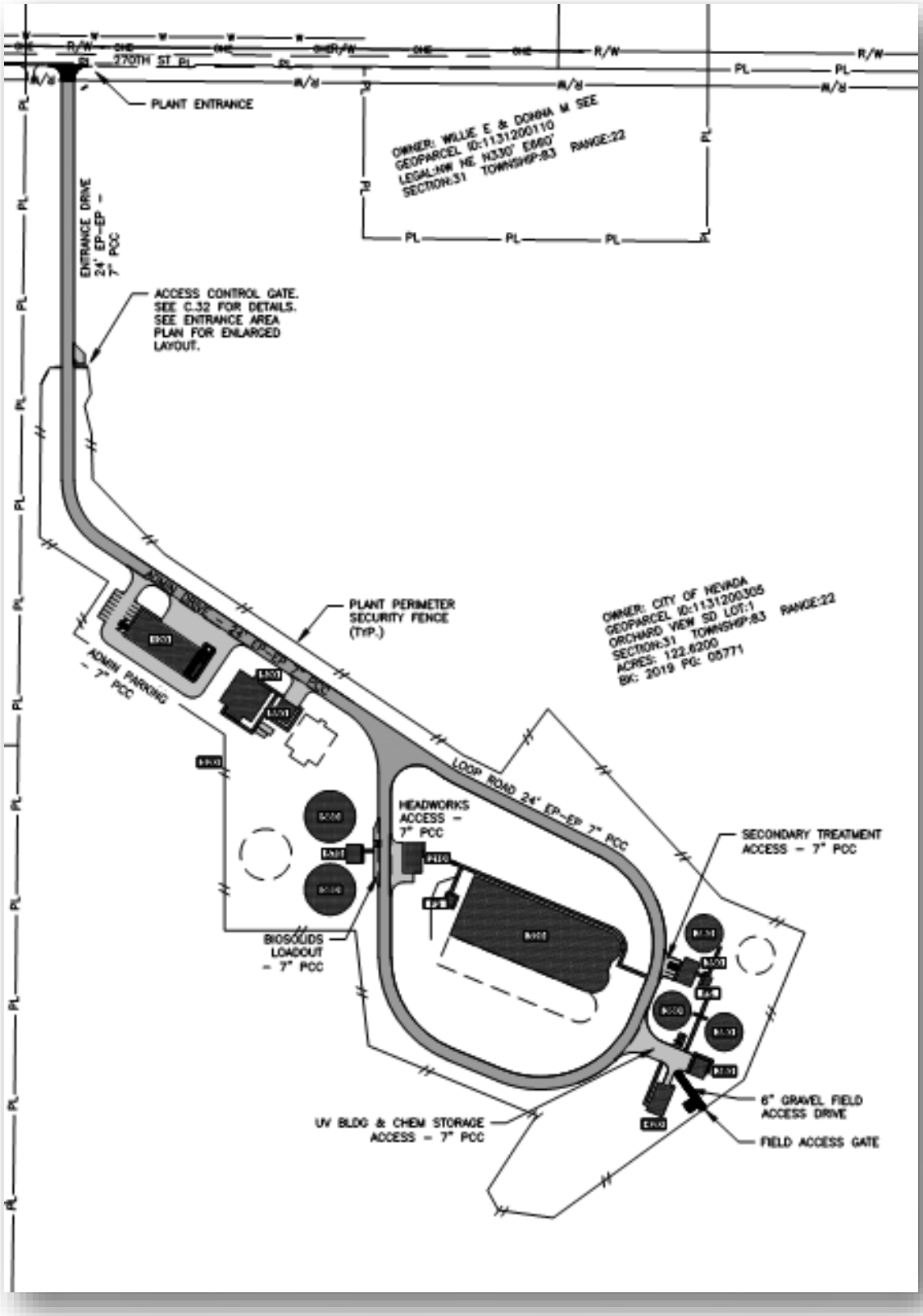


Figure 3: Site Paving Plan

2.4. Parking and Loading

A single designated parking lot will be provided at the Administration Building for employee, visitor, and accessible parking. At minimum one (1) van accessible parking space will be provided in accordance with American Disabilities Act regulations. At minimum, an additional ten (10) parking spaces will be provided for visitor and employee parking. There is no parking ratio designation for wastewater treatment facilities in Story County's Code of Ordinances, so it was assumed "Manufacturing Plants" to be a reasonable and similar designation. Manufacturing plants require one (1) parking space for every three (3) employees on the largest working shift. The proposed WWTF is anticipated to have four (4) employees on site during the largest shifts. The proposed ten (10) parking spaces should be more than sufficient based on this criterion.

Each remaining building will have a driveway for employee, contractor, or delivery access. These driveways will also serve as access for emergency and fire vehicles. These site buildings are only intended for employee, contractor, and delivery use and thus the driveways will not be designated as parking lots.

Per Story County regulations, a minimum of three (3) trees will be planted at the Administration Building parking lot to comply with the requirement of one (1) tree planted for every ten (10) parking spaces. These trees will be planted along the west side of the parking lot and will also serve as a screening barrier.

The total impervious area on site is approximately 3.4 acres. According to Story County Regulations an equivalent to 20-percent of a site's impervious surface must be planted as landscaped area. As previously stated, all disturbed areas of the site outside of the wastewater treatment facility will be restored to native vegetation. This area will account for greater than 20-percent of the sites impervious surfaces as landscaped area.

2.5. Signs and Lighting

A single landscaped monument sign will be located at the plant entrance to display the site as the City of Nevada's Wastewater Treatment Facility. The proposed sign's surface area will equal 32 square feet to meet the A-1 Zoning limitation. The sign will be lit by a single ground mounted flood light directed at the monument sign to provide visual aid to employees and visitors. See drawing C.33 of the "Phase 2" construction documents for a detail of the proposed sign.

Site lighting will comply with all requirements of Section 88.09 of Story County's Code of Ordinances. A single light pole will be located beside the plant entrance drive, just inside of the property line, to light the plant entrance off 270th Street. Site lighting poles will be placed along the plant's entrance drive from the security gate up to the Administration Building to provide safe access for employees. Site lighting poles will also be placed in the parking area west of the Administration Building, the access drive north of the UV Building, and at the south plant entrance gate. The three clarifier tanks and two biosolids storage tanks will have light poles mounted on top of them. Each building will also have building mounted exterior security lights. See **Figure 4** on the following page for the overall site lighting and power plan. Additional drawings are provided in the "Phase 2" construction documents.

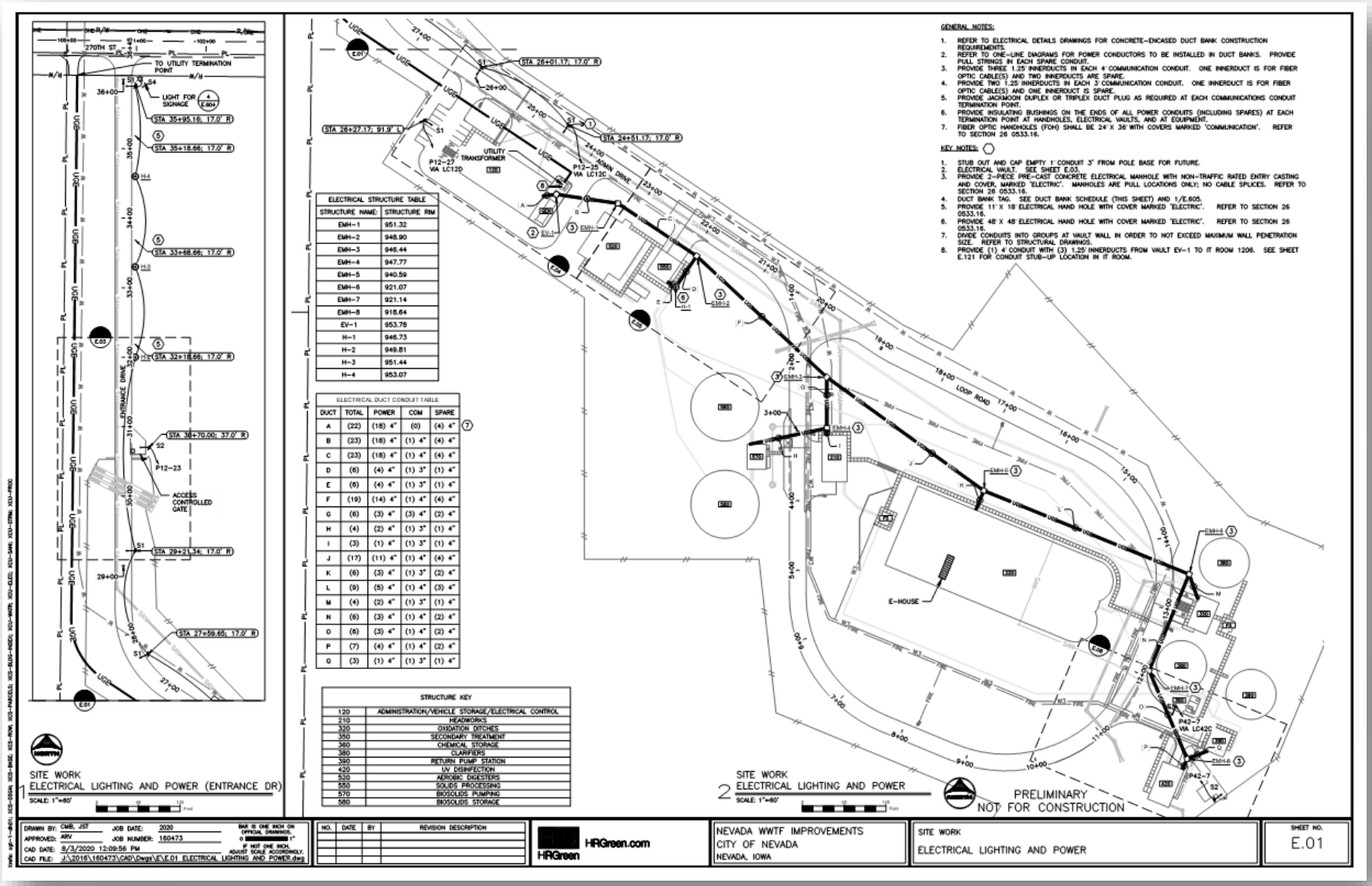


Figure 4: Site Lighting Plan

2.6. Environmental Protection

The proposed WWTF is designed and operated in such a manner that environmental and visual resources will be safeguarded. The treatment facility will be located on property that is currently being farmed as row-crops. As such, there will be little to no environmental impact due to the construction of the WWTF. The disturbed site area that will not be part of the WWTF will be restored to natural vegetation. The WWTF design will also include storm water management practices to prevent erosion to the site and surrounding water bodies in compliance with Story County regulations. Further information regarding the storm water management and erosion control plans will be provided in the "Permitting and Development Compliance" section of this report. A wetland delineation of the site has been performed and found that no wetlands will be impacted for construction of this project. Story County's Code of Ordinances also requires that no more than 15-percent of the sites naturally occurring resources may be removed. See **Figure 5** for a map of the site plan and the site's naturally occurring resources, floodplain, and wetlands. Less than 15-percent of the site's naturally occurring resources will be impacted by the construction of the facility. Refer to **Appendix D** for the wetland delineation report.

The proposed WWTF will also follow all IDNR regulations and comply with all State and Federal guidelines regarding wastewater treatment and discharge. As previously mentioned, the Facility Plan for the WWTF has been reviewed and approved by the Iowa DNR. An Antidegradation Analysis has also been submitted and approved for the facility. The Waste Load Allocation (WLA) provides water quality-based permit limitations for the discharge of the treated wastewater into West Indian Creek. The proposed WWTF will have to comply with all discharge limitations as detailed in the WLA and subsequent discharge permit. The existing WWTF currently discharges into West Indian Creek. The proposed WWTF will provide a benefit to the environment as it will provide a higher level of treatment than what the existing facility provides and discharge several miles downstream of the current facility which will result in less total impacted stream length to West Indian Creek. The WLA is provided in **Appendix E**.

The proposed WWTF will not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution, or other undesirable or nuisance conditions.

The WWTF's largest noise contributors will be equipment used for the wastewater treatment processes (i.e. aeration blowers, standby emergency generator, and pumps). The site's aeration blowers and standby emergency generator will be in noise attenuating enclosures that will be required to keep noise below specified thresholds. All pumps will be located within site buildings and structures that will contain/mitigate noise. Other exterior located equipment, equipment motors, and typical facility operations will not generate excessive noise. In general, the site will not generate any noise more than what would be expected in a typical A-1 Agricultural zone.

The facility will not generate any vibration, dust, or smoke except during construction activities. Construction activities will obtain all necessary permits as required at local, state, and federal levels.

As previously stated, the WWTF will follow all Story County regulations regarding site lighting. As such, the site will not create an excessive amount of glare.

The site's piping, tanks, and structures are designed according to applicable codes and standards. All wastewater will be contained throughout the treatment process and will not result in any impact to existing groundwater. As previously stated, the treated effluent to be discharged into West Indian Creek will meet all discharge limitations and will provide an increased level of treatment as compared to the existing wastewater treatment facility. On-site chemicals are stored inside an enclosed building with containment areas each providing 110-percent of the stored chemical volume. There will be two (2) chemicals stored in bulk on-site for the treatment of the wastewater as necessary. Both chemicals, ferric chloride and a carbon supplement (Micro-C), are non-hazardous. These chemicals should not pose any risk to the existing groundwater.

As with any wastewater treatment facility, there will be odor on the facility site. This odor has been mitigated during the design by choosing methods and processes that are known to reduce odor or produce less odor.

The largest odor producing process in wastewater treatment is from the treatment of the raw sewage. The raw sewage in the proposed WWTF will be treated through screening and grit removal in the Headworks building. Screening is the process of removing inorganic material from the wastewater such as rags, paper, plastic, metals, and other debris. Grit removal is the process of removing finer, largely inorganic, particles from the wastewater. The removed grit material will have a similar consistency to sand. The grit removal and screening will occur within the enclosed headworks building to contain the odor of the raw wastewater influent. The screened waste will be washed to remove organics and also help reduce odor while it is stored. It will be stored in dumpsters within the headworks building until disposal. The grit will also be washed to remove organics and reduce odor. The grit will be conveyed and stored on a covered pad outside of the headworks building. As the grit is inorganic and washed, it will be relatively odorless.

The screened raw wastewater will then be treated for organic and nutrient removal through an extended aeration process using a dual Oxidation Ditch layout. This process involves aerating and mixing the wastewater to allow microorganisms to remove organics and nutrients from the wastewater. The aerated treatment process minimizes odors while treating wastewater. The process is designed to have adequate detention times for constituent removal without allowing for the formation of odor-causing compounds (e.g. hydrogen sulfide) due to excessive detention time in the process.

Once the wastewater has been treated for nutrient and organic removal, the remaining solids are settled out as "sludge" in clarifiers before the treated wastewater is sent to the UV building for disinfection. These last two processes are known to be odorless as the organic material has been removed. The "sludge" that was settled in the clarifiers is typically treated through anaerobic or aerobic digestion. This facility will use aerobic digesters for the treatment of the waste sludge. Aerobic digestion is completed in an environment that limits the formation of odor-causing compounds. As such, the process is relatively odorless.

Additionally, the aerobic digestion process will incorporate covers over the tanks which will provide a secondary benefit of containing the minimal amount of odors produced during digestion. Once the sludge has been treated, the stabilized liquid material it is stored in large tanks and eventually applied to farm fields as a liquid fertilizer.

With the use of design considerations as described above, this WWTF will not produce excessive odor. The facility will not generate odor more than what would be expected of the current site or surrounding sites as an Agricultural use.

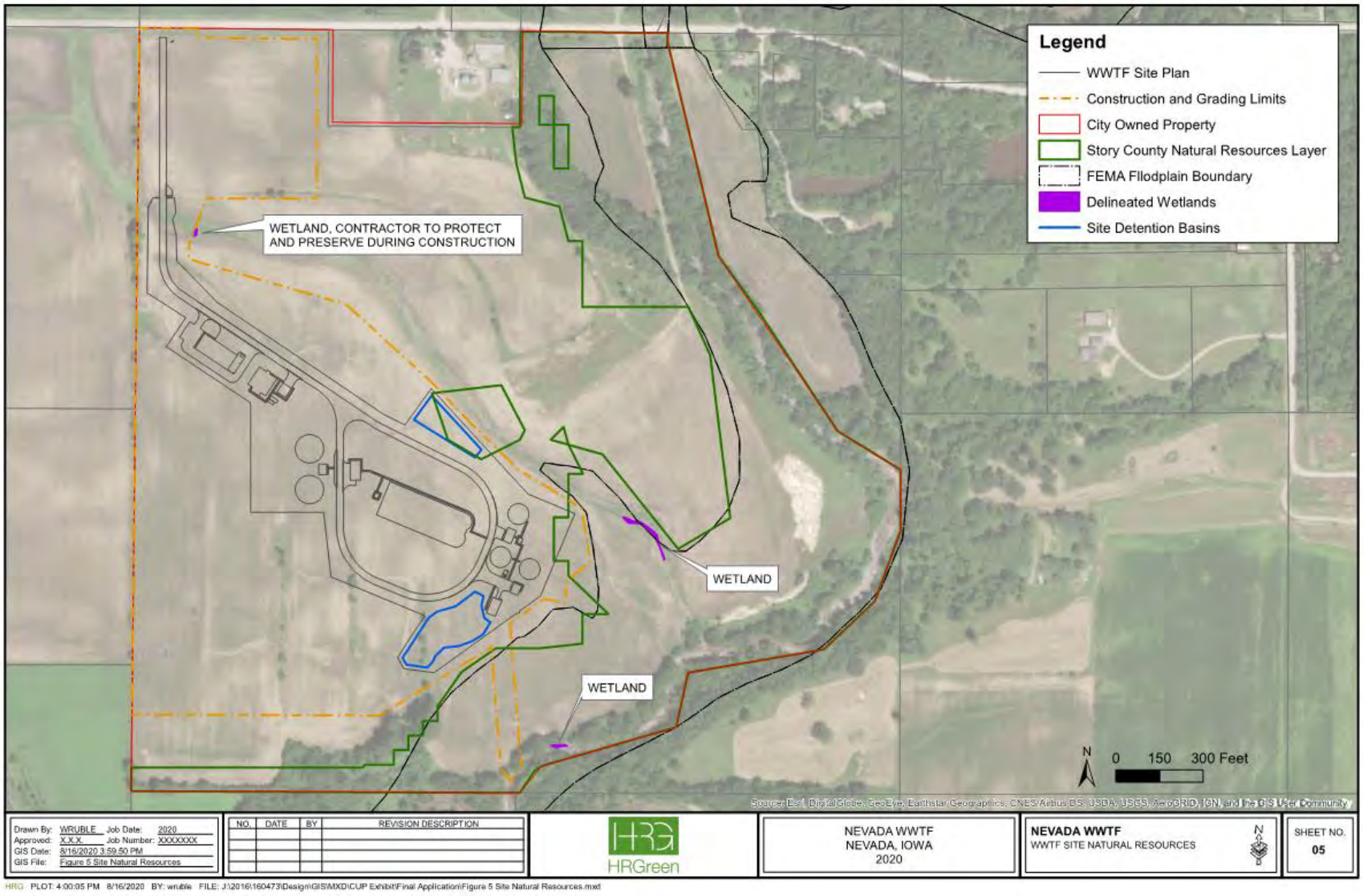


Figure 5: Site Natural Resources

3. PERMITTING AND DEVELOPMENT COMPLIANCE

3.1. Joint Application and Environmental Review

As this project will be SRF funded, it is undergoing an Environmental Review through the IDNR. This review includes a site survey, archeological survey, preparation of an Environmental Information Document (EID), and a public hearing to receive a "Finding of No significant Impact" certification for the proposed site. Currently, the environmental review has provided a preliminary approval from the site survey and completed the archeological survey. These documents can be found in **Appendix F**.

The project will also be performing construction activities within West Indian Creek's floodplain to construct the sites effluent outfall sewer into West Indian Creek. As such, a joint application has been submitted which will require approval from the IDNR Floodplain and Sovereign Lands divisions and the US Army Corps of Engineers. This application was submitted on August 14, 2020 and is currently under review.

3.2. Story County Floodplain Permit

Due to the construction of the effluent outfall sewer within the floodplain of West Indian Creek, a Story County Floodplain Development Permit will be required. The effluent outfall sewer consists of the construction of a 30-inch sewer to discharge treated plant effluent into West Indian Creek. A portion of the 30-inch sewer and the outfall structure will be located within the floodplain. The effluent sewer will be constructed of reinforced concrete pipe to combat uplift forces due to buoyancy during flooding events and combat external pressures due to soil movement due from thermal expansion and contraction. The outfall structure will consist of a concrete flared end section and a rip rap apron to dissipate the effluent flow energy prior to discharge into West Indian Creek. Rip Rap protection will be placed along West Indian Creek's bank upstream and downstream of the outfall. Vegetation such as potted plugs and live stakes may also be utilized to stabilize the bank and reduce energy from the sewer outfall. See Phase 1 construction documents for a plan and profile of the proposed outfall and details.

The floodplain permit will be submitted after acceptance of the conditional use permit. Only activity associated with installation of the effluent outfall pipe will occur within the floodplain.

3.3. Stormwater Management and Erosion Control

The proposed WWTF will follow all Story County regulations regarding stormwater management and Erosion Control.

As the proposed WWTF site will disturb greater than one (1) acre of land, a stormwater NPDES permit will be required. The required Stormwater Pollution Prevention Plan will be prepared for and signed by HR Green as part of the construction documents. Stormwater management will be the construction contractors' responsibility during each phase of construction. Each contractor will be responsible to uphold the NPDES permit and stormwater pollution prevention plan. Preliminary erosion control site plans can be found in the construction

documents. A preliminary copy of the stormwater pollution prevention plan can be provided upon request.

The WWTF will follow all drainage and discharge requirements as required under Story County's Code of Ordinances Chapter 88. A stormwater management plan will be developed per these requirements as the facility will disturb one (1) or more acres of land. A draft of the sites storm water management plan is provided in **Appendix G.**

3.4. Construction Permits

All applicable permits for construction including Iowa DNR Schedules A, F, and G will be completed and submitted with final documents to Iowa DNR prior to any construction activities taking place on site.

3.5. Fire Protection

The proposed WWTF will meet all requirements of the International Fire Code (IFC) as determined to be applicable by the City of Nevada Fire Chief who will serve as the site's Authority Having Jurisdiction (AHJ). The site will utilize plant effluent water to provide fire protection water throughout the site. Hydrants are spaced throughout the site meeting requirements of the International Fire Code. The Administration Building and Chemical Storage Building require sprinkler protection according to guidelines from the IFC and National Fire Protection Agency (NFPA). The AHJ has determined the Chemical Storage Building will not require sprinkler protection as it does not house any hazardous chemicals and has written a variance. See **Appendix H** for the approval letter and variance from the AHJ regarding the site fire protection system.

4. CONSTRUCTION PHASING

4.1. Schedule and Programmatic Agreement

Design and construction of the WWTF and Trunk Sewer will be divided into several construction phases due to the large scale of the construction project. The City, Iowa DNR, and HR Green are developing a Programmatic Agreement (PA) for the project permitting and construction. The PA will lay out a phased construction schedule for construction of the WWTF and conveyance system (lift station, force main, & trunk sewer) between the existing and proposed WWTFs. This PA is necessary to provide compliance with regulatory requirements for environmental reviews and issuance of clearances (FONSI) to allow for construction of the improvements. The use of a PA will facilitate an accelerated construction schedule and completion of the proposed improvements. The draft PA schedule for proposed improvements is given below:

Phase	Title	Description of Work Included	Begin Construction	Complete Construction
1	Wastewater Treatment Facility (WWTF) Site Grading	• Earthwork (cut/fill) for changing site topography for subsequent construction of WWTF infrastructure (tanks, buildings, etc.) • Construction of site access driveway from 270th Street to south of existing drainage ditch, including installation of stormwater culverts under the site access driveway • Construction of influent trunk sewer pipe and manholes within the WWTF site boundaries • Construction of effluent outfall sewer pipe and manhole	November 2020	March 2020
2	WWTF Improvements	• Construction of WWTF treatment structures and buildings, yard piping, site utilities (potable water, non-potable water, electric, natural gas, communications); final site grading; landscaping; paving of access driveways and parking areas	July 2021	November 2023
3	Trunk Sewer and Main Lift Station	• Construction of main influent sewage lift station at the existing WWTF site • Construction of main influent sewer lift station force main from lift station to start of trunk sewer • Construction of 24-inch/30-inch diameter sanitary sewer gravity interceptor piping and related manholes to the WWTF site	January 2022	November 2023

4.2. Phase 1 & 2 WWTF Construction

The WWTF construction is proposed to be completed in two phases: (1) Site Grading Phase and (2) A WWTF Construction Phase. The purpose of the separate construction contracts of the WWTF is to accelerate the construction timeline, limit sub-contractor coordination, and encourage a more competitive bidding environment for resident bidders.

Phase 1 and 2 is covered under one environmental review effort. Related permitting and clearances will cover Phase 1 and 2 activities. Separate Iowa DNR Construction Permits will be obtained for Phase 1 and 2 construction. All required permits will be obtained prior to giving notice to proceed on construction activities.

4.2.1. Phase 1: Grading Phase

Site grading is planned to begin this fall (2020) once all permitting requirements are approved. The grading phase of the project will include rough site grading to balance the site's cut and fill, construction of the entrance drive's triple 54 inch drainage culvert, construction of the influent trunk sewer located on the City of Nevada's property, and construction of the effluent outfall sewer.

Bidding this work as a separate contract will allow the City to accelerate project construction versus waiting to begin this work in Spring 2021.

4.2.2. Phase 2: WWTF Construction Phase

The construction of the remaining portion of the WWTF will take place under the Phase 2 contract. This contract is expected to be awarded in Spring of 2020 and commence immediately following the completion of the Phase 1 grading contract.

With the rough site grading completed over the previous fall construction can begin in Spring 2021.

4.3. Trunk Sewer Construction

Final design and construction of the trunk sewer will take place following the completion of the Phase 2 WWTF design for the following reasons:

1) The Iowa DNR environmental review of the trunk sewer will take additional time that would delay project construction if included as part of the WWTF construction contract.
2) Complete design and construction of the trunk sewer will take less time than the construction of the WWTF.

The Iowa DNR has given verbal approval for this methodology through the PA.

Preliminary alignments of the proposed trunk sewer are provided with this application. The trunk sewer contract will consist of the construction of a new lift station at the existing WWTF to convey flows via a force main up to the intersection of SW 3rd Street and Maple Avenue. The force main will follow the south side of U.S. Highway 30 and the east right-of-way of SW 3rd Street before discharging to a receiving manhole and flowing by gravity the remainder of the

way to the proposed WWTF. The Gravity sewer will follow the right-of-way of SW 3rd Street/County Road S14 the majority of the way to the new WWTF. The sewer will cross County Road S14 with trenchless construction as needed to avoid utilities. The final segment of the sewer will be constructed within easements on private property (existing farmland) to avoid deep bury conditions at the intersection of County Road S14 and 270th Street. The sewer will cross 270th Street with trenched construction if allowable and tie into the influent trunk sewer to be constructed during the Phase 1 construction contract.

Work related to temporary and permanent easement acquisition is planned for Spring of 2021. The trunk sewer design will be completed and bid for construction Fall of 2021. This will allow adequate time for construction of the trunk sewer to be completed prior to the completion of the of WWTF construction contract.

5. PROJECT BENEFITS

Construction of the new WWTF will have multiple benefits to the surrounding community including:

1) Improves opportunity for redevelopment of existing WWTF site
2) Higher level of wastewater treatment
3) Increased capacity for planned industrial growth
4) Capacity for projected 20-year residential and industrial growth
5) Sufficient expansion capability for growth beyond 20-years
6) Capability to connect future developments along County Road S14 to the Influent Trunk Sewer

With the existing wastewater treatment facility nearing the end of its design life, the expansion of a Significant Industrial User and subsequent increased loadings to the WWTF, and more stringent treatment regulations a new WWTF is a necessity for the City of Nevada. The proposed WWTF will also have the additional benefits that will serve the surrounding community for many years to come.

A. Appendix A – 1,000 ft Site Separtion Property Owner Certification

PURCHASE AGREEMENT FOR REAL ESTATE

This Purchase Agreement for Real Estate ("Agreement") is entered into on this 23rd day of January, 2017, between **Willie E. See** and Donna M. See ("Seller"), and **City of Nevada, Iowa** ("Purchaser"). Seller and Purchaser shall be collectively referred to herein as (the "Parties"). In consideration of the mutual covenants set forth in this Agreement and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Seller and Purchaser agree as follows:

1. **PROPERTY**
   Purchaser agrees to purchase from the Seller and the Seller agrees to sell to Purchaser the following described real property:

   See Exhibit B

   which property, in the aggregate, contain approximately 123.50 acres of real estate, which is further depicted on Exhibit A attached hereto and legally described in Exhibit B attached hereto (the "Property").

2. **PURCHASE PRICE.** The Purchaser agrees to purchase the Property for the purchase price of $7,500.00 per acre, for the total purchase price of $926,250.00 (the "Purchase Price.") The Purchaser shall pay the full amount of the Purchase Price on the date of Closing.

3. **EVIDENCE OF TITLE**
   Within ten (10) days after the execution of this Agreement, Seller shall deliver to Purchaser the abstract of title to the Property. The Purchaser agrees to pay for the costs associated with the updating the abstract. The abstract shall show merchantable title in Seller in conformity with this Agreement, Iowa Law, and Title Standards of the Iowa State Bar Association. The abstract shall become the Property of Purchaser when the Purchase Price is paid in full.

4. **CONVEYANCE OF TITLE**
   Upon payment by Purchaser of the Purchase Price for the Property, Seller shall convey the Property to Purchaser by a Warranty Deed subject to easements and restrictions of record.

5. **CONDITIONAL USE PERMIT, POSSESSION AND CLOSING**
   The Purchaser's obligation to purchase the Property shall be contingent on (i) the Plat of Survey being successfully recorded and (ii) the Purchaser, with the assistance of Seller, obtaining a conditional use permit ("CUP") for the intended use. To that end, upon execution of this Agreement, the Purchaser shall prepare the requisite conditional use application, which application shall be executed by the Seller. The Purchaser shall then submit the application for review of the Story County Planning and Zoning Commission and Board of Adjustment.

   After receipt of the CUP, Seller shall deliver possession of the Property to Purchaser concurrently with the closing of this transaction, which shall be held on or before thirty (30) days after the approval of the CUP ("Closing"). At Closing, Purchaser shall deliver the Purchase Price to the Seller.

6. **PRORATIONS AND ADJUSTMENTS**
   The following items shall be prorated at closing as of the date of delivery of possession:

   N/A: Purchaser agrees to cover all prorations and adjustments.

7. **TAXES AND SPECIAL ASSESSMENTS**

Seller shall pay all real estate taxes that are liens for prior years, and the Purchaser shall pay for all prorated real estate or ad valorem taxes for the current tax fiscal year which may not be due and payable until after Closing. All subsequent real estate or ad valorem taxes shall be paid by Purchaser.

Seller shall pay in full all special assessments, which are certified as liens on the subject Property as of the date of closing. All other special assessments shall be paid by Purchaser.

8. CONDITION OF PROPERTY

The parties agree that the Purchase Price reflects the condition of the Property and Purchaser acknowledges that the real estate and improvements thereof have been inspected, and Purchaser is acquainted with the condition thereof and accepts the same in:

"As Is" condition except Seller warrants that the following items will be completed prior to Closing:

1. N/A

9. ENVIRONMENTAL

Purchaser, at its cost, shall have the right to perform environmental testing which must be completed prior to Closing.

10. SURVEY

Purchaser may obtain a current survey of the Property prepared, at Purchaser's expense, by a duly licensed land surveyor conforming to customary local certification requirements ("Purchaser's Survey"). If Purchaser's Survey shows any matters adversely affecting title, such matters shall be deemed a title defect.

11. FARMING OF PROPERTY

The Parties agree that, as part of the consideration for the sale of the Property, the Seller or their designee shall be allowed to farm the Property, with no rental cost assessed to the Seller, until such time as the Purchaser provides notice of termination. It is acknowledged that the farming lease will not exceed a period of five (5) years, unless such time is renegotiated between the Parties. In the event of termination, the Purchaser shall provide notice of termination in accordance with Iowa Code §562.7, on or before September 1st of the relevant year prior to the beginning of any construction.

All crop production expenses and expenses for fence and building repairs shall be responsibility of the Seller. In farming the Property, the Seller agrees to take no actions that might cause a mechanic's lien or other lien to be imposed upon the Property. The Seller further agrees to farm the Property in an efficient and steward-like manner, control weeds and brush in the fields, fence rows, and road ditches, provide proper maintenance to control erosion and maintain terraces, waterways and tiles on the Property.

In the event Seller elects to farm the Property, the Purchaser shall be allowed the right to enter the premises at any time for any reasonable purpose.

12. DISTANCE WAIVER

The Parties acknowledge that the Seller will continue to own an inhabitable single-family residence on a parcel adjacent to the Property. Furthermore, the Parties understand that the Purchaser's proposed improvements on the Property will include construction of a wastewater treatment system, which will be nearer than 1,000 feet to said single family residence. The Seller hereby agrees to execute a Distance Waiver, in substantially the same form as Exhibit C, attached hereto, which document shall be filed with the Story County Recorder. Seller further agrees that any future sale of the parcel containing the single-family residence shall be subject to and conditioned upon any purchaser executing a subsequent Distance Waiver as needed.

13. RIGHT OF FIRST REFUSAL

The Parties hereby agree that the Purchaser shall have the right of first refusal to purchase the parcel of land containing Seller's homestead, which is locally known as _____ (the "Homestead"). Thus, before Seller may sell the Homestead to a third party, Seller shall first offer the Homestead to Purchaser on the

same terms and conditions as are offered by the third party. Purchaser shall have 30 days during which to accept said offer. If Purchaser does not accept said offer within said period, Seller shall be free to accept the third-party offer. If Seller does not enter into an agreement with the third party on said terms and conditions and close the transaction within 90 days, Seller's right to sell the Homestead to the third party shall expire and the procedure described in this section shall again be applicable.

14. DEFAULT

If Purchaser fails to make any payment or to perform any obligation imposed upon Purchaser by this Agreement, Seller may serve written notice of default upon Purchaser and if such specified default is not corrected within ten (10) days thereafter, Seller, subject to the terms of any listing agreement, may accept the Earnest Money as damages or may pursue any available legal remedy including specific performance.

In the event Seller fails to perform any obligation imposed upon Seller by this Agreement, Purchaser may serve written notice of default upon Seller and if such default is not corrected within ten (10) days thereafter, Earnest Money shall be refunded to Purchaser without prejudicing the Purchaser's right to any available legal remedy including specific performance.

In the event of default, the defaulting party shall be liable to the other party for reasonable attorney fees, expenses incurred by reason of default, and the real estate brokerage fee.

15. CASUALTY CLAUSE

Seller shall bear the risk of loss and damage to the Property prior to closing or possession, whichever first occurs. In the event all or a material part of the Property is damaged or destroyed prior to closing or possession, whichever first occurs, this contract shall terminate and be of no further force and effect, unless the Property can be restored to its present condition on or before the closing date. Purchaser shall be responsible for insurance coverage upon taking title to or possession of the subject Property, whichever occurs first.

16. EXPENSES OF TRANSFER

A. Purchaser shall pay:

(1) Abstracting fees to update abstract.
(2) Recording fee for deed and mortgage
(3) Transfer tax.
(4) Cost of any Survey.

Each Party shall be responsible to pay its own legal fees and costs incurred in connection with the transaction.

17. REPRESENTATIONS OF SELLER – HAZARDOUS WASTE

Seller hereby represents to Purchaser that, to the best of Seller's knowledge, the subject Property is not contaminated with, nor threatened with contamination from outside sources by, any chemical, material or substance to which exposure is prohibited, limited or regulated by any federal, state, county, local or regional authority or which is known to pose a hazard to health and safety and that Seller has not used the subject Property as a landfill or dumpsite, or for storage of hazardous substances, or has not otherwise done anything to contaminate the subject Property with hazardous wastes or substances. Seller warrants that the subject Property is not subject to any local, state or federal judicial or administrative action, investigation or order, as the case may be, regarding wells or underground storage tanks, solid waste disposal sites, or hazardous wastes or substances.

At Purchaser's cost, Purchaser shall be permitted to conduct any environmental tests it deems necessary for the purpose of discovering the existence of any hazardous waste or substances. Should such environmental testing reveal the presence of any hazardous wastes or substances, Purchaser may, at its option, terminate this Agreement and any Earnest Money paid shall be returned to Purchaser. Purchaser agrees, at its cost and without undue delay, to restore the subject Property to its original condition should it proceed with the environmental testing contemplated herein.

18. LEASES

As of the date of this Agreement, the subject Property is subject to the following leases: None.

19. NOTICES

All notices required hereunder shall be in writing and shall be served upon the parties at the addresses designated herein by personal service, certified mail (return receipt requested), or Federal Express or other overnight mail.

Seller:
Willie E. See
Willie E See

Purchaser:
City of Nevada
c/o City Administrator
1209 6th Street
Nevada, Iowa 50201

20. GENERAL CONDITIONS

This Agreement shall be binding upon the parties and their successors and assigns. Time is of the essence of this Agreement. This Agreement shall be governed by and enforced in accordance with the laws of the state in which the subject Property is located. This Agreement contains the entire agreement of the parties and no representations, warranties, or agreements have been made by either party as set forth herein. No modification, waiver, or amendment of the Agreement shall be effective unless made in writing and signed by the parties. All representations, warranties and covenants made by the parties shall survive closing. Paragraph headings are for the convenience of reference and shall not limit or affect the meaning of the Agreement.

21. OTHER PROVISIONS

(1) Seller shall provide Purchaser any documents and/or material in Seller's possession relating to the value, use, soil condition, environmental quality, survey, special assessments, zoning, association documents or proposed condemnation and all leases affecting the Property, if any.

22. LEGAL ASSISTANCE

The Seller and Purchaser are aware that when fully executed, this is a legally binding agreement for the sale and purchase of real estate and that in order to protect their respective interests, Seller and Purchaser are advised to consult legal counsel before this Agreement is signed.

23. ACCEPTANCE BY SELLER

Until accepted by Seller, this document constitutes an offer by Purchaser on the terms stated above. This Agreement must be accepted by Seller in writing on or before **Monday, January 23, 2017** by no later than **5:00 p.m. CDT.** If not so accepted, the Offer shall be void.

24. CONFIDENTIALITY

The Parties agree that the terms of this Agreement are confidential and shall not be released to or shared with any other third party, whether verbally or in writing, without the prior written approval of all Parties (other than the Parties' attorneys, consultants, lenders and advisors who shall also be subject to confidentiality). No Party shall make any public announcement or carry out any publicity whatsoever in connection with this Agreement unless mutually agreed in writing. This confidentiality requirement shall survive termination of this Agreement in the event it is terminated by either Party and also survive the Closing of the transaction described in this Agreement except as to those matters which will appear of public record after the filing of the Warranty Deed for the Property by Purchaser.

Seller hereby accepts the foregoing offer this 23 **day of** Jan, **2017.**

SIGNATURE PAGE:

PURCHASER:

City of Nevada, Iowa

By: Lynn Hathrop

Its: Mayor

SELLER:

Willie E. See

By: Willie E See

Donna M. See

By: Donna M. See

EXHIBIT A

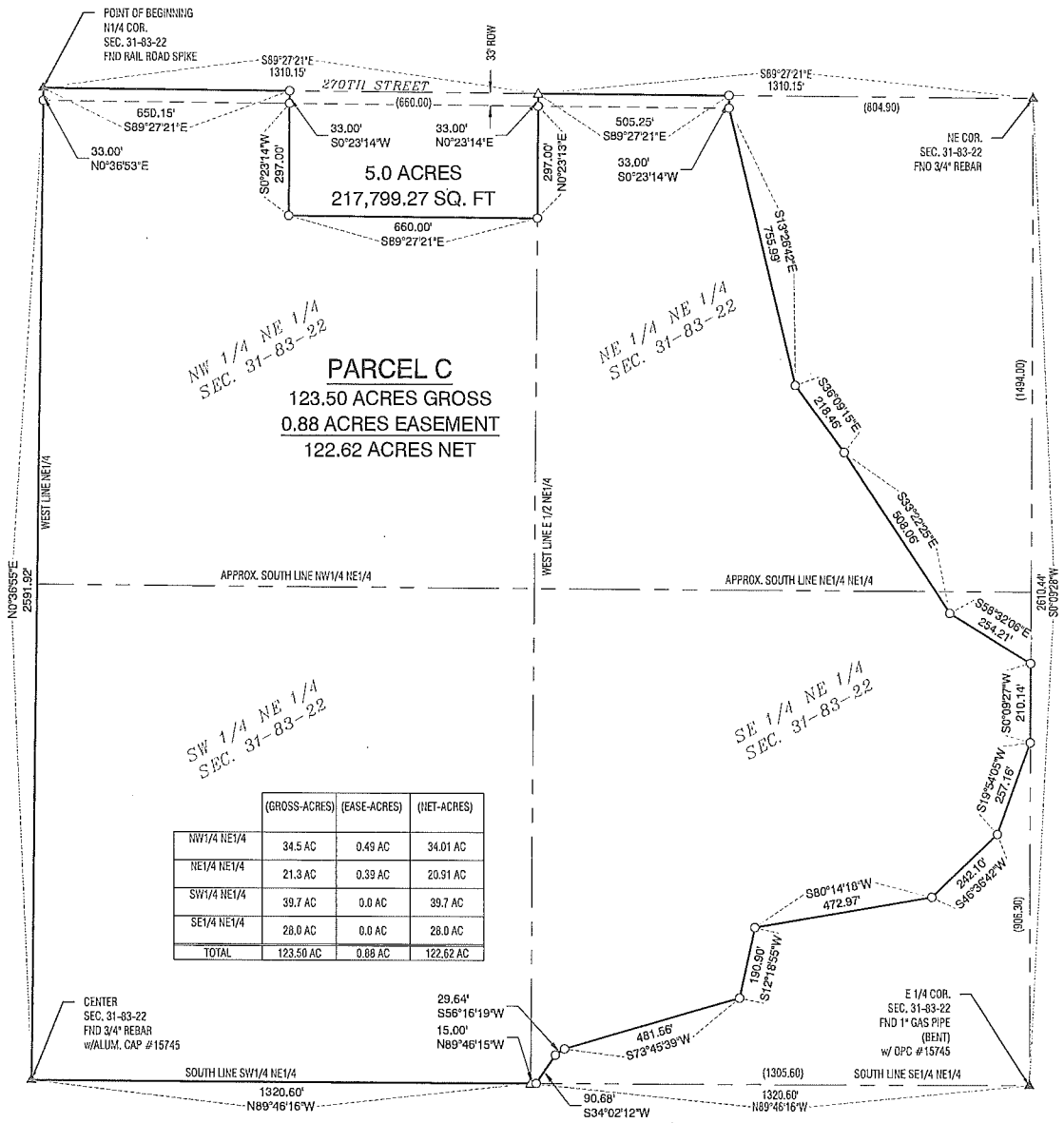
[INSERT ENGINEERING RENDERING OF PROPERTY]

EXHIBIT B

[INSERT LEGAL DESCRIPTION]

PLAT OF SURVEY

INDEX LEGEND	
LOCATION:	NE 1/4 SEC. 31, T83N, R22W ,5TH PM NEVADA TWP., STORY COUNTY, IOWA
PROPRIETOR:	WILLIE E & DONNA M SEE
SURVEY REQUESTED BY:	WILLIE E & DONNA M SEE
FIELD WORK COMPLETED:	12/29/2016
SURVEY PREPARED BY: RESPOND TO:	CLAPSADDLE-GARBER ASSOCIATES, INC, 16 EAST MAIN STREET, P.O. BOX 754, MARSHALLTOWN, IOWA 50158 PHONE 641-752-6701 TSTEWART@CGACONSULTANTS.COM



	(GROSS-ACRES)	(EASE-ACRES)	(NET-ACRES)
NW1/4 NE1/4	34.5 AC	0.49 AC	34.01 AC
NE1/4 NE1/4	21.3 AC	0.39 AC	20.91 AC
SW1/4 NE1/4	39.7 AC	0.0 AC	39.7 AC
SE1/4 NE1/4	28.0 AC	0.0 AC	28.0 AC
TOTAL	123.50 AC	0.88 AC	122.62 AC

PARCEL 'C' LEGAL DESCRIPTION:

A PARCEL OF GROUND LOCATED IN NORTHEAST ¼ OF SECTION 31, TOWNSHIP 83 NORTH, RANGE 22 WEST OF THE 5TH P.M., NEVADA TOWNSHIP, STORY COUNTY, IOWA. MORE PARTICULARLY DESCRIBED AS THE FOLLOWING: COMMENCING AND BEGINNING AT THE NORTH ¼ CORNER OF SECTION 31, TOWNSHIP 83 NORTH, RANGE 22 WEST OF THE 5TH P.M.; THENCE S89°27'21"E, 650.15 FEET ALONG THE NORTH LINE OF SAID SECTION 31; THENCE S0°23'14"W, 33.00 FEET; S0°23'14"W, 297.00 FEET; THENCE S 89°27'21" E, 660.00 FEET; THENCE N 0°23'13" E, 297.00 FEET; THENCE N 0°23'14" E; 33.00 FEET, THENCE S 89°27'21" E, 505.25 FEET ALONG THE NORTH LINE OF SAID SECTION 31; THENCE S 0°23'14" W, 33.00 FEET, THENCE S 13°26'42" E, 765.99 FEET; THENCE S 36°09'15" E, 218.46 FEET; THENCE S 33°22'25" E, 508.06 FEET; THENCE S 58°32'06" E, 254.21 FEET TO A POINT ON THE EAST LINE OF SAID SECTION 31; THENCE S 0°09'14" W, 210.14 FEET ALONG THE EAST LINE OF SAID SECTION 31; THENCE S 19°54'05" W, 257.16 FEET; THENCE S 46°36'42" W, 242.10 FEET; THENCE S 80°14'18" W, 472.97 FEET; THENCE S 12°18'55" W, 190.90 FEET; THENCE S 73°45'39" W, 481.56 FEET; THENCE S 56°16'19" W, 29.64 FEET; THENCE S 34°02'12" W, 90.68 FEET TO THE SOUTH LINE OF THE NE ¼ OF SAID SECTION 31; THENCE N 89°46'15" W, 15.00 FEET ALONG SAID SOUTH LINE OF THE NE ¼, THENCE N 89°46'16" W, 1320.86 FEET ALONG SAID SOUTH LINE OF THE NE ¼ TO THE CENTER OF SAID SECTION 31, THENCE N 0°36'55" E, 2591.92 FEET ALONG THE WEST LINE OF THE NE ¼ OF SAID SECTION 31, THENCE N 0°36'53" E, 33.00 FEET ALONG SAID WEST LINE OF THE NE ¼ OF SAID SECTION 31 TO THE POINT OF BEGINNING. PARCEL 'C' CONTAINS 123.5 ACRES AND IS SUBJECT TO THE EASEMENTS AND RESTRICTIONS OF RECORD.

NOTE:
ALL BEARINGS ARE THE RESULT OF G.P.S. OBSERVATIONS.

LEGEND:

- ▲ GOVERNMENT CORNER MONUMENT FOUND
- △ GOVERNMENT CORNER MONUMENT SET 1/2" x 30" REBAR w/ORANGE PLASTIC ID CAP #17162
- ⊕ PARCEL OR LOT CORNER MONUMENT FOUND
- ○ SET 1/2" x 30" REBAR w/ORANGE PLASTIC ID CAP #17162
- ( ) RECORDED AS

N

SCALE 1"=300'
0 300'

PLAT OF SURVEY

TRAVIS R. STEWART LICENSED 17162 IOWA PROFESSIONAL LAND SURVEYOR

I hereby certify that this land surveying document was prepared and the related survey work was performed by me or under my direct personal supervision and that I am a duly Licensed Professional Land Surveyor under the laws of the State of Iowa.

Travis R. Stewart, PLS date
Iowa License Number 17162
My License Renewal Date is December 31, 2017
Pages or sheets covered by this seal: THIS SHEET

CGA

Clapsaddle-Garber Associates, Inc
16 East Main Street
Marshalltown, Iowa 50158
Ph 641-752-6701
www.cgaconsultants.com

DRAWN	SHEET NO.
RWA	1
DATE	PROJECT NO.
01-04-2017	77253.05

J:\77253\dwg\Survey\77253-Plat of Survey.dwg - Plat LEGEND - 01-04-17 - 2:54pm - rw236

Prepared by and Return to: City of Nevada, 1209 6th Street, Nevada, IA 50201 (515) 382-5466

DISTANCE WAIVER

The undersigned, being the record titleholder(s) to the real property located in Story County, Iowa, locally known as 62650 270th Street, Nevada, Iowa 50201, and legally described as follows:

See Exhibit A

(hereinafter the "Property"), which Property contains either an inhabitable single family residence or commercial business, acknowledged that the City of Nevada will be constructing a wastewater treatment facility on adjoining property. Furthermore, the undersigned acknowledges that the construction of the wastewater treatment system will be nearer than 1,000 feet to said single family residence or commercial business located on the Property.

567-64.2 (3) of the Iowa Administrative Code (I.A.C.) states, "The following separation distance from treatment or lagoon water surfaces shall apply: a 1,000 feet from the nearest inhabitable residence, commercial building, or other inhabitable structure. If the inhabitable or commercial building is on the property of the owner of the proposed treatment facility, or there is written agreement with the owner of the building, the separation criteria shall not apply. Any such agreement shall be filed with the county recorder and recorded for abstract of title purposes, and a copy submitted to the Department (Iowa Department of Natural Resources)."

In consideration of the sum of one dollar ($1.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned, in signing this DISTANCE WAIVER, hereby waives their rights to the separation criteria as set forth in 567-64.2 (3), and consents to the placement of a wastewater treatment facility to be constructed by the City of Nevada on the real property legally described as:

Lot 1 of the Orchard View Subdivision, an Official Plat, in Story County, Iowa.

Property described subject to any and all easements of record.

Furthermore, the undersigned acknowledges that the City has yet to determine the exact location of the wastewater treatment facility, but understands that the constructed facility will be located entirely within the area designated as the proposed site on the aerial photograph attached hereto as "Exhibit A". It is expressly agreed and understood that the waiver and consent given herein shall be applicable to the entire designated as the proposed site on "Exhibit A", with the

exact location of the wastewater facility to be determined by the City of Nevada from within the designated proposed site.

It is further agreed by the undersigned that upon final site selection by the city of Nevada, that the City may incorporate the legal description of the real property selected for the wastewater treatment plant into this DISTANCE WAIVER and such DISTANCE WAIVER will be filed with the county recorder and a copy submitted to the Iowa Department of Natural Resources. All costs associated with conveying and recording this DISTANCE WAIVER shall be paid by the City of Nevada.

Willie C See
Property Owner

Donna M. See
Property Owner

STATE OF IOWA)
)ss:
STORY COUNTY)

Subscribed and sworn to before me by Willie See and Donna See on the 7th day of June, 2017.

JODY LYNN ELDRIDGE
Commission Number 710090
My Commission Expires
5.22.19

Jody Lynn Eldridge
Notary Public in and for said State

EXHIBIT A

Outlot A and Outlot B of the Orchard View Subdivision, an Official Plat, in Story County, Iowa.

B. Appendix B – Adjacent Property Value Impact Analysis

C. Appendix C – Traffic Impact Analysis

HRGreen®

▷5525 Merle Hay Road | Suite 200 | Johnston, IA 50131
Main 515.278.2913 + **Fax** 515.278.1846

▷HRGREEN.COM

August 16, 2020

Darren Moon, P.E.
Story County Engineer
837 N Avenue
Nevada, Iowa 50201

Re: Nevada WWTF Improvements Conditional Use Permit – Historical and Projected Future Traffic

Dear Mr. Moon,

As discussed during the May 7, 2020 Conditional Use Permit Conceptual Review Meeting for the City of Nevada Wastewater Treatment Facility (WWTF) Improvements HR Green is providing the historical traffic data at the nearest intersection to the proposed Nevada WWTF site and the future average daily and weekly trips generated for the site. For the future projected WWTF site traffic we having included two (2) conditions: 1) "Normal Condition" due to daily/weekly traffic; 2) "Seasonal Condition" traffic due to biosolids land application activities that is in addition to the "Normal Condition" traffic. From the feedback received during the May 7th meeting it is our understanding that your office will determine impacts to the county roads based on these trip generation numbers.

Historical Traffic Volumes

The north adjacent road to the site is 270th Street with 620th Avenue/County Road S14/NE 72nd Street as the west adjacent road. The proposed site entrance is along 270th Street. We anticipate that the typical traffic route to/from the proposed WWTF site will use 270th Street west of the WWTF site entrance and 620th Avenue/County Road S14/NE 72nd Street north to US Highway 30.

The 2015 Iowa Department of Transportation (DOT) traffic map indicates the daily traffic volume at 140 vehicles per day (vpd) along 270th Street and 990 vpd along 620th Ave/S14/NE 72nd St.

Future "Normal Condition" Generated Traffic from WWTF Site

The 10th edition of the Institute of Transportation Engineers' (ITE) *Trip Generation Manual* was utilized to estimate the future average daily trips (ADT) for the WWTF site. The tables in the *ITE Trip Generation Manual* estimate the ingress and egress traffic for weekday traffic conditions for various types of land uses. For this purpose, the WWTF site was zoned as Light Industrial (most comparable land use type) with four (4) full-time employees. The total number of daily trips generated by the WWTF site was estimated to be approximately 24 total trips (12 entries, 12 exits). The AM peak hour can be expected to generate 5 total trips (4 entries, 1 exit), and the PM peak hour can be expected to generate 5 total trips (1 entry, 4 exits).

Given that the ITE *Trip Generation Manual* does not have a land use code for WWTFs, we also estimated future "Normal Condition" ADT for the proposed WWTF site based on feedback from the City of Nevada staff regarding typical traffic generated at the current WWTF. We anticipate similar trip generation when compared to the existing WWTF site with a slight increase due to additional staffing needs at the proposed WWTF site. This method resulted in an expected 13-14 total trips for a typical weekday.

Future "Seasonal Condition" Generated Traffic from WWTF Site

Based on historical activity at the existing WWTF site the seasonal biosolids land application activity would occur once per every 12 months. Current biosolids land application sites are located east of the proposed WWTF site. We anticipate biosolids hauling will use a combination of the following routes:

Route 1

- 270th Street west to 620th Avenue/County Road S14/NE 72nd Street; 620th Avenue/County Road S14/NE 72nd Street, south to 280th Street; 280th Street east to 630th Avenue; 630th Avenue south to 287th Street; 287th Street east to 640th Avenue; north on 640th Avenue.

Route 2

- 270th Street east 640th Avenue; south on 640th Avenue.

We are assuming traffic generated by biosolids hauling will be based on the use of two (2) semi-trucks with 6,000 gallon tanker trailers and up to two support vehicles (heavy-duty pickup trucks). We estimate that the "Seasonal Condition" duration will be 15 days total over a three (3) week period. It is unlikely the hauler will work 15 days straight for land application activities. Therefore, the anticipated total number of daily trips generated during the "Seasonal Condition" would be 84 trips.

Summary

Table 1 summarizes the daily and weekly trip generations for the proposed WWTF site.

Table 1. Proposed Nevada WWTF Site Projected Traffic Volumes

Condition	Total Trips	Daily Average (ADT)	Weekly Average
Normal – ITE Method	NA	24 *AM Peak = 5* *4 entries, 1 exit* *PM Peak = 5* *1 entry, 4 exits*	120 (M-F)
Normal – City feedback Method	65-70 (M-F) 8-12 (Sat-Sun)	13-14 (M-F) 4-6 (Sat – Sun)	78
Seasonal[1]	Up to 1,258[2]	84	420
[1] Once every 12 months; Based on 15 days total over 3 week period; 5 workdays per week			
[2] Based on 858 tanker trips and 400 support vehicle trips during the entire duration of land application process			

We request the opportunity to review and discuss your office's findings on the impacts from the projected traffic volumes to the county roads prior to submittal of the findings to Story County Planning & Zoning for the Conditional Use Permit.

Please feel free to contact me at (515) 657-5304 or mroth@hrgreen.com with any questions on this matter.

Sincerely,

HR GREEN, INC

Michael Roth, P.E.
Senior Project Manager

Cc: Jerry Moore, Story County
Mike Neal, City
Kerin Wright, City
Jordan Cook, City

\\hrgreen.com\HRG\Data\2016\160473\Design\Permits\Conditional Use Permit - Story County\Traffic\ltr-081420-CUP Traffic Letter-Story_Co_Engr.docx

D. Appendix D – Wetland Delineation Report

Wetland Delineation Report
Nevada Wastewater Treatment Facilities Improvement Project

Story County, Iowa

August 2020

HR Green Project No: 160473

Prepared For:

City of Nevada

Prepared by:

Ted McCaslin, PWS

HR Green, Inc.,

St. Paul, MN

HRGreen

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Appendices

Appendix A: Wetland Determination Data Forms
Appendix B: Site Photographs

1.0 Introduction

The City of Nevada is proposing construction a new wastewater treatment facility (WWTF) south of Nevada in Story County, Iowa. The approximately 77-acre site is currently mainly row crops with a grassed agricultural waterway and forested areas adjacent to West Indian Creek near a proposed outfall. The proposed WWTF site is in the southeast quarter of Section 31, Township 83 North, Range 22 West. It is approximately three miles south of the existing WWTF in Nevada. See Location Map in Figure 1.

The following sections describe the background data collected and reviewed, delineation methods, and results of the wetland delineation.

2.0 Background Data Collection and Review

The study area is in Land Resource Region (LRR) M – Central Feed Grains and Livestock Region, Illinois and Major Land Resource Region (MLRA) 103 – Central Iowa and Minnesota Till Prairies (NRCS, 2006).

2.1 USGS Quadrangle Map

The USGS The National Map topographic map was reviewed (ESRI Basemap, See Figure 1). Elevations in the study area are between 910 and 970feet. The site slopes towards an intermittent stream stretching from the northwest to the southeast within the study area and towards West Indian Creek. Areas along West Indian Creek along the southeast border appear forested. West Indian Creek is a tributary of Indian Creek and the South Skunk River. The South Skunk River and Skunk are tributaries of the Mississippi River.

2.2 National Wetlands Inventory (NWI)

The USFWS NWI GIS dataset for South Dakota was reviewed (See Figure 2). An R4SBC polygon (riverine, intermittent, streambed, seasonally flooded) is present near the intermittent stream shown in the USGS quadrangle. No other NWI polygons are present.

2.3 Story County NRCS Soil Data

A United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) web soil survey was reviewed for the project study area. Fifteen (15) soil map units are present. Two units – Nicollet loam, 1 to 3 percent slopes and Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes – are listed as hydric. The two hydric units occupy approximately 12.0% of the study area and are located at higher elevations. No hydric soil units are associated with the intermittent stream area shown on the USGS Quadrangle or NWI mapping. Table 1 shows the NRCS web soil survey map units present in the study area (See Figure 2 and Appendix C).

TABLE 1: NRCS SOILS IN STUDY AREA

Map Unit Symbol	Map Unit Name	Hydric?	Drainage Class	% of Study Area
1314	Hanlon-Spillville complex, channeled, 0 to 2 percent slopes	No	Moderately well drained	0.3%
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	No	Well drained	24.9%
L55	Nicollet loam, 1 to 3 percent slopes	Yes	Poorly drained	11.8%
27B	Terril loam, 2 to 6 percent slopes	No	Well drained	8.6%
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	No	Well drained	6.2%
L638C2	Clarion-Storden complex, Bemis moraine, 6 to 10 percent slopes, moderately eroded	No	Moderately well drained	2.5%
L507	Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes	Yes	Very poorly drained	0.2%
5010	Pits, gravel	Unranked	<Null>	2.4%
34C	Estherville sandy loam, 2 to 6 percent slopes	No	Well drained	3.4%
L62D2	Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded	No	Well drained	17.8%
L62E2	Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded	No	Well drained	9.8%
201B	Coland-Terril complex, 1 to 5 percent slopes	No	Moderately well drained	6.0%
356G	Hayden-Storden loams, 25 to 50 percent slopes	No	Well drained	0.1%
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded	No	Somewhat poorly drained	3.9%
W	Water	Unranked	<Null>	0.6%
828B	Zenor sandy loam, 2 to 5 percent slopes	No	Somewhat excessively drained	1.5%

Source: USDA Web Soil Survey, NRCS SSURGO GIS Dataset for Story County, IA

2.4 FEMA National Flood Hazard Layer

The Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) online map was reviewed (See teal color in Figure 2). Flood Zone A (100-year floodplain) abuts West Indian Creek within the southeast part of the study area.

3.0 Methods

Wetland delineation activities were conducted by wetland scientist Ted McCaslin, PWS. An on-site wetland delineation was conducted on July 1, 2020. The delineation used methods described in the 1987 Corps of Engineers Wetlands Delineation Manual and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0) and 2010 Regional Supplement to the 1987 Corps of Engineers Delineation Manual.

Additionally, paired wetland points (one wetland/one upland) were sampled with a soil auger to a minimum depth of 20 inches for each sample point. Midwest Region data forms were completed for plant communities and for representative wetland and non-wetland sites within the study area. Wetland vegetation, soil indicators, hydrology indicators and other data were recorded on Midwest Region data forms at five (5) sample points within the study area. Additional plots were sampled throughout the study area to refine the wetland boundaries before the boundaries were recorded. Data forms are included in Appendix A.

Wetland boundaries were identified in the field, drawn on high-resolution photographs, and recorded with GPS equipment with sub-meter accuracy. Representative photographs taken during the field delineation are in Appendix B.

Potential streams were observed for stream indicators including ordinary high water marks (OHWM), running water, water flow direction, absence of vegetation within wetlands, active sediment sorting, bank erosion, and bank filling.

3.1 Vegetation

The hydrophytic vegetation criteria for wetland classification are met when greater than 50% of the dominant plant species are hydrophytes. The indicator status of plant species is expressed in terms of the estimated probabilities of that species occurring in wetland conditions within a given region. Hydrophytes include all plants with indicator status given as Facultative (FAC), Facultative Wet (FACW), or Obligate (OBL). Facultative Upland (FACU) and Upland (UPL) are not considered hydrophytes. The latest U.S. Army Corps of Engineers (USACE) National Wetland Plant List, Midwest indicators found in the 2018 Regional Wetland Plant List was used for species indicators.

3.2 Soils

A hydric soil is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Hydric soils exhibit characteristic morphologies that result from repeated periods of saturation or inundation. Saturation or inundation, combined with soil microbial activity causes the depletion of oxygen. This promotes certain biogeochemical processes, such

as the accumulation of organic matter and the reduction, translocation, or accumulation of iron and other reducible elements. These processes result in distinctive characteristics, or field indicators, that persist in the soil during both wet and dry periods. Regionally specific hydric soil indicators are described in the USDA Field Indicators of Hydric Soils in the United States Version 8.2, 2018. Soils were evaluated for field indicators by directly by digging soil pits and using a soil probe in soils with heavy clay content. Soil colors are described using the Munsell color notation system in this report.

3.3 Hydrology

In order for an area to have wetland hydrology, it must exhibit one or more primary indicators and/or two or more secondary indicators for USACE jurisdictional and isolated wetlands. Primary indicators include either the direct presence of water as inundation or saturation within the upper 12 inches of the soil profile, or direct evidence of recent inundation including water marks, drift lines, sediment deposits, or drainage patterns. Secondary indicators are conditions reflecting anaerobic conditions produced because of saturation or inundation. Secondary indicators include such conditions as surface soil cracks, oxidized root channels in the upper 12 inches of the soil profile, crayfish burrows, and a positive “FAC-Neutral Test” (i.e., the dominant vegetation is, on average, hydrophytic).

4.0 Results

Most of the study area is in active crop rotation. A grassed waterway sloping from the northwest to the southeast crosses the study area. Additionally, several grassed upland terraces and a forested area along West Indian Creek are present. Three wetlands totaling 0.057 acres were identified in the study area. Wetlands are shown on Figure 3. See Table 2 for summary data on the wetlands.

Wetland 1 is located on a stream bench along West Indian Creek. The wetland appears to be part of the creek in aerial photos. The observed Cowardin Classification is PEMC. Hydrophytic vegetation spotted lady’s thumb (*Persicaria maculosa*) and reed canary grass (*Phalaris arundinacea*) were observed in the wetland. Hydric soil indicator Depleted Matrix (F3) and primary hydrology indicators Sediment Deposits (B2), Drift Deposits (B3), and Inundation Visible on Aerial Imagery (B7) were observed. See DP2-Wet in Appendix A and Photos 5 and 6 in Appendix B.

Wetland 2 is located within a long, grassed waterway in a vegetated cut depression. The wetland is incised and fed by a broken tile line at its upgradient limit. The wetland follows a drainage to West Indian Creek outside of the study area. The observed Cowardin Classification is PEMA. Hydrophytic vegetation reed canary grass (*Phalaris arundinacea*) and fox sedge (*Carex vulpinoidea*) were observed in the wetland. Hydric soil indicator Redox Dark Surface (F6) and secondary hydrology indicators Surface Soil Cracks (B6), Geomorphic Position (D2), and FAC-Neutral Test (D5) were observed. See DP1-Wet in Appendix A and Photo 7 in Appendix B.

Upland areas within the grassed waterway included area with dominant upland vegetation including smooth brome (*Bromus inermis*) and Canada thistle (*Cirsium arvense*), but also some areas of reed canary grass. Primary wetland hydrology indicators were absent from the waterway the day of the site visit. See DP1-Up and Photos 2, 3, and 4 in Appendix B.

Wetland 3 is an isolated six-foot-deep depression caused by a cave-in above a broken tile line. The observed Cowardin classification is PEMB. The isolated wetland showed hydrophytic vegetation and surface inundation approximately six feet below the surrounding upland within the grassed waterway. The wetland was inaccessible but mapped in Figure 3. See Photo 10 in Appendix B.

TABLE 2: WETLANDS IN STUDY AREA

Feature	Area (acres)	Latitude (Dec Degr)	Longitude (Dec Degr)	Cowardin Class	Associated Wetland Data Point
Wetland 1	0.010	41.958007	-93.448963	PEMC	DP2-Wet DP2-Up
Wetland 2	0.042	41.960033	-93.447867	PEMA	DP1-Wet DP1-Up
Wetland 3	0.005	41.962852	-93.453547	PEMB	DP1-Wet DP1-Up
Total	**0.057**				

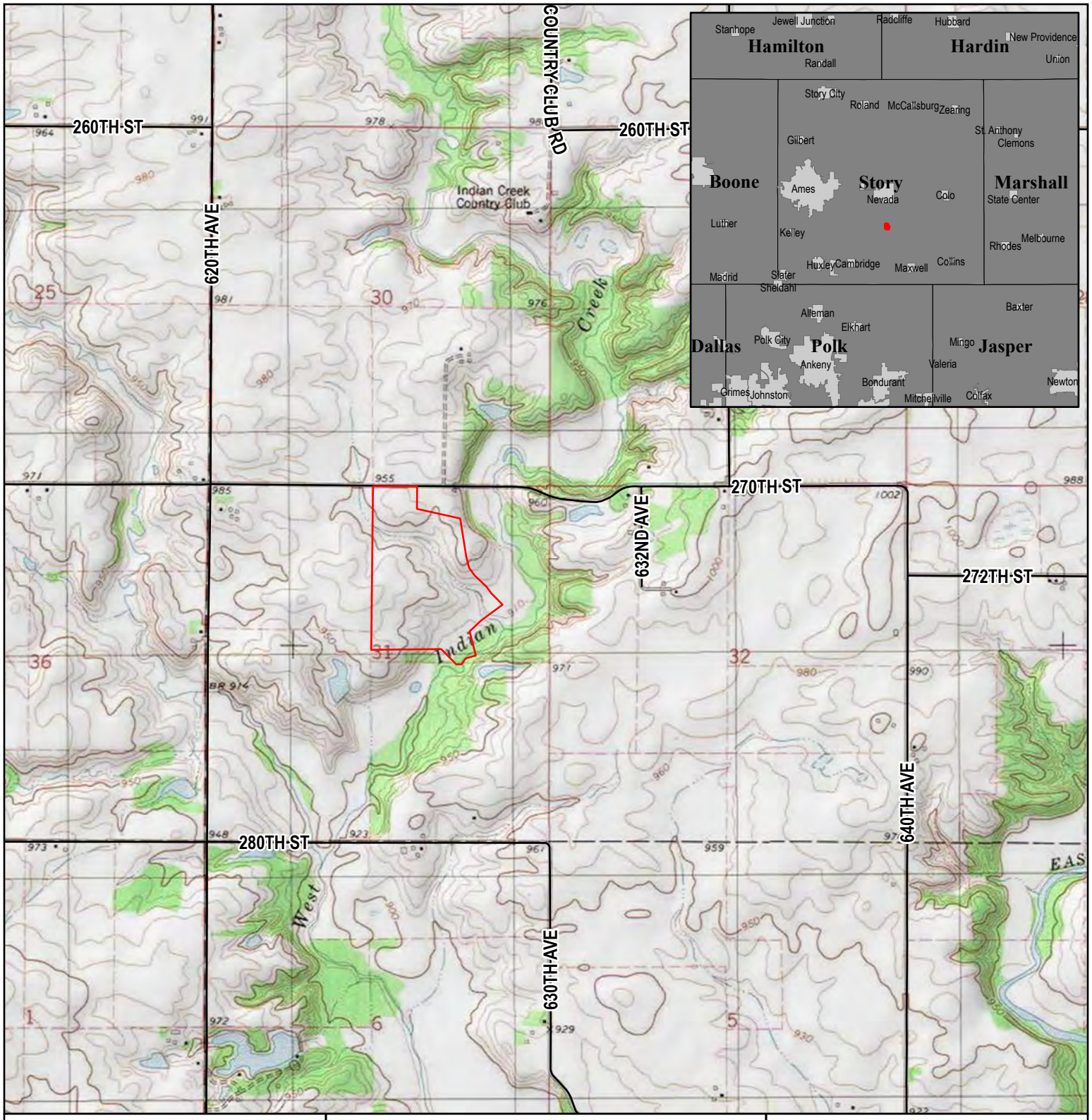
4.2 Other Waters of the United States

The study area abuts West Indian Creek, a perennial stream approximately 35-40 feet wide within the study area. The creek has a steep upland vegetated bank outside of Wetland 1. The stream flows generally southward. See Photo XX in Appendix B.

5.0 Summary

A wetland delineation identified three wetlands totaling 0.057 acres within the study area. Additionally, the study area abuts West Indian Creek. An intermittent stream shown on USGS Quadrangle and NWI maps showed two small wetlands where an observed tile line had failed, but the majority of the grassed waterway is upland.

FIGURES



Wetland Study Area

FIGURE 1 - USGS/LOCATION MAP

NEVADA WWTF

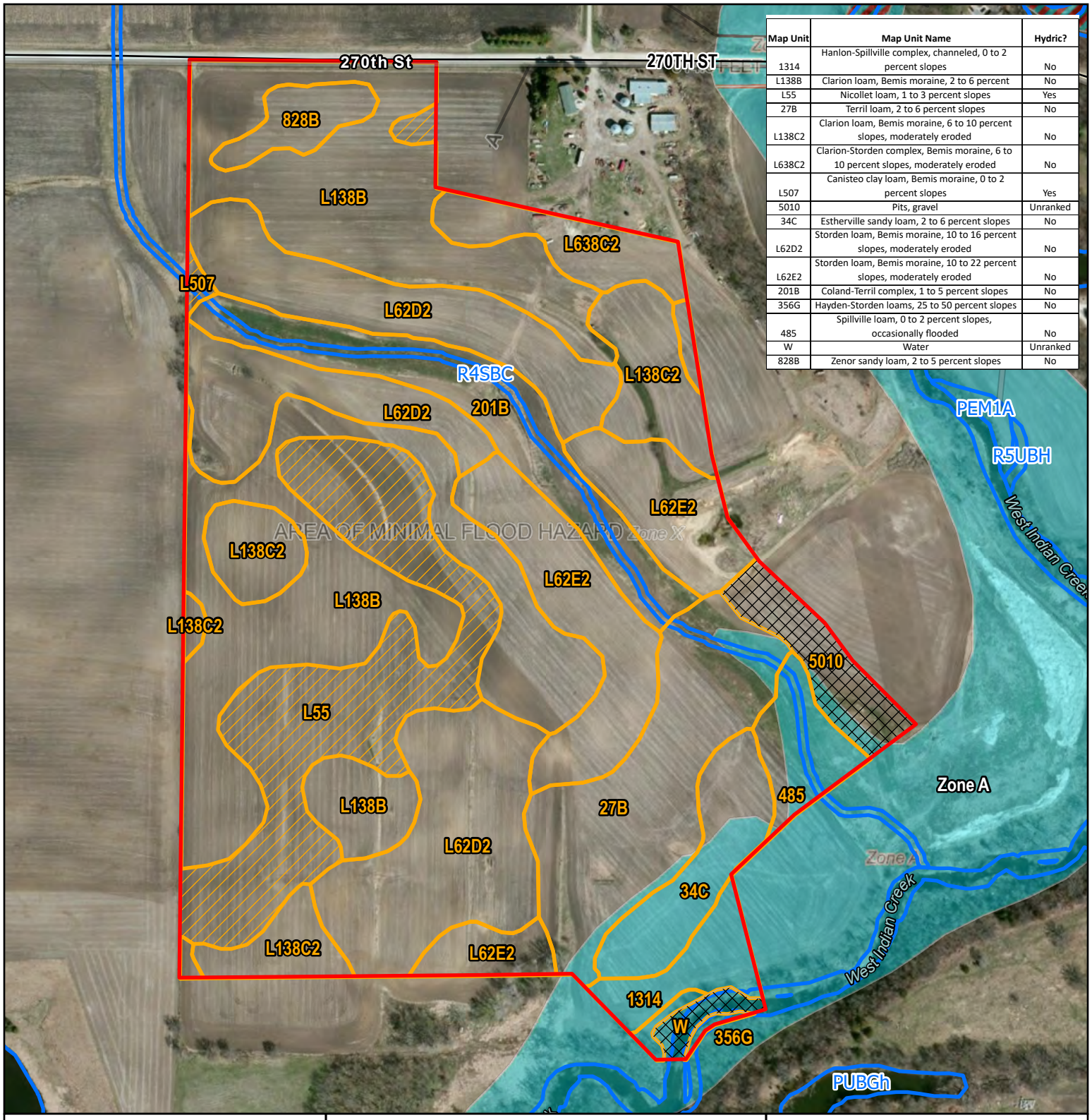
WETLAND DELINEATION

Story County, Iowa

N
W E
S

0 1,000 2,000
Feet

HRGreen



Map Unit	Map Unit Name	Hydric?
1314	Hanlon-Spillville complex, channeled, 0 to 2 percent slopes	No
L138B	Clarion loam, Bemis moraine, 2 to 6 percent	No
L55	Nicollet loam, 1 to 3 percent slopes	Yes
27B	Terril loam, 2 to 6 percent slopes	No
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	No
L638C2	Clarion-Storden complex, Bemis moraine, 6 to 10 percent slopes, moderately eroded	No
L507	Canisteo clay loam, Bemis moraine, 0 to 2 percent slopes	Yes
5010	Pits, gravel	Unranked
34C	Estherville sandy loam, 2 to 6 percent slopes	No
L62D2	Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded	No
L62E2	Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded	No
201B	Coland-Terril complex, 1 to 5 percent slopes	No
356G	Hayden-Storden loams, 25 to 50 percent slopes	No
485	Spillville loam, 0 to 2 percent slopes, occasionally flooded	No
W	Water	Unranked
828B	Zenor sandy loam, 2 to 5 percent slopes	No

Wetland Study Area
National Wetlands Inventory
Hydric Soil Unit?
Yes
No
Unranked
NFHL
Cross-Sections
Flood Hazard Boundaries
Other Boundaries
Limit Lines
Other Boundaries
Limit Lines

FIGURE 2 - SOILS/NWI/FEMA

NEVADA WWTF

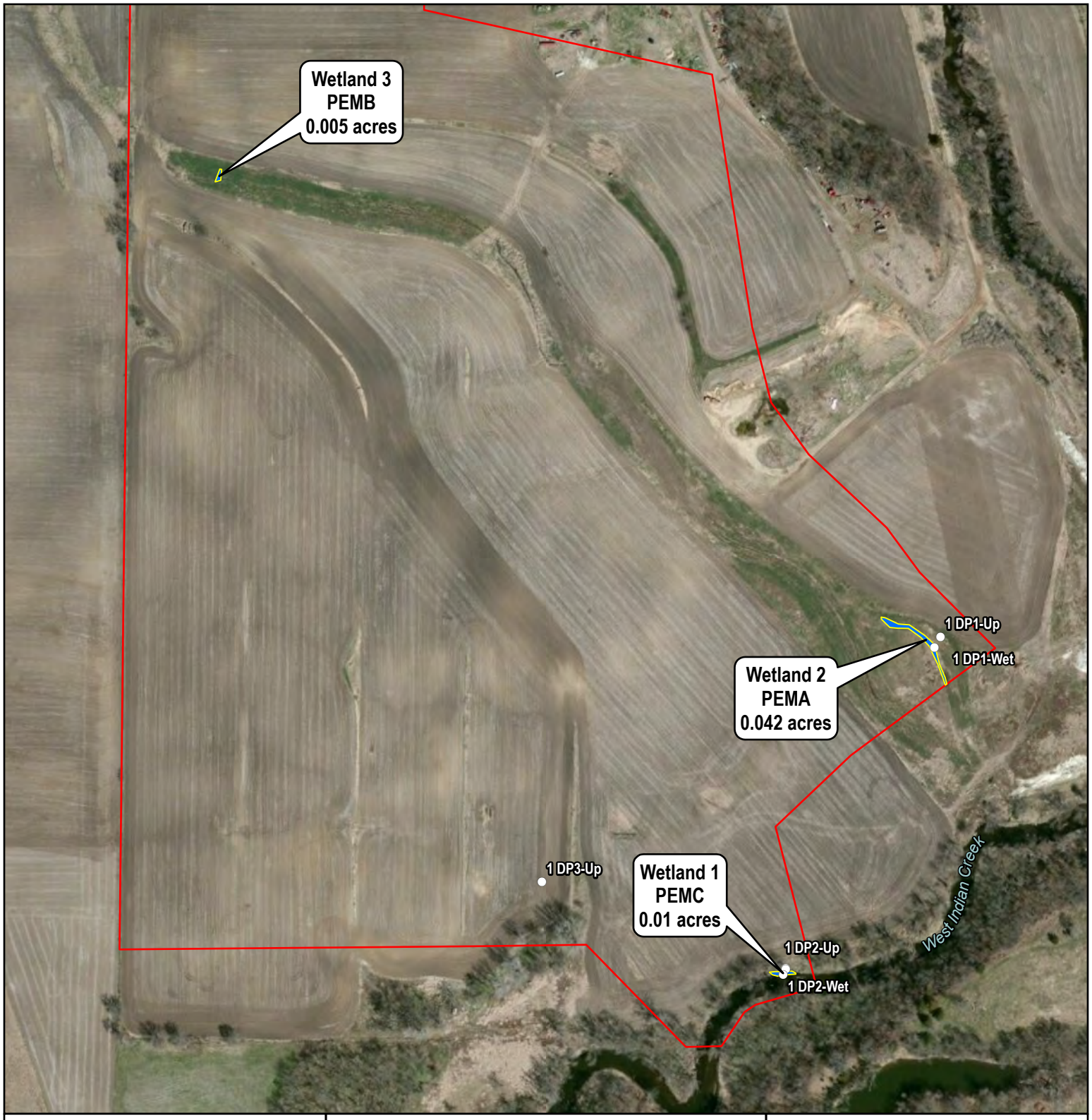
WETLAND DELINEATION

Story County, Iowa

N
W E
S

0 200 400
Feet

HRGreen



Wetland Study Area
SamplingPoints
Delineated Wetlands

FIGURE 3
DELINEATED WETLANDS

NEVADA WWTF

WETLAND DELINEATION

Story County, Iowa

N
W E
S

0 150 300
Feet

HRGreen

APPENDIX A: WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Nevada WWTP City/County: Nevada/Story Sampling Date: 2020-07-01

Applicant/Owner: City of Nevada State: Iowa Sampling Point: DP-1 Up

Investigator(s): Ted McCaslin, PWS Section, Township, Range: 31, T83N, 22W

Landform (hillslope, terrace, etc.): Upland, Hillslope Local relief (concave, convex, none): None

Slope (%): 2 Lat: 41.960050 Long: -93.447675 Datum: WGS 84

Soil Map Unit Name: 5010 Pits, sand and gravel NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil ✔, or Hydrology ✔ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
Possible disturbed soils apparent on aerial photography. Drain tile adjacent.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Bromus inermis	55	✔	FACU
2. Phalaris arundinacea	50	✔	FACW
3. Urtica dioica	10		FACW
4. Cirsium arvense	5		FACU
5.			
6.			
7.			
8.			
9.			
10.			
	120% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	60	x 2 = 120
FAC species	0	x 3 = 0
FACU species	60	x 4 = 240
UPL species	0	x 5 = 0
Column Totals:	120 (A)	360 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ✔ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP-1 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 3/2	100					Silty clay loam	
2 - 12	10YR 3/2	94	10YR 4/4	6	C	M	Silty clay loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rocks

Depth (inches): 12

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Drain tile approximately for feet deep apparent adjacent to the south.

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Nevada WWTP City/County: Nevada/Story Sampling Date: 2020-07-01

Applicant/Owner: City of Nevada State: Iowa Sampling Point: DP1- Wet

Investigator(s): Ted McCaslin, PWS Section, Township, Range: 31, T83N, R22W

Landform (hillslope, terrace, etc.): Outwash, Depression Local relief (concave, convex, none): Concave

Slope (%): 1 Lat: 41.959985 Long: -93.447723 Datum: WGS 84

Soil Map Unit Name: 5010 Pits, sand and gravel NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil ✔, or Hydrology ✔ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks:
Vegetated drainageway in possible cut channel. Tile observed upgradient from point

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Populus deltoides	1		FAC
2.			
3.			
4.			
5.			
	1% = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Carex vulpinoidea	30	✔	FACW
2. Phalaris arundinacea	10	✔	FACW
3. Ambrosia trifida	7		FAC
4. Bidens tripartita	5		OBL
5. Persicaria pensylvanica	5		FACW
6. Setaria pumila	5		FAC
7. Ambrosia artemisiifolia	3		FACU
8.			
9.			
10.			
	65% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	5	x 1 = 5
FACW species	45	x 2 = 90
FAC species	13	x 3 = 39
FACU species	3	x 4 = 12
UPL species	0	x 5 = 0
Column Totals:	66 (A)	146 (B)

Prevalence Index = B/A = 2.2

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP1- Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 5	10YR 2/1	80	10YR 8/1	20	D	M	Sandy loam	
5 - 20	10YR 6/3	60	10YR 4/1	40	D	M	Silty clay loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✔ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ✔ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ___ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes ✔ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Nevada WWTP City/County: Nevada/Story Sampling Date: 2020-07-01

Applicant/Owner: City of Nevada State: Iowa Sampling Point: DP2-Up

Investigator(s): Ted McCaslin, PWS Section, Township, Range: 31, T83N, R22W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): _____

Slope (%): 3 Lat: 41.958033 Long: -93.448957 Datum: WGS 84

Soil Map Unit Name: 485-Spillville loam, 0 to 2 percent slopes, occasionally flooded NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
Field edge above creek

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juglans nigra	65	✔	FACU
2. Acer negundo	15		FAC
3.			
4.			
5.			
	80%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Acer negundo	10	✔	FAC
2. Lonicera tatarica	10	✔	FACU
3.			
4.			
5.			
	20%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	60	✔	FACW
2. Urtica dioica	25	✔	FACW
3. Alliaria petiolata	15		FAC
4. Amphicarpaea bracteata	15		FAC
5.			
6.			
7.			
8.			
9.			
10.			
	115%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Smilax hispida	7	✔	FAC
2.			
	7%	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	85	x 2 = 170
FAC species	62	x 3 = 186
FACU species	75	x 4 = 300
UPL species	0	x 5 = 0
Column Totals:	222 (A)	656 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ✔ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2-Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 24	10YR 3/2	100					Silt Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Nevada WWTP City/County: Nevada/Story Sampling Date: 2020-07-01

Applicant/Owner: City of Nevada State: Iowa Sampling Point: DP2-Wet

Investigator(s): Ted McCaslin, PWS Section, Township, Range: 31, T83N, R22W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex

Slope (%): 0 Lat: 41.957998 Long: -93.450921 Datum: WGS 84

Soil Map Unit Name: Water NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes ✔	No _____	

Remarks:
Stream bench

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Persicaria maculosa	25	✔	FACW
2. Phalaris arundinacea	12	✔	FACW
3. Urtica dioica	10		FACW
4. Pilea pumila	8		FACW
5. Calystegia sepium	5		FAC
6. Humulus japonicus	5		FACU
7. Ambrosia trifida	3		FAC
8.			
9.			
10.			
	68% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	55	x 2 = 110
FAC species	8	x 3 = 24
FACU species	5	x 4 = 20
UPL species	0	x 5 = 0
Column Totals:	68 (A)	154 (B)

Prevalence Index = B/A = 2.3

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 3	10YR 2/1	60	10YR 4/1	30	D	M	Sandy clay loam	
0 - 3			10YR 5/8	10	C	M		
3 - 20	10YR 4/2	82	10YR 8/1	15	D	M	Sand	
3 - 20			10YR 5/8	3	C	M		
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ✔ Sediment Deposits (B2)
- ✔ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ___ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes ✔ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: Nevada WWTP City/County: Nevada/Story Sampling Date: 2020-07-01

Applicant/Owner: City of Nevada State: Iowa Sampling Point: DP3 -Up

Investigator(s): Ted McCaslin, PWS Section, Township, Range: 31, T83N, R22W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave

Slope (%): 0 Lat: 41.958563 Long: -93.450921 Datum: WGS 84

Soil Map Unit Name: L62E2-Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded NWI classification: PEMA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ✔, Soil _____, or Hydrology ✔ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No ✔

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:
NWI polygon in crop field. Large cave-in downgradient draining the depression.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	30	✔	FACW
2. Glycine max	3		NI
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	33% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	30	x 2 = 60
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	30 (A)	60 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)
Sprayed

SOIL

Sampling Point: DP3 -Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 12	10YR 3/2	97	10YR 6/2	3	D	M	Silty clay loam	
12 - 16	10YR 2/1	90	10YR 6/2	10	D	M	Silty clay loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX B: SITE PHOTOGRAPHS

Photo 1. Facing north, top of grassed waterway at right of photo.

Photo 2. Facing southeast at top of grassed waterway.

Photo 3. Typical vegetation within grassed waterway with dominant smooth brome (FACU) at left and reed canary grass at right (FACW).

Photo 4. Looking southeast at upland vegetation in grassed waterway near east edge of study area.

Photo 5. Facing north, Wetland 1 at left of photo and West Indian Creek at right of photo.

Photo 6. Facing south from Wetland 1 at steep bank on west side of West Indian Creek.

Photo 7. Looking south at pole within Wetland 2 in incised area of grassed waterway.

Photo 8. Cave-in at field edge near DP3-Up.

Photo 9. Facing north at west edge of study area in southwest part of study area.

Photo 10. Facing south, Wetland 3 at tile cave-in within grassed waterway.

E. Appendix E – WLA

City of Nevada

Proposed New Mechanical Facility

(Please do not microfiche this document.)

This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
CBOD5	Secondary Treatment Levels Will Not Violate WQS			
Total D.O.	Minimum Concentration (mg/l)			
January - December	5.0			
Ammonia – Nitrogen*				
January	3.5	15.2	87.6	382.8
February	4.1	14.2	101.6	357.8
March	3.5	14.7	87.5	370.1
April	1.6	15.7	39.2	395.7
May	1.8	15.2	44.7	382.7
June	1.4	**12.7**	33.7	**292.2**
July	1.0	**8.8**	25.8	**199.0**
August	1.0	**8.2**	24.5	**186.4**
September	1.1	**11.3**	27.2	**256.9**
October	1.6	15.7	40.0	395.7
November	2.4	14.7	59.7	370.1
December	2.6	16.0	63.6	402.2
Bacteria	Geometric Mean (#org./100 ml)		March 15th – November 15th	
E. coli	211			
Chloride	392	629	9,837	15,847
Sulfate	1,515	1,515	38,145	38,145
TRC**	0.008	0.019	0.199	0.479
pH	6.5 - 9.0 Standard Units			
Major Facility Acute WET Testing Ratio: Use 99.9% of effluent and 0.1% of dilution water for the testing				

Stream Network/Classification of Receiving Stream:
West Branch Indian Creek (A2, B(WW-2)) to Indian Creek (A1, B(WW-2)) to the South Skunk River (A1, B(WW-1) HH)

Annual critical low flows in West Branch Indian Creek at the outfall:
1Q10 flow 0.1 cfs, 7Q10 flow 0.1 cfs, 30Q10 flow 0.1 cfs

Annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek:
1Q10 flow 9.20 cfs, 7Q10 flow 12.3 cfs, 30Q10 flow 16.7 cfs, 30Q5 flow 26.3 cfs, harmonic mean flow 88.5 cfs

Excel spreadsheet calculations [X] Qual II E model [ ] Qual II E modeling date [ ]

Performed by: Ian Willard

* **Bold** values are governed by CBOD5/DO modeling; the others are based on ammonia nitrogen toxicity protection for aquatic life.
** Only required if chlorine is used for disinfection.

Antidegradation Review Requirement

A tier II antidegradation review is required. See Section 2 for details.

Please note that the antidegradation review conducted in this wasteload allocation is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
1,1,1-Trichloroethane	2.643E+01	2.643E+01	6.653E+02	6.653E+02
1,1-Dichloroethylene	5.405E+01	5.405E+01	1.026E+03	1.361E+03
1,2-Dichloroethane	3.597E+00	5.906E+01	5.345E+01	1.487E+03
1,2-Dichloropropane	1.458E+00	1.458E+00	2.167E+01	2.167E+01
2,3,7,8-TCDD (Dioxin)	4.958E-10	4.958E-10	7.368E-09	7.368E-09
3,3-Dichlorobenzidine	2.722E-03	2.722E-03	4.045E-02	4.045E-02
4,4' DDT	1.010E-06	1.101E-03	2.532E-05	2.772E-02
Aldrin	4.860E-06	3.003E-03	7.223E-05	7.560E-02
Aluminum	8.786E-02	7.507E-01	2.203E+00	1.890E+01
Antimony	2.299E+00	1.101E+01	3.881E+01	2.772E+02
Arsenic (III)	1.515E-01	3.403E-01	3.798E+00	8.568E+00
Barium	2.052E+02	2.052E+02	5.166E+03	5.166E+03
Benzene	4.958E+00	1.652E+01	7.368E+01	4.158E+02
Benzo(a)Pyrene	1.750E-03	1.750E-03	2.600E-02	2.600E-02
Beryllium	5.005E-01	5.005E-01	1.260E+01	1.260E+01
Bis(2-ethylhexyl)phthalate	2.139E-01	2.139E-01	3.178E+00	3.178E+00
Bromoform	1.361E+01	1.361E+01	2.023E+02	2.023E+02
Cadmium	4.567E-04	4.320E-03	1.145E-02	1.088E-01
Carbon Tetrachloride	1.555E-01	2.157E+01	2.311E+00	5.431E+02
Chlordane	4.342E-06	2.402E-03	1.089E-04	6.048E-02
Chloride	3.92E+02	6.29E+02	9.837E+03	1.5847E+04
Chlorobenzene	5.746E+00	1.612E+01	9.701E+01	4.057E+02
Chlorodibromomethane	1.264E+00	1.264E+00	1.878E+01	1.878E+01
Chloroform	4.569E+01	4.569E+01	6.790E+02	6.790E+02
Chloropyrifos	4.140E-05	8.308E-05	1.038E-03	2.092E-03
Chromium (VI)	1.111E-02	1.602E-02	2.785E-01	4.032E-01
Copper	1.703E-02	2.693E-02	4.271E-01	6.779E-01
Cyanide	5.251E-03	2.202E-02	1.317E-01	5.544E-01
Dichlorobromomethane	1.653E+00	1.653E+00	2.456E+01	2.456E+01
Dieldrin	5.249E-06	2.402E-04	7.801E-05	6.048E-03
Endosulfan	5.655E-05	2.202E-04	1.418E-03	5.544E-03
Endrin	3.635E-05	8.608E-05	9.116E-04	2.167E-03
Ethylbenzene	7.542E+00	2.267E+01	1.273E+02	5.708E+02
Fluoride	8.085E+00	8.085E+00	2.035E+02	2.035E+02
gamma-Hexachlorocyclohexane (Lindane)	9.509E-04	9.509E-04	2.394E-02	2.394E-02
Heptachlor	3.837E-06	5.205E-04	9.622E-05	1.310E-02

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
Heptachlor epoxide	3.791E-06	5.205E-04	5.634E-05	1.310E-02
Hexachlorobenzene	2.819E-05	2.819E-05	4.189E-04	4.189E-04
Hexachlorocyclopentadiene	3.951E+00	3.951E+00	6.670E+01	6.670E+01
Iron	1.001E+00	1.001E+00	2.520E+01	2.520E+01
Lead	7.769E-03	1.976E-01	1.948E-01	4.975E+00
Mercury (II)	5.387E-04	1.642E-03	9.095E-03	4.133E-02
Nickel	9.469E-02	8.442E-01	2.374E+00	2.125E+01
Nitrate as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
Nitrate+Nitrite as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
para-Dichlorobenzene	6.824E-01	2.002E+00	1.152E+01	5.040E+01
Parathion	1.313E-05	6.506E-05	3.292E-04	1.638E-03
Pentachlorophenol (PCP)	2.257E-02	2.917E-02	5.660E-01	7.343E-01
Phenols	5.049E-02	2.502E+00	1.266E+00	6.300E+01
Polychlorinated Biphenyls (PCBs)	6.221E-06	2.002E-03	9.246E-05	5.040E-02
Polynuclear Aromatic Hydrocarbons (PAHs)	6.636E-05	3.003E-02	1.253E-03	7.560E-01
Selenium	5.049E-03	1.932E-02	1.266E-01	4.864E-01
Silver	3.804E-03	3.804E-03	9.576E-02	9.576E-02
Sulfate	1.515E+03	1.515E+03	3.8145E+04	3.8145E+04
Tetrachloroethlyene	3.208E-01	3.208E-01	4.767E+00	4.767E+00
Thallium	1.688E-03	5.986E-01	2.850E-02	1.507E+01
Toluene	1.106E-01	2.727E+00	2.088E+00	6.607E+01
Total Residual Chlorine (TRC)**	8E-03	1.9E-02	1.99E-01	4.79E-01
Toxaphene	2.020E-06	7.307E-04	5.064E-05	1.840E-02
trans-1,2-Dichloroethylene	5.028E-01	5.028E-01	8.489E+00	8.489E+00
Trichloroethylene (TCE)	8.079E-02	4.004E+00	2.026E+00	1.008E+02
Vinyl Chloride	2.333E-01	2.333E-01	3.467E+00	3.467E+00
Zinc	2.158E-01	2.158E-01	5.432E+00	5.432E+00

WLAs/Permit Limits for the City of Nevada's Proposed New Mechanical Facility

These wasteload allocations and water quality based permit limitations are for the City of Nevada's wastewater discharge from a proposed new mechanical facility. The wasteload allocations/permit limits are based on the Water Quality Standards (IAC 567.61) and 'Iowa Wasteload Allocation (WLA) Procedure', February 21, 2018. The chloride allocation/permit limits are based on the criteria that became effective on November 11, 2009.

The water quality based limits in this WLA are calculated to meet the surface water quality criteria to protect downstream uses. There could be technology based limits applicable to this facility that are more stringent than the water quality based limits shown in this WLA. The technology based limits could be derived from either federal guidelines based on different industrial categories or permit writer's judgment.

1. BACKGROUND:
The City of Nevada currently discharges treated domestic wastewater from a mechanical (trickling filter) wastewater treatment facility into Unnamed Creek.

The City of Nevada is proposing to build a new mechanical (activated sludge) wastewater treatment facility at a new location. The design flows and design mass loadings used throughout this WLA are proposed values for the proposed new mechanical facility. The proposed new mechanical facility would discharge into West Branch Indian Creek (at 41° 57' 31.667" N, 93° 26' 50.871" W).

Route of flow and use designations:
At the outfall, West Branch Indian Creek is an A2, B(WW-2) designated use waterbody. Approximately 23,980 ft downstream of the outfall, West Branch Indian Creek flows into Indian Creek. Directly downstream of the mouth of West Branch Indian Creek, Indian Creek is an A1, B(WW-2) designated use waterbody. Approximately 128,710 ft downstream of the mouth of West Branch Indian Creek, Indian Creek flows into the South Skunk River. Directly downstream of the mouth of Indian Creek, the South Skunk River is an A1, B(WW-1) HH designated use waterbody.

The designations have been adopted in Iowa's state rule described in the rule referenced document of Surface Water Classification effective on June 17, 2015. Based on the pollutants of concern, the use designations of waterbodies further downstream will not impact the resulting limits for this facility.

Critical low flow determination:
The annual critical low flows in West Branch Indian Creek at the outfall are estimated based on the Regional Regression Equations (RRE) from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013).

The annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek are estimated based on the Weighted Drainage Area Ratio (WDAR) method from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013) and flow statistics obtained at USGS gage station 05471050, located on the South Skunk River at Colfax, Iowa.

Table 1a: Annual Critical Low Flows in West Branch Indian Creek

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)
West Branch Indian Creek at the outfall	44	0.1	0.1	0.1

Table 1b: Annual Critical Low Flows in the South Skunk River

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic Mean (cfs)
The South Skunk River at (or just upstream of) the mouth of Indian Creek	814	9.20	12.3	16.7	26.3	88.5

2. ANTIDEGRADATION REVIEW:

According to the Iowa Antidegradation Implementation Procedure, effective February 17, 2010 (IAC 567-61.2(2).e), all new or expanded regulated activities (with limited exceptions, such as unsewered communities) are subject to antidegradation review requirements.

Table 2: Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☒, No ☐, or Not Applicable ☐	1: Proposed design capacity shown on the request form.
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☒, No ☐, or Not Applicable ☐	1: Note that if chlorine is utilized for disinfection in the future an antidegradation review will be required.
4	Less Stringent Water Quality Based Limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Less stringent copper and ammonia nitrogen limits will trigger an antidegradation review.
5	Outfall Location Change	Yes ☒, No ☐, or Not Applicable ☐	
Conclusion and discussion: Due to Items 1, 3, 4, and 5, a tier II antidegradation review is required. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.			

3. TOTAL MAXIMUM DAILY LOAD (TMDL) LIMITATIONS:

The following waterbodies in the discharge route are on the 2016 impaired waters list:

- Indian Creek for bacteria (indicator bacteria, *E. coli*) and biological (low aquatic macroinvertebrate IBI)
- The South Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Mississippi River for metals (aluminum)

The City of Nevada STP has not been assigned allocations in any TMDLs at this time.

Please note that the results presented in this report are wasteload allocations based on meeting the State's current water quality standards in the receiving waterbody. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations. Information on impaired streams in Iowa and approved TMDLs can be found at the following website: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement/Impaired-Waters.

4. CALCULATIONS:
The WLAs/permit limits for this outfall are calculated based on the facility's proposed Average Dry Weather (ADW) design flow of 1.64 mgd and its proposed Average Wet Weather (AWW) design flow of 3.02 mgd.

Please note that only wasteload allocations/permit limits (water quality based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality based permit concentration limits are derived using the allowed stream flow and the proposed ADW design flow, while the loading limits are derived using the allowed stream flow and the proposed AWW design flow.

Toxics:
The toxics wasteload allocations will consider the procedures included in the 2000 revised WQS and the 2007 chemical criteria.

To protect the aquatic life use:
Important to toxics is the use of the 1Q10 stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the Mixing Zone (MZ) and the Zone of Initial Dilution (ZID), respectively.

To protect the human health (HH) use:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 30Q5 flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the harmonic mean flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic life use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 5/week, based on a proposed design population equivalent (PE) of 36,365; the limits for other toxics are based on a sampling frequency of 1/week.

Ammonia Nitrogen:
Standard stream background pH, temperatures, and concentrations of NH3-N are mixed with the discharge from the facility's effluent pH and temperature values to calculate the applicable instream criteria for the protection of West Branch Indian Creek.

Based on the ratio of the stream flow to the discharge flow, 5% of the 1Q10 flow and 100% of the 30Q10 flow in West Branch Indian Creek at the outfall are used as the ZID and the MZ, respectively. At the outfall, West Branch Indian Creek is a B(WW-2) stream; therefore, early life protection will begin in April and run through September.

The monthly background pH, temperatures, and NH3-N concentrations shown in Table 3 are used for the wasteload allocation/permit limits calculations based on the Year 2000 ammonia nitrogen criteria. Table 4 shows the statewide monthly effluent pH and temperature values for mechanical facilities. Table 5a shows the calculated toxicity based ammonia nitrogen wasteload allocations for this facility. Additionally, Table 5b shows the final ammonia nitrogen wasteload allocations for this facility with reductions from the CBOD5/DO modeling (discussed below).

Table 3: Background pH, Temperatures, and NH3-N Concentrations
For Use with Year 2000 Ammonia Nitrogen Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
January	8.1	0.3	0.02
February	8.0	0.1	0.08
March	8.1	1.5	0.12
April	8.3	9.3	0.03
May	8.2	15.0	0.03
June	8.2	19.4	0.02
July	8.2	23.5	0.02
August	8.2	24.3	0.02
September	8.3	20.2	0.02
October	8.3	14.2	0.02
November	8.3	8.0	0.02
December	8.3	0.8	0.03

Table 4: Standard Effluent pH & Temperature Values for Mechanical Facilities

Months	pH	Temperature (°C)
January	7.67	12.4
February	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.70	22.1
July	7.58	24.1
August	7.63	24.4
September	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

Table 5a: Toxicity Based Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life

Months	ADW-Based*		AWW-Based**	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	14.5	1.4	14.4	1.3
July	17.6	1.0	17.6	1.0
August	16.2	1.0	16.2	1.0
September	16.5	1.1	16.5	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: bases for concentration limits; **: bases for mass loading limits

Table 5b: Final Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life after CBOD5/DO Modeling*

Months	ADW-Based**		AWW-Based***	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	**12.7**	1.4	**11.6**	1.3
July	**8.8**	1.0	**7.9**	1.0
August	**8.2**	1.0	**7.4**	1.0
September	**11.3**	1.1	**10.2**	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: **Bold** values are governed by CBOD5/DO modeling, while the other values are based on ammonia nitrogen toxicity protection for aquatic life
**: bases for concentration limits
***: bases for mass loading limits

CBOD5/Total Dissolved Oxygen:
Streeter-Phelps DO Sag Model is used to simulate the decay of CBOD and dispersion of total Dissolved Oxygen (DO) in the receiving water downstream from the outfall. The criterion is that the discharge cannot cause the DO level in the receiving stream (warm water) to be below 5.0 mg/l.

The parameter values used in the modeling are listed below:

Background:
The temperature and ammonia nitrogen levels are shown in Table 3. The ultimate CBOD and DO levels are assumed to be 6.0 mg/l and 6.0 mg/l, respectively.

Effluent:
The temperatures are shown in Table 4. The CBOD5 level used in the modeling is 40 mg/l, which is the technology based maximum limit for standard secondary treatment. The ammonia nitrogen values used in the modeling are the calculated toxicity based acute wasteload allocations shown in Table 5a. Both ADW and AWW flows and the ammonia nitrogen limits associated with them are used in the modeling.

Receiving stream parameters:
There is an average water channel slope of 0.00126 (the water channel elevation changes from 898 ft to 870 ft over a distance of approximately 22,310 ft, estimated based on the GIS LiDAR 2-ft contour coverage).

Field Use Attainability Assessment (UAA) had one site along West Branch Indian Creek that was downstream of the outfall. Two observations of stream width, depth, and velocity were made at the site. Based on these UAA data, the stream average width, depth, and velocity at 7Q10 + ADW and 7Q10 + AWW conditions are estimated and are shown in Table 6.

Table 6: Stream Width, Depth, and Velocity

Flow Condition	Flow (cfs)	Width (ft)	Depth (ft)	Velocity (fps)
7Q10 + ADW	2.64	23.0	0.28	0.42
7Q10 + AWW	4.77	24.7	0.36	0.54

Reaeration:
The UAA site on West Branch Indian Creek downstream of the outfall indicated that the stream contains both riffle and run features. Aerial imagery showed that the stream exhibits a moderate amount of meander downstream of the outfall. Therefore, the USGS pool-riffle model (Melching and Flores 1999) is used.

Discussion and conclusion:
The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of 40 mg/l (technology based limits for secondary treatment) and a minimum DO level of 5.0 mg/l, will not cause the DO level in the receiving stream to be below 5.0 mg/l at any time; however, some of the calculated water quality based ammonia nitrogen wasteload allocations, as shown in Table 5a, need to be reduced. The final ammonia nitrogen wasteload allocations are shown in Table 5b.

***E. coli*:**
To protect the Class A2 waterbody:
The water quality standard for *E. coli* in a Class A2 waterbody is a geometric mean of 630 org./100 ml and a sample maximum of 2,880 org./100 ml from March 15th through November 15th. The criteria apply at "end-of-pipe".

To protect the Class A1 waterbody:
The water quality standard for *E. coli* in a Class A1 waterbody is a geometric mean of 126 org./100 ml and a sample maximum of 235 org./100 ml from March 15th through November 15th. *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration. The decay is estimated by using a first order decay model with a length of 23,980 ft, a decay rate of 1.0/day, and a flow velocity of 0.54 fps for 7Q10 + AWW conditions. When *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration, the limits for the protection of the Class A1 waterbody are a geometric mean of 211 org./100 ml and a sample maximum of 393 org./100 ml from March 15th through November 15th.

Final limits:
The limits for the protection of the Class A1 waterbody are more stringent than those for the protection of the Class A2 waterbody; therefore, the limits for the protection of the Class A1 waterbody govern. However, 567 IAC 62.8(2) states that "the daily sample maximum criteria for *E. coli* set forth in Part E of the 'Supporting Document for Iowa Water Quality Management Plans' shall not be used as an end-of-pipe permit limitation." Therefore, only the geometric mean limit of 211 org./100 ml applies.

Chloride and Sulfate:
The chloride and sulfate criteria became effective on Nov. 11, 2009. The default hardness for background and effluent is 200 mg/l.

Chloride criteria are functions of hardness and sulfate concentration, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797} *(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797} *(\text{Sulfate})^{-0.07452}$$

The criteria apply to all Class B waters.

Sulfate criteria, shown in Table 7, are functions of hardness and chloride concentration.

Table 7: Sulfate Criteria

Hardness (mg/l as CaCO3)	Sulfate Criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The criteria defined in Table 7 serve as both acute and chronic criteria and apply to all Class B waters.

The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the MZ and the ZID, respectively.

The default chloride concentration for both background water and effluent is 34 mg/l, while the default sulfate concentration for both background water and effluent is 63 mg/l. The limits are calculated based on an assumed sampling frequency of 1/week.

Iron:
The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for both general use and designated use streams. In this case, the ZID is 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall.

pH:
Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the MZ, which is 25% of the 7Q10 flow in West Branch Indian Creek at the outfall. Therefore, the pH in the effluent at the outfall must be between 6.5 and 9.0 Standard Units.

TDS:
Effective Nov. 11, 2009, the site-specific TDS approach is no longer applicable; instead the new chloride and sulfate criteria became applicable. However, the TDS level should be controlled to a level such that the narrative criteria stated in IAC 567.61.3 are fulfilled.

Major Facility Acute WET Testing Ratio:
Use 99.9% of effluent and 0.1% of dilution water for the testing. The ratio is calculated using the ADW design flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall as the ZID.

5. PERMIT LIMITATIONS:
- *Based on the Year 2006 Water Quality Standards & 2002 Permit Derivation Procedure.*

The acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The water quality based limits are shown on Pages 1 – 3 of this report.

F. Appendix F – Site Survey Approvals

IOWA DEPARTMENT OF NATURAL RESOURCES

GOVERNOR KIM REYNOLDS
LT. GOVERNOR ADAM GREGG
DIRECTOR KAYLA LYON

November 27, 2019

Mr. Matt Mardesen
City Administrator
City of Nevada
1209 6th Street
Nevada, IA 50201

RE: **City of Nevada Wastewater Treatment facility Improvements**
DNR Project #2019-0233A
SUBJECT: **Preliminary Site Investigation & Site Approval**

Dear Mr. Mardesen:

On November 12, 2019 Ms. Anne Hildebrand with the IDNR Field Office in Des Moines, Iowa, conducted a preliminary site investigation for the above-referenced project. The site survey was done in accordance with the Sub rule 567 IAC Chapter 64.2(3) for the proposed wastewater treatment facilities improvements including the construction of the new plant at a new location in Story County, Iowa.

Based upon the site survey report, the site is approvable at this time. Please note that the site approval is preliminary and that further detailed engineering investigations may warrant additional considerations in the future. This approval in no way relieves the Facility from the responsibilities of insuring that the wastewater treatment plant is designed and constructed in accordance with good engineering judgment, and all applicable agency approvals are obtained.

If you have any further questions, please feel free to call me at 515-725-8429 or email me at Suresh.Kumar@dnr.iowa.gov.

Sincerely,

Suresh Kumar, Environmental Engineer/Industrial Coordinator

C: Iowa DNR Field Office 5
City of Nevada Wastewater File 6856200101
Nevada SRF File # CS192094501
HR Green engineering, consultant

THE UNIVERSITY OF IOWA

OFFICE OF THE STATE ARCHAEOLOGIST
700 Clinton Street Building
Iowa City, Iowa 52242
319-384-0732
osa@uiowa.edu
archaeology.uiowa.edu

25 June 2020

Michael Sullivan
Environmental Specialist
Iowa DNR
502 East 9th Street
Des Moines, IA 50319
michael.sullivan@dnr.iowa.gov

RE: Phase I Archaeological Survey, WO 65 DNR Nevada Project, Story County, OSA Technical Report 1326

Dear Mike:

Attached please find the OSA report *Phase I Intensive Archaeological Investigation of the Proposed Nevada Wastewater Treatment Facility Project, Section 31, T83N-R22W, Story County, Iowa*, by Veronica Mraz (TR 1326). As a result of the study no previously recorded archaeological sites were located within the project area and no newly recorded sites were identified. No further archaeological work is recommended in the surveyed areas. The details of our findings are provided in the attached report.

As you know, to complete your archaeological compliance obligations, copies of the enclosed report must also be provided to the appropriate state or federal agencies involved with the project and comment solicited; we assume you will handle this distribution. Keep in mind that agency comments must be received prior to ground-disturbing activities being undertaken within the project area.

The University of Iowa Accounts Payable department will invoice you for this project in about 30 days. If you have any questions, please contact me at 319-384-0937 or via e-mail at william-whittaker@uiowa.edu. Thank you for selecting the OSA for your archaeological service needs and good luck with your project.

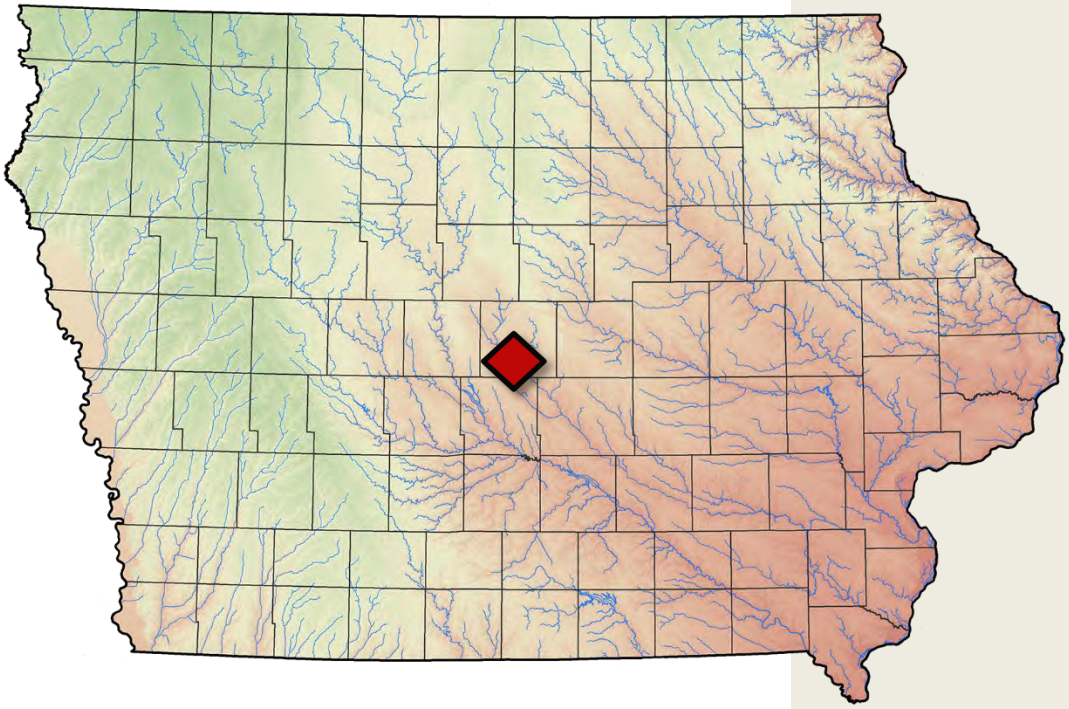
Sincerely,

Bill Whittaker

William E. Whittaker, Ph.D., Research Director

Phase I Intensive Archaeological Investigation of the Proposed Nevada Wastewater Treatment Facility Project, Section 31, T83N-R22W, Story County, Iowa

by Veronica Mraz



Office of the State Archaeologist
The University of Iowa
700 Clinton Street Building
Iowa City, IA 52242

Technical Report 1326
2020

Phase I Intensive Archaeological Investigation of the Proposed Nevada Wastewater Treatment Facility Project, Section 31, T83N-R22W, Story County, Iowa

by Veronica Mraz

William E. Whittaker
Principal Investigator

Prepared for
Iowa Department of Natural Resources
502 East Ninth Street
Des Moines, IA 50319

Contract: 20ESDWQBSKONR-0001
DNR Work Order 065

Prepared by
Office of the State Archaeologist
The University of Iowa
700 Clinton Street Building
Iowa City, IA 52242

Technical Report 1326
June 25, 2020

Information contained in this report relating to the nature and location of archaeological sites is considered private and confidential and not for public disclosure in accordance with Section 304 of the National Historic Preservation Act (54 U.S.C. § 307103); 36 CFR Part 800.6 (a)(5) of the Advisory Council on Historic Preservation's rules implementing Sections 106 and 110 of the Act; Section 9(a) of the Archaeological Resource Protection Act (54 U.S.C. § 100707) and Chapter 22.7 § 20 of the Iowa Code

Abstract

A Phase I intensive archaeological survey was conducted by the University of Iowa Office of the State Archaeologist at the location of the proposed Nevada wastewater treatment facility, Story County, Iowa. The field investigation was conducted on May 26–30, 2020. No artifacts or archaeological features were identified in the survey of the 60 ac parcel. No further archaeological investigation of the area surveyed prior to the proposed project activities is recommended.

Introduction

The Office of the State Archaeologist (OSA) of the University of Iowa has prepared this report under the terms of a cultural resource survey agreement between OSA and Iowa Department of Natural Resources of Des Moines, Iowa. This report records the results of a Phase I archaeological investigation of the proposed Nevada wastewater treatment facility. This project area is situated in the uplands and into the West India Creek valley, in Section 31, T83N-R22W, Story County, Iowa (Figures 1–4). The proposed project involves the construction of four buildings, two ditches, two storage tanks, a pump station with the associated piping, structures, and access road. The area surveyed includes a cultivated field and creek tributary, spanning 25 ha (60 ac).

The Phase I investigation was conducted on May 26–30, 2020 by Veronica Mraz and Dustin Clark and took 54 person hours in the field. Mraz served as report author and William Whittaker served as project director.

The OSA is solely responsible for the interpretations and recommendations contained in this report. All records including maps and figures are curated in the OSA Archives. The National Archeological Data Base Form is included as Appendix I.

Information contained in this report relating to the nature and location of archaeological sites is considered private and confidential and not for public disclosure in accordance with Section 304 of the National Historic Preservation Act (54 U.S.C. § 307103); 36 CFR Part 800.6 (a)(5) of the Advisory Council on Historic Preservation's rules implementing Sections 106 and 110 of the Act; Section 9(a) of the Archaeological Resource Protection Act (54 U.S.C. § 100707) and, Chapter 22.7 § 20 of the Iowa Code.

Geomorphological Context

The proposed project is located within the Iowa landform region known as the Des Moines Lobe. This region is underlain by glacial till deposited during the most recent ice advances into Iowa, approximately 12,000 to 14,000 years ago. The Bemis, Altamont, and Algona end moraines delimit the three major Late Wisconsinan glacial ice margins. The surface of the Des Moines Lobe lacks a Wisconsinan loess mantle (Prior 1991:39–40, 47). Except along major streams, drainage systems are generally not well established. Kettle lakes, eskers, kames, and other features formed by ice wasting and meltwater discharge mark the landscape. Though many wetlands have been drained, the majority of Iowa's natural lakes are located in the region. The Des Moines River and its immediate tributaries deeply incise the till plain, exposing the underlying bedrock in many places.

Holocene alluvial valley fills in Iowa are subdivided on the basis of lithology and stratigraphic relationships into the Gunder, Corrington, Roberts Creek, and Camp Creek members of the DeForest formation (Bettis and Littke 1987). Gunder member alluvium and Corrington member alluvial fans may

contain Paleoindian through Woodland components; Roberts Creek member deposits may contain Late Archaic through early historic components; and Camp Creek member alluvium may contain buried and unburied historic archaeological components, and may bury older surfaces. Three additional DeForest formation members are specific to the Des Moines Lobe. The Flack member is composed of colluvium at the base of hillslopes as a result of sheet wash, rill erosion, and mass movement on upland hillslopes. Deposition is time regressive, dependent on landscape position and factors affecting hillslope stability. The Woden member consists of alternating zones of fine-grained colluvium and organic sediment on semi-closed and closed depressions. The West Okoboji member is composed of sediments associated with the extant lakes on the Des Moines Lobe (Bettis et al. 1996).

Environmental Context

The project area is situated on the southeastern edge of the Des Moines Lobe landform region and associated moraines. The area is in the W½, NE¼ and the SE¼, NE¼ of Section 31, T83N-R22W, Story County, Iowa, 4.5 km south of the City of Nevada and Iowa Highway 30, at an elevation range of 910–960 ft above mean sea level (Figures 1–4). At the time of survey, the project area was a planted agricultural soybean field. The parcel consisted of an irregular area measuring 800 x 500 m in maximum extent. Project area entrances, staging areas, and material storage areas will be within surveyed areas or on nearby paved areas.

Soils of the project area are mapped as Zenor, Clarion, Storden, Coland, Terril, Nicollet, Estherville, and Spillville (Figure 3; Table 1; Artz 2005; DeWitt 1984; USDA 2020). Terril soils series are a part of the Gunder or Corrington Members, which can contain a buried soil, that were typically deposited between 9,000 and 2,500 years BP. These soils can have a high potential for containing archaeological sites. Coland soil series is described as Roberts Creek or Gunder Member. These soils describe DeForest Formation sediments with a gradational contact between the two members with Roberts Creek above the Gunder Member. Roberts Creek sediments were generally deposited between 4,000 and 500 years BP and the Gunder Member has a date range between 10,500 to 3,000 years BP, which provides a high potential for these soils to contain archaeological sites. Spillville soil series is listed as part of the Roberts Creek Member, which is usually Late Holocene in age (4,000–500 years BP). Roberts Creek soils have a high potential to preserve archaeological remains.

Soils in upland settings, such as Zenor and Clarion, have relatively shallow archaeological potential when the parent material predates the earliest human occupation of Iowa and Holocene-aged surface deposition is slow or absent. Movement of artifacts within the soil column is restricted to biologically active horizons. If there is adequate ground surface visibility, larger archaeological sites in plowed upland soils will generally display surface artifacts. Shallow subsurface deposits may exist in unplowed upland areas, and the bottoms of deep human-dug features may be preserved even in plowed areas. Subsurface archaeological testing within these upland settings is usually terminated below the biologically active zone as indicated by the presence of a pedologically formed subsoil (B horizon), relatively unaltered parent material (C horizon), or bedrock (R horizon).

The Landscape Model for Archaeological Site Suitability (LANDMASS) is a useful tool for predicting the suitability of a particular upland landform position for prehistoric habitation (Artz et al. 2006; Riley et al. 2011). The ranking is divided into three suitability rankings: low, moderate, and high, based on logistic regression statistical analysis of how often sites have been found in areas with topographically similar terrain. Based upon the model, the project area is located on a landform with a moderate prehistoric suitability ranking. It is important to note that this predictive model is limited to upland landforms and does not include alluvial settings, such as river valleys and drainages.

Historical and Cultural Context

The Iowa Site Record at OSA, records of previous archaeological surveys nearby (OSA 2020), the National Register Information System web site (National Park Service 2020), the Andreas atlas of Iowa (Andreas 1875), and Story County plat books (Hixson 1930; Huebinger 1902; Kenyon 1919, 1926; Nevada Representative 1908; Warner and Foote 1883) were reviewed for this survey. Other consulted resources included the 1847 General Land Office survey map (ISUGISRF 2020; U.S. Department of the Interior 2020), the Historic Indian Location Database (HILD), and the OSA Notable Locations database of cemeteries and poorly located historic or archaeological locations (Whittaker 2016, 2020).

Historic documentation revealed no buildings or other improvements within the project area, and there are no standing buildings or structures located within the project area (Figures 4–9).

There are four archaeological sites recorded within 1.6 km (1 mi) of the project area: 13SR230, 13SR231, 13SR232, and 13SR233, all prehistoric isolated finds described in detail below. The nearest survey was Martin et al. (2010), located 0.1 km to the east. No sites were recorded near the project area in Martin et al. survey. The HILD reveals no documented historic Native American use of the project area or nearby areas. The Notable Locations database shows one nearby suspected archaeological or historical locations (ID: XX574, possible mounds, located approximately 1.3 km to the northeast).

Site 13SR230 is a prehistoric isolated surface find, located in the SE¼, SW¼ Section 31, T83N-R22W. This site has not been evaluated for the National Register of Historic Places (NRHP). This site was recorded by a private collector, Jimmie Thompson. This site consists of one projectile point and nine lithic chips and chunks. These artifacts were scattered on a south facing hillside terrace several feet above the point of the junction of the flood plains of West Indian Creek and Grant Creek (ditch).

Site 13SR231 is a prehistoric isolated surface find, located in the SE¼, SW¼ Section 31, T83N-R22W. This site has not been evaluated for the NRHP. This site was recorded by a private collector, Jimmie Thompson. This site consists of one scraper, one broken projectile point, and 24 lithic chips and chunks. This site is located on the eastern side of a hillslope adjacent to the west side of Grant Creek (ditch) floodplain.

Site 13SR232 is a prehistoric isolated surface find, located in Section 31, T83N-R22W. This site has not been evaluated for the NRHP. This site was recorded by a private collector, Jimmie Thompson. This site consists of one projectile point, one scraper, and 24 lithic chips and chunks. This site is located on a floodplain between the West Indian Creek and Grant Creek (ditch).

Site 13SR233 is a prehistoric isolated surface find, located in Section 31, T83N-R22W. This site has not been evaluated for the NRHP. This site was recorded by a private collector, Jimmie Thompson. This site consists of five lithic chips and chunks. This site is located west of West Indian Creek and east of an artificial pond.

Archaeological Assessment

METHODS

Ground surface visibility was adequate for pedestrian survey, at 75%. The entire project area was investigated through 10 m interval pedestrian survey. Six soils cores were placed across the upland landforms to verify soil type and determine degree of soil erosion or disturbance. Across the creek terrace six 20 cm diameter auger tests were excavated in a linear transect at 30 m intervals to test for archaeological deposits in buried soils (Figure 4). Auger test soils were removed in arbitrary 10 cm levels to examine soil stratigraphy and were screened with ¼ in hardware cloth. Soils were described using the conventions of Schoeneberger et al. (2012) and Vogel (2002). Maximum test depth was 150 cm.

RESULTS

Several modern bricks, indeterminate pieces of metal, and modern glass artifacts were observed on the surface but are not demonstrably older than 50 years and no buildings or structures were recorded historically in the area. It is likely that these items were brought into the field through typical farming activities such as manure spreading. Soil cores revealed a highly eroded soil profile consisting of a deflated plow zone overlying weak B subsoil horizons.

No artifacts were recovered in auger tests. Auger Test 1 in the southeast part of the survey area revealed a surface comparable to Spillville, comprised of several A loam horizons overlying a dark grayish brown loam C horizon (Tables 1 and 2, Figure 4). None of the auger tests or cores encountered buried A horizons or other buried surfaces suitable for habitation.

Management Recommendations

The Phase I archaeological survey by the OSA of a proposed Nevada wastewater treatment facility project revealed no archaeological material or other cultural deposits. The project area was investigated through pedestrian survey, six soil cores, and six auger tests. The surface of the project area contained glacial till, modern bricks and glass, and short soybean plants. Because of this absence of cultural resources older than 50 years of age, no further archaeological work for this project is recommended.

No technique is completely adequate to locate all archaeological materials, especially deeply buried ones. Therefore, should any cultural, historical, or paleontological resources be exposed as part of proposed project activities, the responsible agency must be notified immediately in accordance with the Protection of Historic Properties regulations of the Advisory Council on Historic Preservation [36 CFR Part 800.13(b)]. If human remains are accidentally discovered, Iowa burial law [Code of Iowa, Sections 263B, 523I.316(6), and 716.5; IAC 685, Ch.11.1] requires that all work in the vicinity of the finding be halted, the remains protected, local law enforcement officials notified, and the Bioarchaeology director at the OSA contacted immediately (319-384-0740). Archaeologists with the OSA (319-384-0937) and the State Historical Society of Iowa (515-281-8744) are also available to consult on issues of accidental discovery.

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Table 1. Project Area Mapped Soils.

Soil Name	ID	Description	I-Sites LSA[1]	Landform	Native Vegetation	Pedon
Clarion	138B1, 138C2	1–9% slopes; very deep, moderately well drained, formed on glacial till	Glacial till	Uplands	Tall grass prairie	Ap-A1-A2-Bw1-Bw2-C1-C2
Coland	201B1	0–5% slopes; very deep, poorly drained formed in alluvium	Roberts Creek/Gunder	Floodplains, alluvial fans in river valleys and upland drainageways	Wet tolerant tall grass prairie	Ap-A1-A2-AB-Bg1-Bg2-Cg
Estherville	34C1	0–70% slopes; very deep, drained soils over sandy and gravelly outwash	Glaciofluvial	Outwash plains, stream terraces, valley trains, and kames on moraines	Tall grass prairie	Ap-A-Bw1-2Bw2-2C1-2C2
Nicollet	55A1	0–5% slopes; very deep, poorly drained, formed in glacial till	Glacial till	Till plains and moraines	Tall grass prairie	Ap-A-B2-Bg1-Bg2-BCg-BCkg
Spillville	485A	0–5% slopes; very deep, moderately drained soils formed in alluvium	Roberts Creek	Floodplains and foot slopes on uplands	Tall grass prairie	A1-A2-A3-C
Storden	62D3, 62E3, 62E1	4–70% slopes; very deep, well drained soils formed in glacial till	Glacial till	Glacial moraines	Tall grass prairie	Ap-Bk1-Bk2-C
Terril	201B1, 8027B1	0–25% slopes; very deep, well drained soils formed in colluvium	Gunder or Corrington	Base slopes, foot slopes, drainageways, swales, toe slopes on alluvial fanes, treads and risers on stream terraces	Tall grass prairie	Ap-A1-A2-A3-A4-Bw1-Bw2-BC
Zenor	828B1	2–30% slopes; very deep, excessively drained soils formed in glacial outwash	Glaciofluvial	Uplands and stream benches	Tall grass prairie	Ap-AB-Bw1-Bw2-BC-C1-C2-C3

[1] Landform/Sediment Assemblage (Artz 2005).

Table 2. Representative Soil Profiles.

Location	Depth (cm)	Description
Soil Core 1	0–17	Ap horizon of very dark gray (10YR 3/1) sandy loam; common fine roots; weak subangular blocky structure; clear boundary.
	17–45	Bw1 horizon of brown (10YR 4/3) sandy clay loam; weak subangular blocky structure; clear boundary.
	45–70	Bw2 horizon of brown (10YR 5/3) to yellowish brown (10YR 5/4) sandy clay loam; pebbles; weak subangular blocky structure.
Soil Core 2	0–20	Ap horizon of very dark brown (10YR 2/2) sandy loam; common fine roots; sand lens at 20 cm; weak subangular blocky structure; gradual boundary.
	20–45	Bw1 horizon of dark yellowish brown (10YR 3/4) mottled with light yellowish brown (10YR 6/4) sandy clay loam; weak subangular blocky structure; gradual boundary.
	45–90	Bw2 horizon of yellowish brown (10YR 5/6) mixed with dark yellowish brown (10YR 4/6) sandy clay loam; weak subangular blocky structure.
Soil Core 3	0–25	Ap horizon of very dark gray (10YR 3/1) sandy loam; common fine roots; weak subangular blocky structure; gradual boundary.
	25–45	Bw1 horizon of dark yellowish brown (10YR 3/4) to dark yellowish brown (10YR 3/6) sandy clay loam; pebbles; subangular blocky structure; gradual boundary.
	45–80	Bw2 horizon of yellowish brown (10YR 5/4) to yellowish brown (10YR 5/6) sandy clay; subangular blocky structure.
Soil Core 4	0–5	Ap horizon of very dark gray (10YR 3/1) sandy loam; common fine roots; gradual boundary.
	5–20	Ap/A horizon of dark yellowish brown (10YR 3/4) sandy loam; common fine roots; weak subangular blocky structure; gradual boundary.
	20–25	Bw1 horizon of dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4) sandy clay loam; subangular blocky structure; gradual boundary.
	25–45	Bw2 horizon of yellowish brown (10YR 5/4) to yellowish brown (10YR 5/8) sandy clay loam; subangular blocky structure.
Soil Core 5	0–20	Ap/AB horizon of dark yellowish brown (10YR 4/4) to dark yellowish brown (10YR 4/5) sandy loam; common fine roots; weak subangular blocky structure; clear boundary.
	20–75	C1 horizon of yellowish brown (10YR 5/4) to yellowish brown (10YR 5/6) with light yellowish brown (10YR 6/4) sand; granular; clear boundary.
	75–80	C2 horizon of brownish yellow (10YR 6/6) fine sand; granular.
Soil Core 6	0–20	Ap horizon of very dark grayish brown (10YR 3/2) sandy clay loam; common fine roots; pebbles; weak subangular blocky structure; clear boundary.
	20–30	Bw horizon of dark yellowish brown (10YR 3/4) to dark yellowish brown (10YR 4/6) sandy clay loam; pebbles; subangular blocky structure; hit rock.
Auger Test 1	0–20	Ap horizon of black (10YR 2/1) sandy loam; fine common roots; pebbles; weak subangular blocky structure; gradual boundary.
	20–75	A horizon of very dark grayish brown (10YR 3/2) sandy loam; faint redox; weak subangular blocky structure; clear boundary.

Location	Depth (cm)	Description
Auger Test 1, cont.	75–90	Bw1 horizon of very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) sandy clay loam; subangular blocky structure; faint redox; hit water table at 80cm; gradual boundary.
	90–140	Bw2 horizon of dark grayish brown (10YR 4/2) sandy clay loam; subangular blocky structure; gradual boundary.
	140–150	Bw3 horizon of dark yellowish brown (10YR 4/6) very sandy clay loam; subangular blocky structure.
Auger Test 3	0–25	Ap horizon of black (10YR 2/1) sandy loam; fine common roots; pebbles; weak subangular blocky structure; gradual boundary.
	25–75	A horizon of very dark grayish brown (10YR 3/2) sandy loam; faint redox; weak subangular blocky structure; hit the water table at 60 cm; clear boundary.
	75–85	Bw1 horizon of very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) sandy clay loam; subangular blocky structure; faint redox; gradual boundary.
	85–95	Bw2 horizon of dark grayish brown (10YR 4/2) sandy clay loam; subangular blocky structure.
Auger Test 6	0–20	Ap horizon of very dark grayish brown (10YR 3/2) sandy loam (wet); sand lens 18–19 cm; weak subangular blocky structure; gradual boundary.
	20–55	A horizon of very dark gray (10YR 3/1) sandy loam; iron redox; subangular blocky structure; clear boundary.
	55–60	? horizon of dark grayish brown (10YR 4/2) to brown (10YR 4/3) sand; granular; clear boundary.
	60–80	Bw1 horizon of very dark gray (10YR 3/1) sandy clay loam; iron redox; subangular blocky structure; clear boundary.
	80–110	Bw2 horizon of dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) sandy clay loam; iron redox; subangular blocky structure.

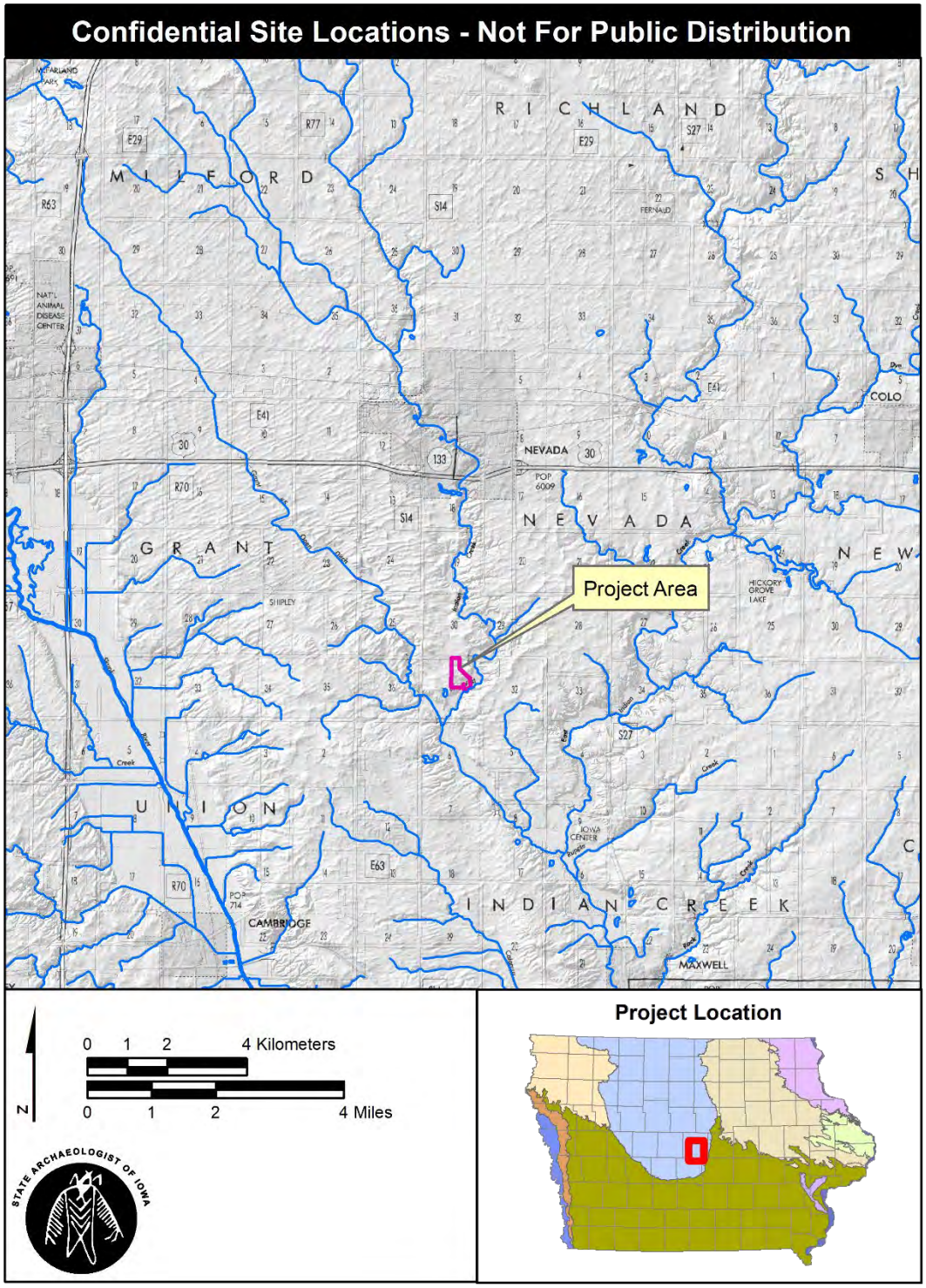

Figure 1. Project location.
From ISUGISSRF (2020).

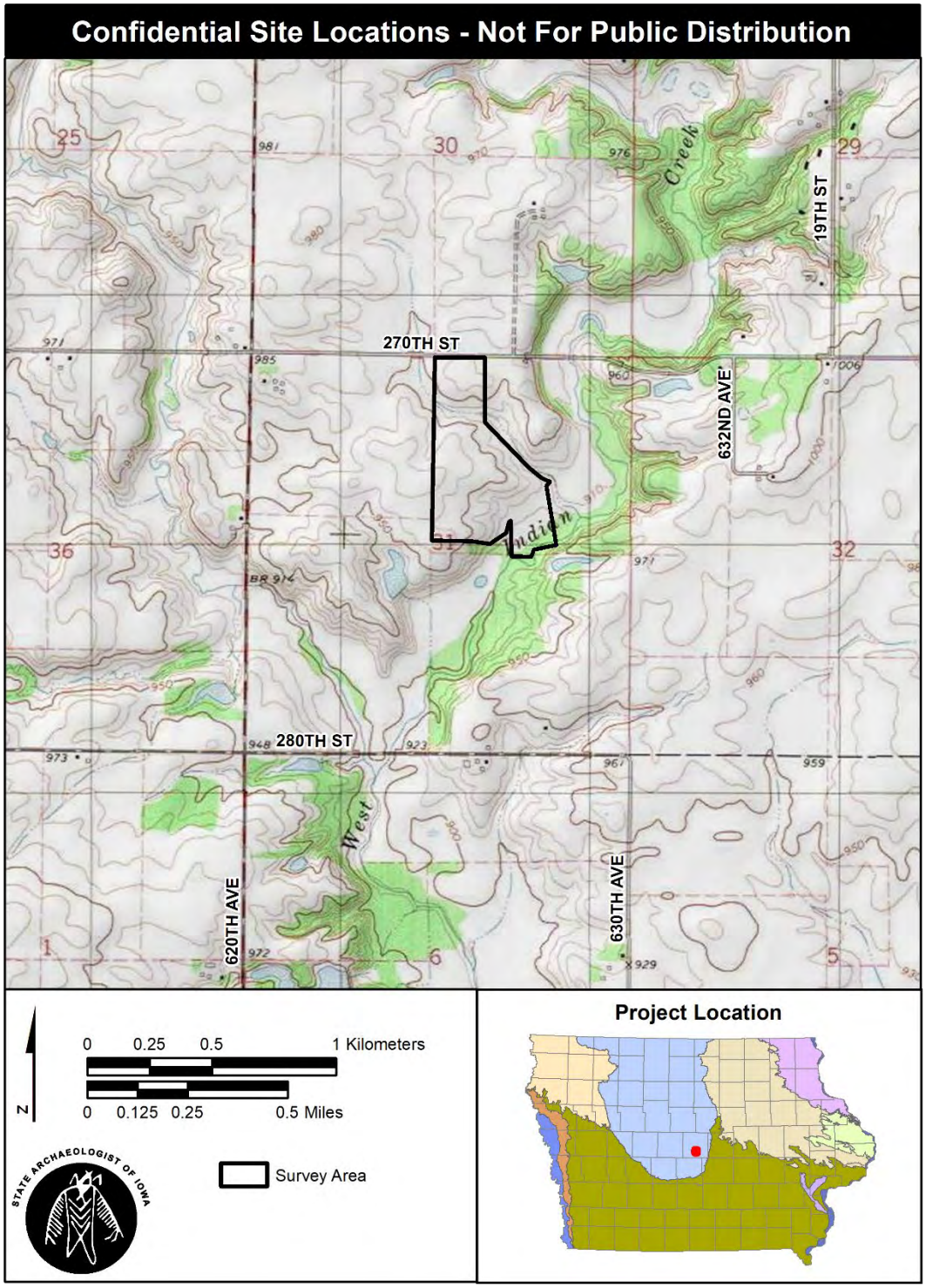

Figure 2. Project location in relation to surrounding topography.
From USGS Maxwell (1975), 7.5' series quadrangle map. Scale 1:24,000.

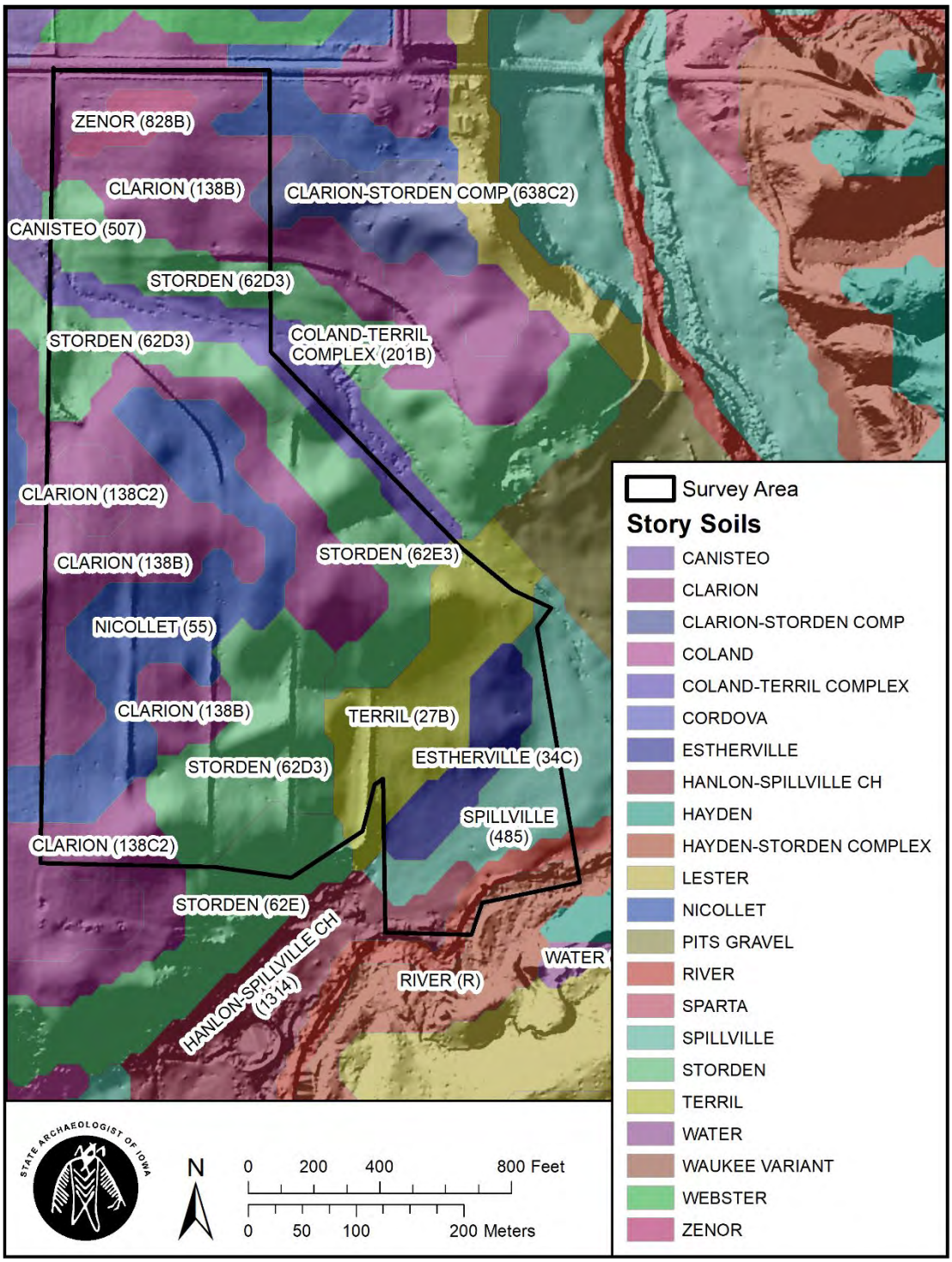

Figure 3. Project location in relation to mapped soil type.
From Iowa Cooperative Soil Survey digitization of Story County, base image is lidar 1-m hillshade map (ISUGISSRF 2020).

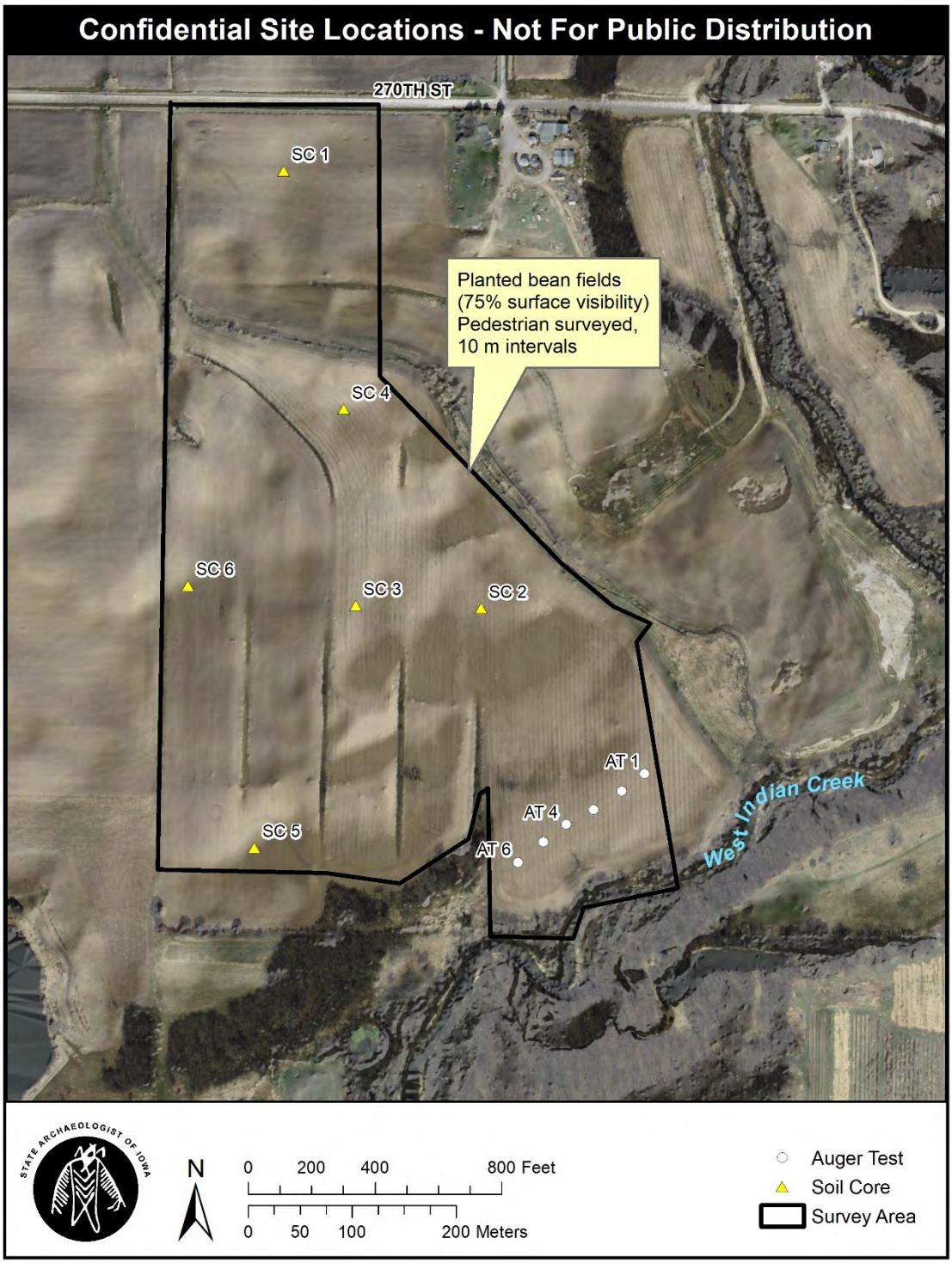

Figure 4. Detail map of project area showing subsurface test locations. Base aerial image: ISUGISRF (2020).

Figure 5. Project area photographs.
Upper: facing north from the northern portion of the project area showing Dustin Clark conducting pedestrian survey. Lower: facing north from the southeast part of the project area.

Figure 6. Project area photographs.
Upper: facing north from the southwest corner of the project area. Lower: facing south taken from the southwest corner of the project area.

Figure 7. Project area photographs.
Upper: facing southeast taken from the western edge of the project area. Lower: facing east from the western edge of the project area.

Figure 8. Project area photographs.
Upper: facing east from the southeast sector or the project area. Lower: facing west from the eastern edge of the project area.

Figure 9. Project area photograph, facing west from the middle of the project area.

Appendix I: National Archeological Data Base - Reports: Data Entry Form

Complete items 3 and 5-14. The State Historic Preservation Office will record information for items 1 through 4.

1. DOCUMENT NO. _____

2. SOURCE _____ AND SHPO – ID _____

3. FILED AT
Office of the State Archaeologist
700 CLSB
University of Iowa
Iowa City, IA 52242

4. UTM COORDINATES

Zone _____Easting_____Northing_____
Zone _____Easting_____Northing_____
Zone _____Easting_____Northing_____
Zone _____Easting_____Northing_____
Zone _____Easting_____Northing_____
Zone _____Easting_____Northing_____

Continuation, see 14.

5. AUTHORS Veronica Mraz

6. YEAR 2020 (year published)

7. TITLE Phase I Intensive Archaeological Investigation of the Proposed Nevada Wastewater Treatment Facility Project, Section 31, T83N-R22W, Story County, Iowa

7. PUBLICATION TYPE (circle one)
4. Report Series

9. INFORMATION ABOUT PUBLISHER/PUBLICATION
Follow the American Antiquity style guide for the type of publication circled.

Technical Report 1326 Office of the State Archaeologist, The University of Iowa, Iowa City.

10. STATE/COUNTY (Referenced by report. Enter as many states, counties, or towns, as necessary. Enter all, if appropriate. Only enter Town if the resources considered are within the town boundaries.)

STATE 1 Iowa COUNTY Story TOWN T83N-R22W

11. WORKTYPE [32] PHASE I

12. KEYWORDS and KEYWORD CATEGORIES

Enter as many keywords (with the appropriate keyword category number) as you think will help a person (1) who is trying to understand what the report contains or (2) who is searching the database for specific information. Whenever appropriate, record the number of acres studied in a document.

[6] Project Area: 60 acres [ ]
[ ] [ ]

13. FEDERAL AGENCY

14. CONTINUATION/COMMENTS (include item no.)

FORM COMPLETED BY

Name Angela Collins Date June 24, 2020

Address Office of the State Archaeologist
700 CLSB
University of Iowa

City Iowa City State IA

Zip 52242

Telephone Number 318-384-0937

G. Appendix G – Stormwater Management Manual

HRGreen

HRGREEN.COM

Stormwater Management Plan

August 12, 2020

HR Green Project No: 160473

Prepared for:

City of Nevada and Story County

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Appendix A: Geotechnical Engineering Report
Appendix B: Existing Topography
Appendix C: Proposed Site Conditions and Topography
Appendix D: Floodplains

Purpose

This stormwater management plan details the site conditions and modifications to meet the requirements set forth by Story County and the Iowa Stormwater Management Manual. The City of Nevada proposes to replace the existing Wastewater Treatment Facility. The existing Wastewater Treatment Facility has insufficient capacity for projected loadings, no nutrient removal capability with existing processes and nearing the end of its useful lifetime. The existing facility has insufficient space to expand the treatment and thus is being relocated to a city-owned site approximately 3.5 miles to the south of the existing wastewater treatment facility.

Methodology

Culvert

Streamstats was used to determine the flow experienced at the upstream end of the proposed culvert system. To ensure that the access road to the wastewater treatment plan, SUDAS guidelines were referenced for the design of the culvert system. SUDAS states that the headwater of the culvert system should not exceed 1 foot below the lowest point of the roadway. Headwater elevations were determined using HY-8 Version 7.50.

Storm Sewer

Rational method was used to determine the pipe sizes for the storm sewers. A significant amount of flow draining to the storm sewers will be added via the roadway ditches aimed to capture the offsite drainage. To ensure that the ditches do not fill up with water, the storm sewer pipes were sized to accommodate flows up to the 100-year design storm. Runoff coefficients were determined by utilizing the results of the geotechnical engineering report. The existing ground and soil data are classified as a poorly drained agricultural field with grass and crop stubble.

Detention

To protect stream channels, the site shall be designed to provide 24-hours of extended detention of the channel protection volume determined for the 1 year, 24-hour storm. To accomplish this, runoff is collected on-site to temporarily store excess runoff. An outfall structure is designed to limit the rate of flow being discharged from the detention area. The outflow rate will be lower than the inflow rate, thus collecting water within the detention area. The detention area shall be large enough to contain the post construction 100-year, 24-hour event and the outlet structure should release at the 5-year, 24-hour storm pre-construction rate. Sizing for the outlet structure was calculated using HydroCAD.

Existing Conditions

The project is located approximately 1.0 miles east of 620th Ave. Per Story County standards, the site soil conditions are to be classified by County Soil Maps. The County Soil Maps located on the NRCS website have not been updated since 1903. To provide more accurate soil data, a geotechnical engineering report was conducted. The report concluded that the existing ground cover is an agricultural field with grass and crop stubble. The existing grades generally slope down from west to east across the site with about 40 feet of total elevation change. An existing swale/drainage way runs northwest to southeast and is located immediately north of the proposed treatment plant. The project site is located near the eastern boundary of a geomorphic region known as the ‘Des Moines Glacial Lobe.” Recent deposits consist of poorly drained material.

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Proposed Solution

Culvert

The new facility is located immediately south of a blue line drainage way according to streamstats. To ensure that flow is not blocked due to the new construction, a triple-54" culvert is being installed along the natural drainage way to convey flow and ultimately outlet to West Indian Creek. The flows for the various storm event were provided by streamstats and the pipe capacity and headwater elevations were calculated using HY-8 Version 7.50. SUDAS standards for roadway crossing state that the 100-year storm event should be conveyed through the culvert without the headwater depth exceeding 1 foot below the low point of the roadway.

TABLE 1: STREAMSTATS FLOWS (CFS)

Storm Event	Flow (cfs)
2-Year	35.10
5-Year	93.20
10-Year	149.00
25-Year	232.00
50-Year	301.00
100-Year	377.00
200-Year	463.00
500-Year	562.00

TABLE 2: HY-8 RESULTS BASED ON STREAMSTATS FLOWS

	Pipe Invert (elev)	Pipe Size (in)	Pipe Type	Headwater Elev (ft)	Velocity (ft/s)
10-Year	942.00	Triple 54"	RCP	944.92	11.35
50-Year	942.00	Triple 54"	RCP	946.58	13.28
100-Year	942.00	Triple 54"	RCP	947.47	14.00

Storm Sewer

The proposed facility design includes a loop roadway which will require additional culverts to maintain drainage pathways to either the existing drainage swale or West Indian Creek. Flows used to determine the culvert size were calculated using rational method. The runoff coefficients for the drainage areas were determined by using the soil and ground cover data as reported by the geotechnical engineering report. The existing ground cover and soil data is noted as poorly drainage agricultural field with grass and crop stubble. The site will also utilize roadway ditches to concentrate and convey the flow to a centralized low point. To ensure that the pipes could adequately drain these low points, the pipes were sized to convey the 100-year flow. The intakes at the low point will be the only constraint, however the ditches have enough capacity to store the 100-year storm event.

TABLE 3: PROPOSED STORM SEWER

	Size (in)	Slope (%)	Pipe Capacity (cfs)	Q Calculated (cfs)
STP-1	30 Arch			22.53
STP-2	24			

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STP-3	15	1.91%	8.93	0.18
STP-4	24	0.50%	16.00	11.42
STP-5	30	0.47%	28.12	21.09
STP-6	15	1.05%	6.62	4.62
STP-7	30	0.60%	31.77	26.08
STP-8	36	1.43%	79.76	71.20

Detention

The new facility will create more impervious area than existing on the current site. Due to the increased impervious area, there is a need for increased detention onsite. Detention calculations and sizing will follow the guidelines set forth by the Iowa Stormwater Management Manual and the Chapter 88 standards provided by Story County.

The stormwater management guidelines provided by Story County state that "stormwater management shall be provided to limit the post development rate of runoff from the site area during the 5-year through the 100-year, 24 hour storm events to the lesser of the following values: runoff rates equivalent to those from a storm event of the same intensity and duration based on predeveloped conditions or runoff rates equivalent to those from the 5-year storm event based on conditions which exist as of the date of the proposed improvements plan." The detention basin is designed to provide 24-hours of extended detention for the channel protection volume (1-year, 24-hour storm). The basin's design will feature a multi-stage outlet structure sized to restrict outlet flow. The restricted flow will mimic natural hydrology during small storm events, therefore reducing the potential for channel erosion.

TABLE 4: DETENTION REQUIREMENTS

	Curve Number	North Detention Basin		South Detention Basin	
		Area (Ac)	Volume (cf)	Area (Ac)	Volume (cf)
Pre-development	85	5.15	53,328	15.67	162,262
Post-development	95	5.15	56,887	15.67	173,091

The proposed detention design will satisfy the requirements for the water quality volume (WQv) and the channel protection volume (CPv). The design rainfall depth to be used for determining the WQv in Iowa is 1.25 inches. Design calculations for WQv can be found in Chapter 2 of the Iowa Stormwater Management Manual (ISWMM). The channel protection volume can be determined using TR-55 with rainfall depths for 1-year, 24-hour storm event (2.73 inches at the project site). Rainfall depths for the project were determined using NOAA Rainfall Data. Both the WQv and the CPv were calculated for the entire site and distributed between the two detention basins as both detention basins will outlet to West Indian Creek.

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TABLE 5: IMPERVIOUS STRUCTURES BREAKDOWN

Structure Type	**Area (cf)**	**% Impervious**
Buildings / Structures	17922	100
Sidewalks	8904	100
Driveways / Pads	35524	100
Access Drive	86039	100
Open Top / Non-Impervious	71546	0
Gravel	3337	100

TABLE 6: WATER QUALITY AND CHANNEL PROTECTION VOLUMES FOR PROPOSED DESIGN

	Volume (cf)
Water Quality Volume	15,074
Channel Protection Volume	40,511

The multi-stage outlet design for the detention basin will have a release rate equal to the runoff rate of the 5-year, 24-hour storm event under pre-developed conditions. The bottom surfaces of the detention basin will hold the WQv and the CPv. The outlet structure elevation will have outlets for the low flow storm events as well as outlets to release the larger storm events at the rate of the small storm events. The outlet structure will also contain an overflow outlet for the storms larger than the 100-year, 24-hour storm event.

TABLE 7: DETENTION BASIN KEY ELEVATIONS

	North Detention Basin	South Detention Basin
Basin Bottom Elevation		
WQv Elevation		
CPv Elevation		
5-Year Pre-developed Outlet Elevation		
100-Year Post-developed Overflow Elevation		

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Appendix A

DRAFT

Geotechnical Engineering Report

Nevada Wastewater Treatment Facility
Nevada, Iowa
May 22, 2020
Terracon Project No. 08205065-01

Prepared for:
HR Green, Inc.
Johnston, Iowa 50131

Prepared by:
Terracon Consultants, Inc.
Des Moines, Iowa

May 22, 2020

HR Green, Inc.
5525 Merle Hay Road
Johnston, Iowa 50131

Attn: Mr. Michael Roth, P.E. – Senior Project Manager
P: (515) 657 5304
E: mroth@hrgreen.com

Re: Geotechnical Engineering Report
Nevada Wastewater Treatment Facility
T83N, R22W, NE ¼ Section 31, Nevada Township
Nevada, Iowa
Terracon Project No. 08205065-01

Dear Mr. Roth:

We have performed geotechnical engineering services for the referenced project in general accordance with Terracon Proposal No. P08205065 dated March 18, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Mark A. Jacobsen II, P.E.
Senior Engineer

Kole C. Berg, P.E.
Senior Associate / Senior Engineer

REPORT TOPICS

INTRODUCTION 1
SITE CONDITIONS 1
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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLAN
EXPLORATION RESULTS
- GeoModels
- Boring Logs (D1 through D10, S1 through S9, and V1 through V5)
- Grain Size Distribution

SUPPORTING INFORMATION
- General Notes
- Unified Soil Classification System

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

Nevada Wastewater Treatment Facility

Nevada, Iowa

Terracon Project No. 08205065-01

May 22, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Nevada Wastewater Treatment Facility to be located south of Nevada, Iowa. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Lateral earth pressures
- Foundation design and construction
- Floor slab design and construction
- Seismic site class per IBC
- Dewatering considerations
- Frost considerations

The geotechnical engineering Scope of Services for this project included the advancement of twenty-four (24) test borings to depths ranging from approximately 15½ to 50½ feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location and Exploration Plan** section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in **Exploration Results**.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	▪ The project is located approximately ½ mile east of the intersection of 270th Street and NE 72nd Street, approximately 3 miles south of Nevada, Iowa. ▪ Latitude/Longitude: 41.9607°, -93.4515° (approximate)
Existing Improvements	None

Item	Description
Current Ground Cover	Agricultural field, grass, crop stubble
Existing Topography	Grades generally slope down from west to east across the site with about 40 feet of total elevation change (between approximate elevations 965 feet to 920 feet). An existing swale/drainageway, running northwest-southeast, is located immediately north of the proposed treatment plant.
Geology	The project site is located near the eastern boundary of a geomorphic region known as the "Des Moines Glacial Lobe". The Des Moines lobe deposits consist of relatively recent, poorly drained glacial material deposited during the Wisconsin glacial period. The glacial material consists of sandy clays, but silts and sand pockets are common, particularly near the surface. Subsurface materials can vary quickly over short distances, particularly near the end terminus of the lobe where the layering of deposits become jumbled. Glacial till soils also contain occasional zones of cobbles and boulders.

PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

Item	Description
Project Description	HR Green is working with the City of Nevada to construct a new wastewater treatment facility that will include a variety of buildings and tank storage facilities.
Proposed Structure(s)	**Heavy Large Volume Tanks:** ■ (580) Biosolids Storage Tanks: two above grade 1.3 million gallon tanks, 100 feet diameter, water depth of 24 feet ■ (520) Aerobic Digestion Tanks: two below grade tanks, 68 feet x 68 feet, embedded 15 to 20 feet, water depth of 24 feet

Item	Description
Proposed Structure(s)	**Intermediate Tanks and Buildings:** ■ (210) Headworks Building: 36 feet by 58 feet concrete structure below grade with masonry superstructure, water depth 9 feet ■ (320) Oxidation Ditch Tanks: two above and below grade tanks, 100 feet by 160 feet, water depth of 15 feet ■ (350) Secondary Treatment Building: 30 feet by 48 feet concrete structure below grade with masonry superstructure ■ (380) Secondary Clarifier Tanks: three totally embedded tanks, 70 feet inside diameter, water depth of 14 feet ■ (550) Solids Processing Building: 40 feet by 68 feet concrete structure below grade with masonry superstructure ■ (420) UV Disinfection Building: 32 feet by 58 feet masonry structure with below grade concrete channels, wet-well water depth of 11 feet **Light Structures / Buildings:** ■ (120) Administration Building and Vehicle Storage Building: 50 feet by 134 feet metal building at grade, ■ (570) Bio-Solids Pump Building: 28 feet by 36 feet below grade concrete basement structure ■ (360) Chemical Storage Building: 14 feet by 29 feet at metal building ■ Engine Generator: 34½ feet by 42 feet at grade concrete structure

Item	Description
Approximate Existing Grade and Foundation Base Elevations **(provided by HR Green)**	**Heavy Large Volume Tanks:** ■ (520) Aerobic Digesters: existing grades = 950 to 956 feet; foundation base elevation = 930 feet ■ (580) Bio-Solids Storage Tanks: existing grade = 953 feet; foundation base elevation = 949 feet **Intermediate Tanks and Buildings:** ■ (210) Headworks Building: existing grade = 950 feet; foundation base elevation = 925 feet ■ (320) Oxidation Ditch Tanks: existing grades = 930 to 947 feet; foundation base elevation = 919 feet ■ (350) Secondary Treatment Building: existing grade = 922 feet; foundation base elevation = 906 feet ■ (380) Secondary Clarifier Tanks: existing grades = 915 to 922 feet; foundation base elevation = 904 feet ■ (420) UV Disinfection Building: existing grade = 915 feet; foundation base elevation = 903 feet ■ (550) Solids Processing Building: existing grade = 951 feet; foundation base elevation = 937 feet **Light Structures / Buildings:** ■ (120) Administration and Vehicle Storage Building: existing grade = 957 feet; foundation base elevation = 952 feet ■ (360) Chemical Storage Building: existing grade = 916 feet; foundation bearing elevation = 917 feet ■ (570) Bio-Solids Pump Building: existing grade = 953 feet; foundation base elevation = 935 feet ■ Engine Generator: foundation bearing elevation = 954 feet

Item	Description
Maximum Loads / Contact Pressures **(provided by HR Green)**	Heavy large volume tanks: ■ Contact pressures of about 1,500 psf based on a tank height of 24 feet ■ Foundation bearing pressures ≥ 2,000 psf Intermediate tanks: ■ Contact pressures of about 600 to 950 psf based on a tank height of 9 to 15 feet ■ Foundation bearing pressures ≥ 1,500 and < 2,000 psf Intermediate buildings: ■ Columns: 75 to 150 kips ■ Walls: 2 to 4 kips per linear foot ■ Suspended Floors: 100 psf ■ Floor Slabs-on-grade: 250 psf ■ Foundation bearing pressures ≥ 1,500 and < 2000 psf Light buildings: ■ Columns: 50 kips ■ Walls: 2 to 3 kips per linear foot ■ Suspended Floors: 100 psf ■ Floor Slabs-on-grade: 250 psf ■ Foundation bearing pressures < 1,500 psf
Approximate Grading/Excavations requirements	We expect fill placement in lower elevations, beneath portions of at grade structures constructed at or above existing grades, and adjacent to structures with below-grade walls. The following are the estimated cuts/excavation depths below existing grade required to develop the base elevation of tanks and the finished floor elevation of buildings: Heavy large volume tank excavation depths: ■ (520) Aerobic Digestion Tanks: 20 to 28 feet ■ (580) Bio-Solids Storage Tanks: 2 to 3 feet Intermediate tanks and buildings excavation depths: ■ (210) Headworks Building: 25 to 26 feet ■ (320) Oxidation Ditch Tanks: 10 to 27 feet ■ (350) Secondary Treatment Building: 11 to 17 feet ■ (380) Secondary Clarifier Tanks: 11 to 18 feet ■ (550) Solids Processing Building: 14 to 16 feet ■ (420) UV Disinfection Building: 12 to 13 feet Light buildings excavation depths: ■ (120) Administration and Vehicle Storage Building: 4 to 5 feet ■ (570) Bio-Solids Pump Building: 17 to 19 feet ■ (360) Chemical Storage Building: N/A, fill thickness < 2 feet

Item	Description
Free-Standing Retaining Walls	We understand that possible retaining walls less than 4 feet in height may be constructed to provide level areas for vehicle access.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical recommendations. Conditions encountered at each exploration point are indicated on the individual logs. The GeoModels, subsurface profiles and individual boring logs can be found in **Exploration Results**.

Stratification boundaries on the GeoModels, subsurface profiles, and boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. As noted in **General Comments**, the characterizations are based on widely spaced exploration points across the site, and variations are likely

As part of our analyses, we identified the following model layers within the subsurface profile. It should be recognized that not all borings encountered the same sequence of soil deposits. For a more detailed description of the model layer and layer depths at each boring location, refer to the GeoModels.

Model Layer	Layer Name	General Description
1	**Topsoils / Local Alluvium / Alluvium**	Approximately 6 to 12 inch Root Zone / Plow Zone Lean Clay, trace to with sand, trace organics (CL) Lean to Fat Clay, trace sand and organics (CL/CH)
2	**Wisconsinan Supraglacial Till**	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	**Glacial Outwash**	Fine to Coarse Grained Sand, trace gravel and varying amounts of silt and clay content (SP, SP/SM, SP/SC)
4	**Wisconsinan Subglacial Till**	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and gravel (CL) Occasional sand seams
5	**Loess**	Lean Clay, trace sand (CL)

Model Layer	Layer Name	General Description
6	**Pre-Illinoian Glacial Till**	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

Groundwater Conditions

The boreholes were observed while drilling, shortly after completion of drilling, and after periods of 3 to 7 days upon completion of drilling for the presence and level of groundwater. The detailed water levels observed in the boreholes can be found on the boring logs in **Exploration Results**, and are summarized in the following table.

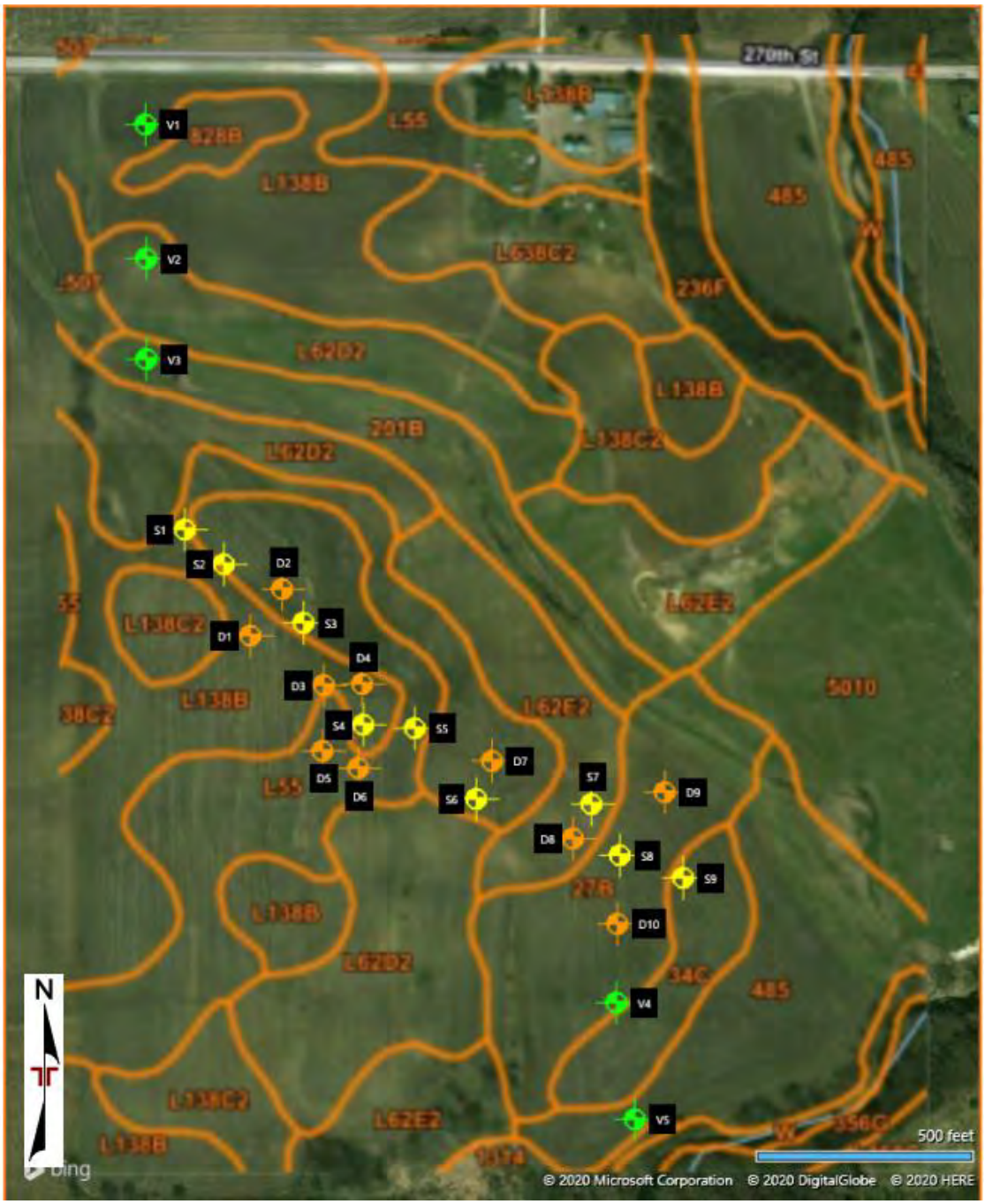
Structure	Nearby Borings	Approximate Depth bgs [1] (Elevations) of Groundwater, feet	
		During Drilling	3 to 7 Days After Drilling Completion [2]
(520) Aerobic Digestion Tanks	D1, D2	19 to 25 (elev. 932 to 933)	1 to 3 (elev. 950 to 955)
(580) Bio-Solids Tank - North (580) Bio-Solids Tank – South	D3, D4, D5, D6	6 to 34 (elev. 919 to 947)	1 to 3 (elev. 949 to 952½)
(320) Oxidation Ditch Tanks	D7, D8, S6, S7	12 to 49 (elev. 880 to 934)	½ to 9 (elev. 925 to 943)
(380) Sec. Clarifier Tank - North (380) Sec. Clarifier Tank - SW (380) Sec. Clarifier Tank - SE	D9 S8 S9	10 (elev. 913) 47 (elev. 873) 11 (elev. 904)	10 (elev. 913) 9 (elev. 911) 2½ (912½)
(350) Sec. Treatment Bldg	D9 S8	10 (elev. 913) 47 (elev. 873)	9 to 10 (elev. 911 to 913)
(360) Chem. Storage Bldg	D10, S9	10 to 11 (elev. 904 to 906)	1½ to 2½ (elev. 912½ to 914½)
(420) UV Disinfection Bldg	D10	10 (elev. 906)	1½ (elev. 914½)
(120) Administration and Vehicle Storage Bldg	S1 S2	11 (elev. 946) None Observed	3 (elev. 954) 3 (elev. 953)
(550) Solids Processing Bldg	D2 S3	19 (elev. 932) None observed	½ to 1 (elev. 950 to 952½)
(570) Bio-Solids Pump Bldg	S4	13 (elev. 940)	2 (elev. 951)
(210) Headworks Bldg	S5	20 (elev. 930)	1 (elev. 949)
Roadways and Utilities	V1 to V5	5 to 8 (elev. 900 to 948)	1 to 2 (elev. 903½ to 954)

1. bgs = Below ground surface
2. Delayed water levels as measured on April 13, 2020

The Natural Resource Conservation Service Web Soil Survey (WSS) indicates the primary near surface soil units at the sites are Clarion Loam, Nicollet Loam, Storden Loam, and Terril Loam with other soil units in portions of the site. The following table summarizes the properties and qualities of the major soil units that will likely be encountered near the ground surface, as mapped and described by the WSS.

Soil Unit Name (Parent Material)	Map Unit Symbol	Drainage Class	Approximate Depth [1] bgs to Seasonal High Water Table, feet
Estherville Sandy Loam (Glacial Till over Glacial Outwash)	34C	Somewhat excessively drained	> 6½
Zenor Sandy Loam (Glacial Outwash)	828B	Somewhat excessively drained	
Storden Loam (Glacial Till)	L62E2	Well drained	
Storden Loam (Glacial Till)	L62D2	Well drained	5 to 6
Clarion Loam (Glacial Till)	L138B	Well drained	4 to 5
27B Terril Loam (Colluvium)	27B	Well drained	3 to 4
Nicollet Loam (Glacial Till)	L55	Somewhat poorly drained	1 to 2
Spillville Loam (Alluvium)	485	Somewhat poorly drained	
Coland-Terril Complex (Alluvium)	201B	Poorly drained	0 to 1

1. bgs = Below natural ground surface



(Source: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be different than the levels indicated on the boring logs. The possibility of shallow groundwater and groundwater level

fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Foundation Support

Due to the approximate 40 feet of grade difference across this site, proposed final grades, and structure bearing elevations, variable subsurface conditions should be expected beneath the proposed structures. In general, structures founded deeper in the subsurface profile could likely be founded on suitable, stiff to very stiff glacial till soils. Structures founded within the upper portion of the subsurface soil profile will likely encounter more variable support conditions. Lightly to moderately loaded structures utilizing relatively low bearing pressures could be founded within the upper profile whereas moderately to heavily loaded structures may require overexcavation and replacement with structural fill to provide improved bearing support. As an alternative to overexcavation and replacement procedures, rammed aggregate piers should be considered to provide improved bearing support while utilizing higher bearing pressures. We anticipate three general bearing conditions for structures will be encountered.

- **Bearing on suitable cohesive glacial till or granular glacial outwash soils or newly placed structural fill (if necessary):**

  We anticipate that suitable glacial till or glacial outwash soils will be encountered at planned foundation levels for the:
  - 120 Administrative and Vehicle Storage Buildings (Borings S1 and S2)
  - 520 Aerobic Digesters (Borings D1 and D2)
  - 550 Solids Processing Building (Boring S3)
  - 570 Bio-Solids Pump Building (Boring S4)
  - 210 Headworks Building (Boring S5)
  - 320 Oxidation Ditch Tanks (Borings D7, D8, S6 and S7)
  - 420 UV Disinfection Building (Boring D10)
  - Engine Generator

  We anticipate that foundations will likely bear on newly placed structural fill placed during initial grading operations for the:
  - 360 Chemical Storage Buildings (Borings S9 and D10)

Relatively conventional foundation design and construction considerations are considered appropriate at these facilities. Foundations bearing on suitable natural glacial till or glacial outwash or on newly placed structural fill can be designed for net allowable bearing pressures ranging between 1500 and 3000 pounds per square foot.

- **Bearing newly placed structural fill:**
  Relatively low strength soils were encountered at planned slab and/or foundation levels for the:
  - 580 Bio-Solids Storage Tanks (Borings D3, D4, D5 and D6)
  - 350 Secondary Treatment Building (Borings S8 and D9)
  - 380 Secondary Clarifier Tanks (Borings D9, S8 and S9)

  To provide more uniform support for slabs as well as spread foundations, we recommend undercutting soils below the base of foundation excavations to provide an adequate thickness of structural fill below foundations. For extensive, deep overexcavation and replacement procedures (e.g., under the proposed Bio-Solids Storage Tanks), either cohesive or granular structural fill may be used to support the proposed slabs and foundations. The selection of either cohesive and/or granular material beneath the Bio-solids Storage Tanks may depend upon how well groundwater levels are controlled in this area. Typically, clean, coarse granular material will be required where water is allowed to pond and soften the exposed subgrade.

  We would recommend that granular structural fill be utilized to provide improved foundation support for the proposed Secondary Treatment Building and Secondary Clarifier Tanks. Additionally, ground improvement (i.e., rammed aggregate piers, stone columns, etc.) could be considered as an alternative to overexcavation and replacement procedures. Rammed aggregate piers or stone columns could be utilized to increase allowable bearing pressures while possibly reducing settlements. More information about the ground improvement option can be found in **Shallow Foundation Support on Ground Improvement**.

More details on foundation support can be found in **Shallow Foundations**.

Groundwater and Subsurface Drainage

Based on the groundwater levels observed in the borings and the potential for water seepage, groundwater will likely be encountered in excavations during construction (e.g., broad excavation areas for below grade structures, excavations for utilities, foundations, etc.). Dewatering will be required where seepage is encountered and should be addressed in advance of construction. The contractor is responsible for employing appropriate dewatering methods to control seepage and facilitate construction.

Continuous influx of moisture seepage due to excavating below groundwater levels will make earthwork and preparation of the subgrades for floors and foundations more difficult. In relatively shallow excavations encountering predominantly cohesive soils, subsurface drainage methods might be able to consist of shallow ditches or trench drains (temporary or permanent) around the perimeter of the excavations to help intercept seepage. A series of sump pits and pumps might be adequate to remove accumulating water.

As discussed with the design team, consideration should be given to install interceptor drain lines around structures that will require deeper excavations well in advance of earthwork construction. The interceptor drain lines should be sloped to gravity drain and daylight to drainage areas. Based on our experience with similar soil profiles, we expect the majority of the moisture seepage will be encountered or perched within the upper Wisconsinan supraglacial till, above the Wisconsinan subglacial till soils. We envision that an interceptor drainage system installed and embedded a minimum of 1 foot into the Wisconsinan subglacial till will intercept the majority of the moisture seepage. More significant seepage could occur in deeper excavations where sand seams and sand layers are encountered, such as within the southeastern portion of this site within the vicinity of Borings D9, D10 and S8.

Boring information indicates granular glacial outwash is likely to be encountered at the base of excavations for the Secondary Treatment Building, UV Disinfection Building and the Secondary Clarifier Tanks. Where excavations terminate in sands or very sandy cohesive soils and cut off trench drains are not adequate to control collection and removal of water, then other dewatering systems, such as well points, will likely be needed to maintain water levels a minimum of 2 feet below the anticipated excavation depths. We recommend groundwater levels be lowered and maintained a minimum of 2 feet below the anticipated base of excavations encountering sand or very sandy soils to reduce the potential for buoyancy or “quick” sand boil conditions.

We recommend the installation of at least 8-inch thick crushed stone working mat (or thickness selected by the contractor) at the base of excavations to reduce potential for subgrade disturbances during construction. Installation of permanent drain lines within the structure footprint after excavation and placement of a working mat of crushed stone should be considered. The drain lines could serve as permanent drainage below the new structures along with a design thickness of granular drainage layer (see section **Below-Grade Structures**).

EARTHWORK

Excavation Considerations

Excavations up to about ±20 feet below existing grades are anticipated at this site. We expect that the majority of the excavations at this site will encounter predominately cohesive glacial till

soils with random sand seams and layers. Boring information within the southeast portion of this site, within the vicinity Borings S8, S9, D9 and D10, very sandy cohesive soils and/or thicker deposits of granular glacial outwash should be anticipated within the predominately cohesive glacial till deposits and these granular soils will be present near or immediately below the planned base of excavations. Unbraced excavations would possibly encroach upon adjacent structures or utilities. There is a risk that sloughing of sloped excavations will occur while the excavations remain open during construction, and a series of benches or flattened zones could be necessary to maintain stability. Excavation side slopes should be protected from erosion by diverting surface water away from the excavations.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions. Contractors, by their contract, are usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

To reduce the overall width required to complete excavations, and the associated zone of backfill, installation of earth retention systems (i.e., permanent or temporary shoring) would be needed. Design and installation of shoring systems should be provided by the contractor to allow for construction of the planned structures and should consider the impacts of groundwater.

Site Preparation

Site preparation should include stripping of all vegetation, organic soils, crop stubble, root systems, frozen soils, and other unsuitable materials from the site surface. Generally, site stripping depths are expected to range between 1 to 2 feet to adequately remove the plow zone and/or to remove soils containing organics from this existing agricultural field. Deeper stripping depths may be necessary in isolated areas or in topographically lower areas of the site where thicker vegetation, organic soils, or very soft soils may be present, such as near the existing waterway.

After any necessary stripping and performing any cuts or excavations to develop the planned subgrade levels for at-grade structures, the exposed subgrades should be evaluated to determine that suitable low plasticity (LL ≤ 45 and PI ≤ 23) material is present and extends to depths of at least 1½ feet below the base of grade-supported slabs. Boring information indicates that the majority of the near surface soils consist of low plasticity soils. However, where moderate to high plasticity soils (LL > 45 and PI > 23) are encountered immediately below grade-supported floor slabs, such as for the UV Disinfection Building, additional undercutting of the site soils will be needed to develop the recommended thickness of low plasticity soils below grade-supported floor

slabs. We recommend grade-supported slabs be constructed on a minimum of 1½ feet of low plasticity soils in order to reduce the potential for subgrade volume changes from causing distress to grade-supported slabs. Boring information indicates that moderate plasticity soils were encountered at the ground surface in Borings D10, V3, V4 and V5.

Lower-strength, high moisture content cohesive glacial till soils and/or loose granular glacial outwash soils are anticipated at the base of some excavations. If necessary, the structures' footprints in these areas should be undercut below the design aggregate base level below floor slabs in buildings and base elevations in tanks to provide at least 8 inches of crushed stone (or thickness selected by the Contractor) to help reduce subgrade disturbance and provide an all-weather working platform. Greater thicknesses of crushed stone may be required in some areas to achieve a stable subgrade, depending on the Contractor(s) intended use and type of equipment that will operate on the subgrade.

Following stripping operations and undercutting of low strength soils, and prior to placement of new fill, the at-grade structure areas should be proof-rolled with heavy, rubber tire construction equipment, to aid in delineating near surface areas of low density, soft, or otherwise unsuitable soil that may require additional removal prior to construction. Proofrolling should be accomplished using a fully loaded, tandem axle dump truck or other equipment providing an equivalent subgrade loading (minimum gross weight of 25 tons is recommended for the proofrolling equipment). Unstable areas identified by proofrolling should be undercut to expose stable material and backfilled with low plasticity structural fill. Proofrolling of subgrades in below grade structure areas is not necessary; however, the exposed soils at the base of excavations should be evaluated during excavation and during the recommended compaction process. Unsuitable areas observed at these times should be corrected prior to construction.

Terracon should be retained to develop a thorough observation and testing program. The testing should be performed prior to and during construction.

Subgrade Stabilization

Subgrades disturbed by precipitation and construction activity or found to be unsuitable during surficial compaction or proofrolling should be improved before new fill or the aggregate base and ground-supported slabs are placed. Terracon should be retained to discuss stabilization options. Potential methods of subgrade improvement are described below. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs.

- **Scarification and Compaction** – Soils can be scarified, moisture conditioned (i.e., dried or wetted), and compacted. The success of this procedure depends primarily on favorable weather and sufficient time to manipulate the soils. Even with adequate time and favorable weather, stable subgrades may not be achieved if the thickness of the unstable material is greater than about 1 to 1½ feet.

- **Undercut and Replacement with Crushed Stone/Aggregate** – The use of crushed stone, crushed concrete, and/or gravel could be considered to improve subgrade stability. To limit depths of undercuts, the use of a geosynthetic (i.e., a geogrid or a high-modulus geotextile) could be considered after underground work, such as utility construction, is completed. Equipment should not be operated above the geosynthetic until one full lift of crushed stoned/aggregate is placed above it. The maximum particle size of material placed over a geosynthetic generally should not exceed 1½ inches. Gradation requirements for backfill materials provided by the geosynthetic product manufacturer should be verified prior to material purchase and delivery to the site.

- **Chemical Treatment** – Chemical modification or stabilization of high water content soils can be accomplished with hydrated lime, Class C fly ash or portland cement. Chemical treatment should be performed by a pre-qualified contractor having experience with successfully stabilizing subgrades on similar sized projects with similar soil conditions. The use of chemical agents can impact the operation of adjacent facilities (e.g., wind-blown dust), and this should be considered by the designer and contractor. Terracon should be notified prior to selection of a chemical stabilization agent to allow time for a review the material's source and chemical constituents data sheet. For estimating purposes, the incorporation rate for portland cement is typically 4 to 6 percent (on a dry soil unit rate basis), whereas Class C fly ash is typically 12 to 15 percent (on a dry soil unit rate basis).

Structural Fill Material Types

We anticipate the majority of earthwork grading operations will include utilizing the near surface inorganic portions of the topsoil, the near surface cohesive glacial supraglacial till, and deeper subglacial till deposits which will likely consist of lean clay and sandy lean clay soils.

Structural fill should meet the following material property requirements.

Soil Type [1]	USCS Classification	Acceptable Location for Placement
On-site cohesive soils [2, 3]	Lean clay (CL), sandy lean clay (CL), or lean to fat clay (CL/CH)	n Site soils with LL ≤ 45 and PI ≤ 23 could be used below aggregate base for grade-supported slabs n Site soils with LL > 45 and PI > 23 could be used more than 1½ feet below grade-supported slabs n Outside granular drainage zones adjacent to below-grade walls [4]
Imported low plasticity cohesive soils [3]	CL Non-organic with LL ≤ 45 and PI ≤ 23 [2]	n Below aggregate base for grade-supported slabs n Below foundations and the aggregate base below-grade floor slabs in overexcavations n Outside granular drainage zones adjacent to below-grade walls [4]
Imported granular material [5]	GW, GP, GM, GC SW, SP, SM, SC	n Below aggregate base for grade-supported slabs n Below foundations and below aggregate base below-grade floor slabs in overexcavations n Backfill adjacent to below-grade walls [4]
Unsuitable soils	ML, OL, OH, PT	n Non-structural locations n Importing moderate to high plasticity (MH and CH) cohesive soil is not recommended

1. Structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to Terracon for evaluation prior to use on this site.
2. Structural fill within 1½ feet of the floor slabs in the building/structure areas should consist of low plasticity materials. By our definition, low plasticity materials should have a liquid limit of 45 or less and a plasticity index of 23 or less (ASTM D 4318).
3. Fine grained material (e.g., clays) can be difficult to compact in relatively small areas (e.g., excavations for foundations or utilities). Moisture conditioning (e.g., drying) would be necessary to achieve compaction requirements if fine grained material is used as structural fill for this project.
4. Recommendations for backfill material for walls constructed to retain soils, such as cast-in-place concrete walls and retaining walls, are included in section **Lateral Earth Pressures**.
5. Specific material requirements will need to be satisfied based on the intended use.

Structural Fill Compaction Requirements

As previously mentioned, extensive grading operations and excavations up to 20 feet are expected at this site to provide the desired final grades or structure foundation grades. We anticipate the majority of earthwork operations will consist of excavating and reusing the cohesive Wisconsinan glacial till soils. Boring information suggests that the near surface, cohesive supraglacial till soils, granular glacial outwash, and the cohesive alluvium, encountered in the lower areas of this site, were generally slightly above to well above the recommended water content range for compaction. The deeper cohesive subglacial till soils were generally near to slightly above the recommended water content range for compaction. Cohesive or granular soils to be excavated and reused as general grading fill in other areas of this site, including as structural

fill beneath structures, will likely require adjustment of the soils' water content in order to lower or raise the moisture to within the recommended water content range.

Structural fill should meet the following compaction requirements.

Item	Description
Fill lift thickness	n 9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used n 4 inches in loose thickness when hand equipment (e.g., jumping jack, vibratory plate compactor, etc.) is used
Compaction of cohesive soil [1, 2]	n At least 95% n At least 98% beneath foundations
Compaction of granular material [1, 2, 3]	n At least 98%
Moisture content of cohesive soil [1]	n Within the range of 0% to +4% of the optimum water content at the time of placement and compaction.
Moisture content of granular material [4]	n Workable moisture levels

1. Compaction values and moisture contents are relative to the materials' standard Proctor maximum dry unit weight and optimum water content (ASTM D698).
2. We recommend structural fill be tested for compaction and moisture content during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. If the granular material is a coarse sand or gravel, is of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254).
4. Specifically, the moisture content of the granular material should be at a level to achieve compaction without the granular material bulking during placement or pumping when proofrolled.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction, including backfill placement and compaction. If utility trenches are backfilled with relatively clean coarse-grained material, they should be capped with at least 18 inches of low permeability cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are a common source of water infiltration and migration. Utility trenches constructed in cohesive soils that penetrate beneath structures or equipment that are sensitive to moisture should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the structure. We recommend constructing an effective clay "trench plug" of either low permeability clay soil or flowable fill that extends a sufficient distance from the face of the structure. If clay soils are used for the plug, the material should be compacted at or above the soil's optimum water content. The clay soil or flowable fill should be placed to completely surround

the utility line and any granular envelope and be compacted or placed in accordance with recommendations in this report. Care should be taken as to not damage the in-place utility.

We understand that some site utilities may not be embedded to frost depth. The natural cohesive soils encountered at this site are frost susceptible. Utilities not supported at or below frost depth and exposed to freezing temperatures can be subjected to frost heave movements. We recommend that utilities not embedded below frost depth be constructed to bear on 2 or more feet of low-frost susceptible granular material. We recommend the low-frost susceptible material consist of a well graded, clean granular material with less than 6% passing the No. 200 sieve. As an alternative to extending the low-frost susceptible granular fill to the full frost depth, consideration can be made to placing extruded polystyrene or cellular concrete under a buffer of at least 2 feet of low-frost susceptible fill.

Vehicular traffic over shallow utilities may result in distress or damage to the utilities. Considerations could be given to placing geogrid and rock over the top of the shallow utilities to spread out vehicular loads and help protect the utilities. As an alternative and depending upon vehicular loads and repetition, a concrete slab could be constructed over the top of shallow utilities to provide further protection.

Grading and Drainage

Adequate drainage should be provided on the site during construction and final grades should slope away from structures in order to divert surface water. Excessive moisture can significantly reduce the support capability of cohesive soils and contribute to soft subgrades and difficult earthwork operations. During earthwork operations, exposed subgrades should be properly sloped to provide rapid drainage so that risks of saturation of the subgrades can be reduced. The soil types observed in the borings are easily eroded by surface water, so appropriate erosion control measures should be provided.

All surface water that accumulates on subgrades should be removed as soon as possible. Excavations for foundations might extend beneath the typical groundwater levels and/or encounter perched water in the upper soil strata during and following wet seasons. Groundwater which collects in excavations should be removed as soon as possible. Removal of groundwater from excavations encountering cohesive soils can usually be accomplished by using a sump pit and pump system. More extensive dewatering systems will be required where excavations extend below seasonal groundwater levels or where sand seams are encountered. The contractor is responsible for employing appropriate dewatering methods to control seepage and facilitate construction.

Positive drainage away from the structures should be incorporated into the design plans. Ponding of water adjacent to the structure foundations could contribute to moisture increases in the subgrade soils and subsequent loss of strength and/or possible settlement.

Earthwork Construction Considerations

Although the exposed subgrade is anticipated to be relatively stable upon initial exposure, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop, stabilization measures will need to be employed. Terracon should be contacted to discuss alternatives to stabilize subgrades.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe working conditions (if applicable). Temporary excavations will likely be required during grading operations and installation of utilities. Contractors, by their contract, are usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of the grade-supported slabs. Moderate to high plasticity soils should not be allowed to dry out prior to construction. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to grade-supported slab construction.

By conducting this exploration and site characterization, Terracon is in an advantageous and beneficial position to observe and evaluate conditions exposed during construction and compare to the findings of the exploration, which would assist in resolutions if variations are present. Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of grade-supported slabs.

Construction Observation and Testing

The earthwork efforts should be observed and tested by a representative of the Geotechnical Engineer. Observation and testing should include documentation of adequate removal of

vegetation and topsoil, proofrolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the substation area. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by a representative of the Geotechnical Engineer. In the event unanticipated conditions are encountered, the Geotechnical Engineer should be contacted to discuss mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Spread Footing Foundation Design Recommendations

Item	Bearing on Suitable Natural Soils or on Structural Fill [1]	Low Strength and/or Variable Bearing Conditions [2, 3]
Required bearing materials [4]	n Medium stiff to stiff, cohesive glacial till or medium dense, granular glacial outwash soils [7, 8] n Stiff to very stiff cohesive glacial till or medium dense to dense granular glacial outwash [9, 12] n Adequate thickness of structural fill, as required, extending to suitable natural soils [10, 11, 13]	n A minimum of 2 feet or more of granular structural fill [10] n A minimum of 3 feet or more of granular structural fill [11] n Foundations bearing on 5 or more feet of cohesive or granular structural fill [13]
Maximum net allowable bearing pressure [4, 5]	n 1,500 psf [7] n 2,000 psf [8] n 2,500 psf [9] n 3,000 psf [12]	n 2,500 psf [10] n 2,500 psf [12] n 3,000 psf [13]
Estimated total settlement [6, 7]	n 1 inch or less	n 1 inch or less

General Foundation Design Recommendations	
Estimated settlement [14]	n 1 inch or less total settlements n About ⅔ of total settlement
Minimum foundation dimensions	n Column footings: 30 inches n Continuous footings: 18 inches
Minimum embedment below finished grade [15]	n Exterior footings: 42 inches n Interior footings in heated areas: 16 inches
Ultimate passive pressure [16] (equivalent fluid density)	See the **Lateral Earth Pressures** in **Below-Grade Structures** section
Ultimate coefficient of sliding friction [17]	

1. Conditions present in borings near Administrative and Vehicular Storage Buildings, Chemical Storage Building, UV Disinfection Building, Bio-Solids Pump Building, Oxidation Ditch Tanks, Aerobic Digesters, Solids Processing Building and Headworks Building. We anticipate the Engine Generator will be constructed near existing grades and will be founded on medium stiff to stiff natural glacial till soils.

Continued on Page 22

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2. Conditions present in borings near Secondary Treatment Building, Secondary Clarifier Tanks, Bio-Solids Storage Tanks. Also see **Shallow Foundation Support on Ground Improvement** for other considerations.
3. Unsuitable or low strength soils should be undercut and replaced according to the recommendations presented in the **Spread Footing Foundation Construction Considerations** section.
4. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
5. Values provided are for maximum loads noted in the **Project Description** section.
6. Foundation settlement will depend on the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of structural fill, and the quality of the earthwork operations.
7. Administration and Vehicular Storage Building, Chemical Storage Building, UV Disinfection Building, Engine Generator
8. Bio-Solids Pump Building
9. Oxidation Ditch Tanks
10. Secondary Treatment Building
11. Secondary Clarifier Tanks
12. Aerobic Digesters, Solids Processing Building, Headworks Building
13. Bio-Solids Storage Tanks
14. Frequent control joints in the structure and sufficiently flexible connections are recommended help to accommodate differential settlement across the length of the building.
15. Embedment necessary to minimize the effects of frost and/or seasonal water content variations.
16. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. The portion of the passive resistance pressure distribution in the upper 3½ feet of the soil profile in exterior locations should be neglected due to frost effects. We also recommend that the upper 1½ feet of the passive pressure distribution be neglected for footings within climate controlled interior locations. Some horizontal movement of the foundation must occur to mobilize passive resistance.
17. Sliding friction along the base of the footings will not develop where net uplift conditions exist

Spread Footing Foundation Construction Considerations

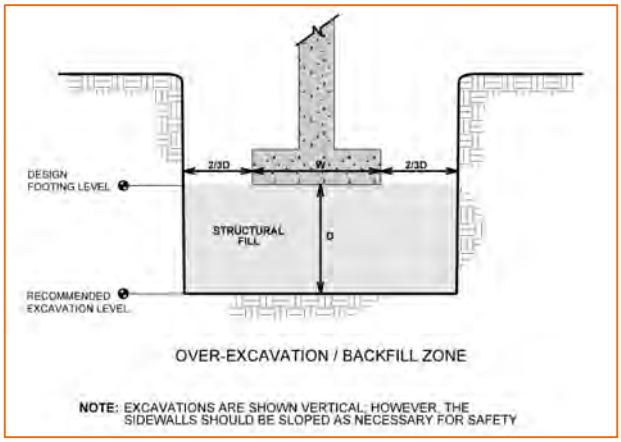
As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The use of earth formed “trench” footings generally appears feasible in the on-site cohesive soils, However, forming of footings would be required in areas where low strength soils are removed and replaced with overexcavation and backfill procedures, or where foundation excavations extend beneath granular working surface layers.

Where lower strength native cohesive soils exhibiting unconfined compressive strengths less than the recommended net allowable soil bearing pressure (determined by field tests such as hand penetrometer, static cone penetrometer, vane shear, etc.) are encountered within 2 feet below

the structure's foundation bearing elevation, overexcavations should extend to the greatest of the following depths in order to develop recommended thicknesses of structural fill below spread footing foundations:

- 50% of the width of isolated foundations,
- 100% of the width of continuous foundations, or
- 2 feet

The overexcavations for compacted structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well-graded granular material (e.g., approved granular materials containing less than 10% passing the No. 200 sieve) placed and compacted as recommended in the **Earthwork** section of this report. The overexcavation and backfill procedure is illustrated in the adjacent figure. Lean concrete could also be used to backfill the overexcavations and widening of the exactions as described above would be required, unless suitable strength soils are encountered at the base of the deepened excavations.



The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. If foundation excavations will need to be left exposed for extended periods, we suggest that the initial excavations be deepened slightly, and a concrete mud mat or layer of compacted crushed stone be placed as a working surface to reduce potential weakening and disturbance.

SHALLOW FOUNDATION SUPPORT ON GROUND IMPROVEMENT

A proprietary ground improvement system (e.g., rammed aggregate piers, stone columns, etc.) could be considered to reinforce or strengthen lower strength soils encountered at some of the structure locations to improve or provide more uniformity for support of spread footing foundations. These ground improvement systems improve the support capability of the site soils and reduce the potential for excessive total and differential settlement of shallow foundations supported above the reinforced soil subgrade.

Structure sites that are anticipated to encounter relatively lower strength foundation soils include:

- Secondary Treatment Building
- Secondary Clarifier Tanks
- Bio-Solids Storage Tanks

The ground improvement systems consist of densified aggregate piers or columns (typically 18 to 30-inch diameter). When properly designed and installed, these systems can develop relatively higher allowable bearing pressures for spread footing foundations while maintaining structure settlements within tolerable magnitudes. The contribution of settlement of deeper soils that are not reinforced by these methods needs to be considered.

Ground improvement systems are proprietary designs and are designed and installed by a specialty contractor. Due to the specialty of these soil improvement procedures, we recommend that a performance specification be used (i.e., designate a desired range of foundation bearing pressure and tolerable settlement). We would be pleased to provide additional information and references regarding these ground improvement alternatives, upon request.

The spread footing foundations supported above ground improvement systems can then be designed and constructed by conventional means. General foundation design parameters are provided in the following table.

Description	Value
Bearing conditions, and Net allowable bearing pressure [1]	n Proprietary ground improvement system n Allowable bearing pressure: determined by proprietary designer (estimated to be in range of 4,000 to 6,000 psf)
Minimum footing widths	n Continuous footings: 18 inches n Column footings: 30 inches
Minimum embedment below finished grade for frost protection [2]	3½ feet
Estimated total settlement [3]	Typically 1 inch or less (to be determined by proprietary designer)
Estimated differential settlement [3, 4]	Typically ⅔ to ¾ of the total settlement (to be determined by proprietary designer)
Ultimate passive pressure [5] **(equivalent fluid density)**	See the **Lateral Earth Pressures** in **Below-Grade Structures** section
Ultimate coefficient of sliding friction [6]	

Description	Value
Continued from Page 24	
1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. The allowable bearing pressure used for design of the foundations could be increased by 1/3 for use with the alternative load combination given in Section 1605.3.2 of the IBC if confirmed by proprietary designer. 2. Minimum embedment may also reduce the effects of seasonal moisture variations in the subgrade soils. Minimum embedment applies to perimeter footings and footings beneath unheated areas. Where interior footings will not be subject to freezing weather and large moisture fluctuations during or after construction, the minimum embedment below top of slab could be reduced to 1½ feet. 3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of structural fill, and the quality of the earthwork operations. 4. Frequent control joints in the structure and sufficiently flexible connections are recommended help to accommodate differential settlement. 5. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. The portion of the passive resistance pressure distribution in the upper 3½ feet of the soil profile in exterior locations should be neglected due to frost effects. We also recommend that the upper 1½ feet of the passive pressure distribution be neglected for footings within climate controlled interior locations. Some horizontal movement of the foundation must occur to mobilize passive resistance. 6. Sliding friction along the base of the footings will not develop where net uplift conditions exist.	

Forming of footings may be required above the ground improvement elements. It is customary or recommended by designers that after excavations are made back to the tops of the elements in the footprint of the foundation, that the aggregate top of the elements be densified with compaction equipment.

The base of all foundation excavations should be free of water, and loose soil prior to placing concrete. Concrete should be placed soon after excavating and the compaction procedure to reduce further disturbance of the bearing surface. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

SEISMIC CONSIDERATIONS

The Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Subsurface explorations at this site were extended to a maximum depth of about 50½ feet. The site properties

below the boring depths to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area.

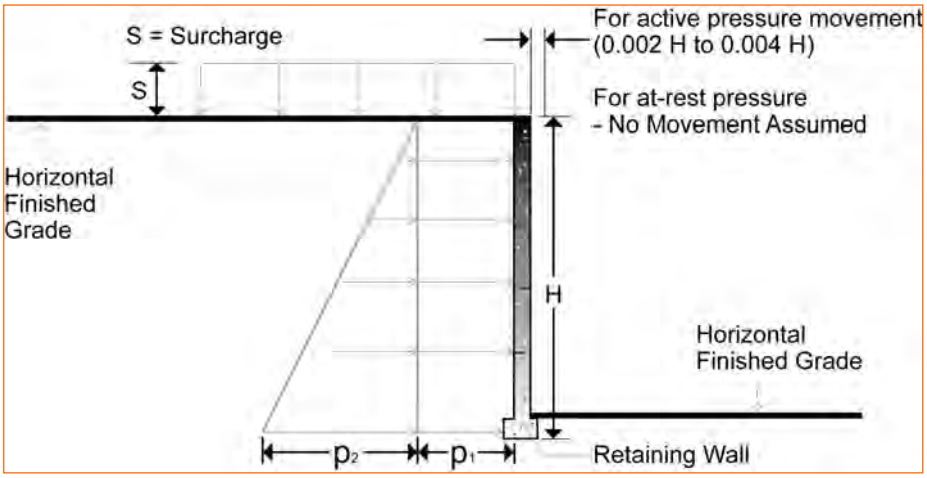
Based on the general soil/bedrock properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the Seismic Site Class is D. However, an improved seismic site classification might be possible for some of the site structures based on the relative depth of bedrock materials to the planned base elevations. Additional geophysical testing may be performed to confirm the seismic parameter conditions below the current boring depths and provide higher seismic site classification, if it would have a significant effect on structural design measures.

BELOW-GRADE STRUCTURES

Lateral Earth Pressure Design Recommendations

Reinforced concrete walls for the below grade tank structures, or any walls designed to retain soil, with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, final grades or sloping of ground adjacent to the walls, surcharges, methods of construction and/or compaction and the strength of the materials being restrained. The recommended design lateral earth pressures provided in this section are for cast-in-place, reinforced concrete walls only, and are not applicable to other wall systems (e.g., segmental block, landscaping walls, etc.).

Two wall restraint conditions are provided in the following table. The "at-rest" condition is commonly used for design of below grade dock walls and other walls restrained from movement and assumes no wall movement. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The surcharge component applies where floor loads or other loading will be applied adjacent to the below grade walls. The recommended design lateral earth pressures do not include a factor of safety.



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure** [2, 3, 4] **(psf)**	**Effective Fluid Pressures** [2, 4, 5, 6] **(psf)**	
			Drained	**Undrained**
At-Rest (K_o)	Granular: 0.50 Cohesive: 0.59	(0.50)S (0.59)S	(60)H (70)H	(90)H (95)H
Active (K_a)	Coarse-grained: 0.33 Fine-grained: 0.42	(0.33)S (0.42)S	(40)H (50)H	(80)H (85)H
Passive [7] (K_p)	Granular: 3.0 Cohesive: 2.4	--- ---	(360)D (285)D	(235)D (200)D
Sliding Resistance [8]	Ultimate coefficient of sliding friction for suitable bearing soils: 0.4			

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance
2. Considers horizontal ground surfaces at the top and base of walls. Sloping ground surfaces would require adjustments in these factors and corresponding lateral earth pressures.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values. H value is used for active and at-rest pressure computations from the top of wall. D value (not shown on figure) is used for passive pressure computations and is depth of foundation embedment below lowest grade at base of wall.
6. In order to achieve "Drained" conditions, follow guidelines in the **Below Grade Walls Subsurface Drainage** section. "Undrained" conditions are recommended when drainage behind walls is not incorporated into the design or where walls will be submerged during flooding events.
7. Passive pressure resistance distribution should consider frost effects as discussed in the **Shallow Foundations** section.
8. Sliding friction along the base of the footings will not develop where net uplift conditions exist

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the at-rest/active and passive cases, respectively.

Below-Grade Slab Design Parameters

Item	Description
Below-grade slab support	n Prepared according to the **Earthwork** section.
Aggregate base	n At least 8 inches of free-draining granular material [1] n This drainage layer would be in addition to any working mat thickness incorporated in the construction.
Estimated modulus of subgrade reaction [2]	n k_1 = 150 psi/in

1. Free-draining granular material such as IaDOT 4131 porous backfill.
2. Modulus of subgrade reaction value is provided for point loads. For large area loads the modulus of subgrade reaction would be lower. This value is representative of a 1 foot by 1 foot loaded area supported on recommended thickness of granular materials and should be scaled appropriately as the loaded area increases. See **Floor Slab Design Parameters** in **Floor Slabs** for additional notes.

A system of collector drains should be constructed at the base of the free-draining granular layer. A relatively basic floor drainage system could consist of interior drain lines located around the perimeter of the below grade walls and at about 30 feet on-center. The drain lines should be placed in shallow trenches that extend below the base of the granular layer under the grade-supported slab. General recommendations for the drain system are provided below.

Item	Description
Subdrain pipe	Minimum 4-inch pipe diameter
Subdrain lines	n Pipe invert should be at least 12 inches below the slabs in continuously heated areas, and at least 42 inches below the slabs if potentially exposed to seasonal freezing climate n Subdrain lines should be sloped to provide positive gravity drainage to a reliable discharge point or sump pit n Subdrain lines should be embedded in at least 4 inches of subdrain trench backfill material
Subdrain trench backfill [1]	n IaDOT porous backfill (Section 4131) [2], or n Free-draining granular material encapsulated with non-woven geotextile filter fabric

Item	Description
Continued from Page 28	
	1. The subdrain trench backfill should extend up to and be hydraulically connected to the recommended aggregate base layer below the floor slabs. 2. Pipe perforations should be appropriately sized to prevent free-draining granular material from entering the subdrain pipe.

As previously discussed, the possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. If groundwater levels rise above the bottom of a structure when it is empty, uplift loads could be imposed on the bottom slab and hydrostatic pressure could be imposed on the walls, which could cause heaving, cracking or other damage to the bottom slab and walls. We anticipate the designs will include measures to reduce hydrostatic loading for the below grade tanks, such as pressure relief valves that will allow backflow of groundwater into empty structures or exterior pumping systems.

Additional design recommendations and commentary for grade supported slabs are included in **Floor Slabs**.

Below Grade Walls Subsurface Drainage

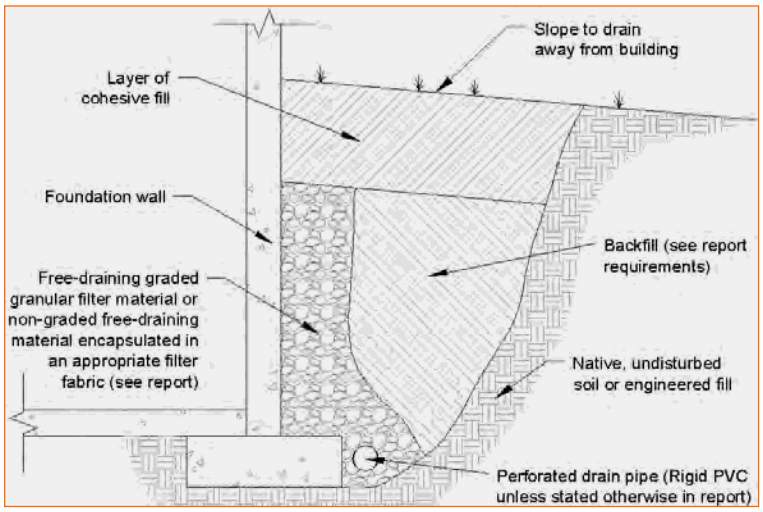
To reduce hydrostatic loading on the below grade walls, we recommend a drainage system be installed along the walls and extend to the foundation of the below grade walls. The wall drain system should be designed according to the following table and accompanying sketch. The drainage systems for below grade floors should be considered with the design of drainage systems for below grade walls.

Item	Description
Below grade wall subdrain pipe	n Perforated rigid plastic drain line with a minimum 4-inch diameter. n Pipe perforations should be appropriately sized to prevent free-draining granular material from entering the subdrain pipe. n Pipe invert should be at least 3½ feet below proposed exterior grade or at the foundation of the wall, whichever is deepest. n Subdrain lines should be sloped to provide positive gravity drainage to daylight or to a reliable discharge point (e.g., storm sewer, sump pit and pump, etc.). n Pipes should be embedded in at least 4 inches of wall drainage backfill material.

Continued on Page 30

Item	Description
Continued from Page 29	
Wall drainage backfill [1]	n A minimum 2-ft wide section of coarse-grained (granular) fill located above the drain line and adjacent to the walls, consisting of either: o IaDOT porous backfill (Section 4131), or o Free-draining coarse-grained material encapsulated with non-woven geotextile filter fabric (Contech C60NW or equivalent). n The coarse-grained fill should extend to within 2 feet of final grade, where it should be capped with fine-grained structural fill to reduce infiltration of surface water into the subdrain system.

1. As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.



If walls must resist combined hydrostatic and lateral earth pressures, then combined hydrostatic and lateral earth pressures should be calculated using the "undrained" values in **Lateral Earth Pressure Design Recommendations**. Water stops and other wall waterproofing measures should also be considered if undrained designs are used.

FLOOR SLABS

Design parameters for at-grade floor slabs expect the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structures and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support for at grade structures [1]	n Minimum 6 inches of free-draining granular material [2] n At least 18 inches of low plasticity materials should be present below floor slabs (the 6-inch free-draining granular layer is considered to be part of the recommended 18-inch low plasticity material zone)
Estimated modulus of subgrade reaction [3]	n k_1 = 150 psi/in

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Free-draining granular material should have less than 6 percent fines (material passing the #200 sieve), e.g., IaDOT granular subbase (Section 4121). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions
3. Modulus of subgrade reaction is an estimated value based on our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower. This value is representative of a 1 foot by 1 foot loaded area supported on recommended thickness of granular materials and should be scaled appropriately as the loaded area increases. The coefficient decreases as the width of the loaded area increases. The following equation by Das (2011) or other appropriate relations can be used to scale the coefficient of subgrade reaction:

   $k = k_1 [(B+1) / (2B)]^2$

   where k_1 = coefficient of subgrade reaction (1 foot by 1 foot area)
   k = scaled coefficient of subgrade reaction
   B = width of loaded area

   (Das, B.M., 2011, Principles of Foundation Engineering, 7th Edition, Pacific Grove, California, Brooks/Cole Publishing Company, p. 311)

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential vertical movement through use of sufficient control joints, appropriate reinforcing or other means.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Exterior Slabs and Frost Considerations

The soils on this site are frost susceptible, and water migration into soils can affect the performance of slabs, including doorways, and pavements exposed to climatic and temperature variations. Exterior slabs should be anticipated to heave during winter months. If frost action

needs to be eliminated in critical areas, we recommend the use of low-frost susceptible fill or structural slabs (e.g., structural stoops in front of building doors). The following recommendations could also be considered to help reduce potential frost heave:

- Providing surface drainage away from the buildings and slabs and toward the site storm drainage system;
- Placing low-frost susceptible fill as backfill below structures to frost protection depth (at least 3½ feet below final exterior grade in non-heated areas);
- Installing drain tiles at or below the frost depth around the perimeter of the grade-supported structures that is hydraulically connected to the granular drainage layer and discharges directly to a reliable outlet, i.e., storm drainage system;
- Grading clayey subgrades such that groundwater potentially perched in overlying more permeable subgrades, such as sand or aggregate base layers, slope toward the site drainage system

The drain lines referenced above should be sloped for positive gravity discharge to a storm sewer or another reliable discharge point, and reverse flow into the system should be prevented. Periodic maintenance of subdrains is required for long-term proper performance.

Low-frost susceptible materials should consist of a well-graded, clean granular material with less than 6% passing the No. 200 sieve.

As an alternative to extending the low-frost susceptible fill to the full frost depth, consideration can be made to placing extruded polystyrene or cellular concrete under a buffer of at least 2 feet of low-frost susceptible fill.

Floor Slab Construction Considerations

Grading for floor slab subgrades is typically accomplished relatively early in the construction phase. Fills are placed and compacted and the initial surface is prepared in a relatively uniform manner. However, as construction proceeds, utility excavations, rainfall, and heavy construction traffic can disturb the subgrade. Surface irregularities are often filled with loose materials to temporarily improve trafficability. As a result, the floor slab subgrade, prepared earlier during initial site grading operations should be carefully evaluated as the time for slab construction approaches. Particular attention should be given to high traffic areas that become rutted and disturbed, and to areas where backfilled trenches are located.

Areas where unstable conditions exist should be repaired by removing and replacing the materials with low plasticity structural fill. All floor slab subgrade areas should be moisture conditioned and compacted to the recommendations in **Earthwork** immediately prior to placement of the aggregate base materials and concrete.

Care will be necessary to avoid contaminating the aggregate base layer located directly below the floor slabs with soil prior to floor slab placement. We recommend the aggregate base layer be placed only immediately prior to slab concrete placement.

GENERAL COMMENTS

Our analysis and opinions are based on our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance on the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location

of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. _____ May 22, 2020 Mark A. Jacobsen II, P.E. Date My license renewal date is December 31, 2020.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Location	Borings Nos. [1]	Boring Depths, feet (bgs) [2]
(520) Aerobic Digestion Tanks	D1, D2	50½
(580) Bio-Solids Storage Tanks	D3, D4, D5, D6	50½
(320) Oxidation Ditch Tanks	D7, D8 S6, S7	50½ 30½ and 40½
(380) Secondary Clarifier Tanks	D9 S8, S9	50½ 30½ and 35½
(420) UV Disinfection Building	D10	50½
(120) Administration and Vehicle Storage Building	S1, S2	30½
(550) Solids Processing Building	S3	35½
(570) Bio-Solids Pump Building	S4	35½
(210) Headworks Building	S5	40½
Roadways and Utilities	V1, V2, V3, V4, V5	15½

1. See Exhibit E for the Anticipated Exploration Plan.
2. bgs = below existing ground surface.

Boring Layout and Elevations: Terracon personnel staked the boring locations using handheld GPS equipment with respect to provided boring coordinates. Following drilling operations, HRG provided boring coordinates and ground surface elevations. The boring locations are shown on the **Exploration Plan**. The boring coordinates and elevations are indicated on the boring logs.

Subsurface Exploration Procedures: We advanced the soil borings with an ATV-mounted drill rig using hollow-stem and solid-stem continuous flight augers. Five to six samples were obtained in the upper 15 feet of the borings and samples were obtained at intervals of 5 feet thereafter. Several borings included additional sampling beneath the floor slab/foundation elevations. Soil sampling was performed using thin-wall tube and split-barrel sampling procedures. We observed and recorded groundwater levels during drilling, immediately after drilling and after periods of 3 to 7 days after drilling operations. The borings were backfilled with a mixture of bentonite chips and auger cuttings upon boring completion.

The drill crew prepared a field log of each boring to record field data including visual descriptions of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation

of the subsurface conditions at each boring location based on field and laboratory data, and observation of the samples.

Laboratory Testing

In the laboratory, water content tests were performed on portions of the recovered samples. The dry unit weight of intact, thin-walled tube samples was determined. Unconfined compressive strength and hand penetrometer tests were performed to estimate the consistency of select samples of fine-grained soils. In order to better define the plasticity of the soils encountered at this site, Grain Size Analyses and Atterberg limits tests were performed on samples of fine-grained soils that are likely to be encountered either during earthwork operations or foundation construction. The results of the laboratory tests are shown on the boring logs at their corresponding sample depths and as graphs in **Exploration Results**.

Boring Nos.	Approximate Sample Depth(s) feet (bgs) [1]	Stratum	Atterberg Limits		
			Liquid Limit	Plastic Limit	Plasticity Index
D6	9 to 11	2	27	15	12
D7	34 to 35½	4	31	15	16
V4	3 to 5	1	33	20	13

1. bgs = below existing ground surface

The samples were described in the laboratory based on visual observation, texture and plasticity, and the laboratory testing described above. The descriptions of the soils indicated on the boring logs are in general accordance with the General Notes and Unified Soil Classification System (USCS) summarized and included in **Supporting Information**.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location
Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Nevada Wastewater Treatment Facility ■ Nevada, Iowa
May 22, 2020 ■ Terracon Project No. 08205065-01

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Nevada Wastewater Treatment Facility ■ Nevada, Iowa
May 22, 2020 ■ Terracon Project No. 08205065-01

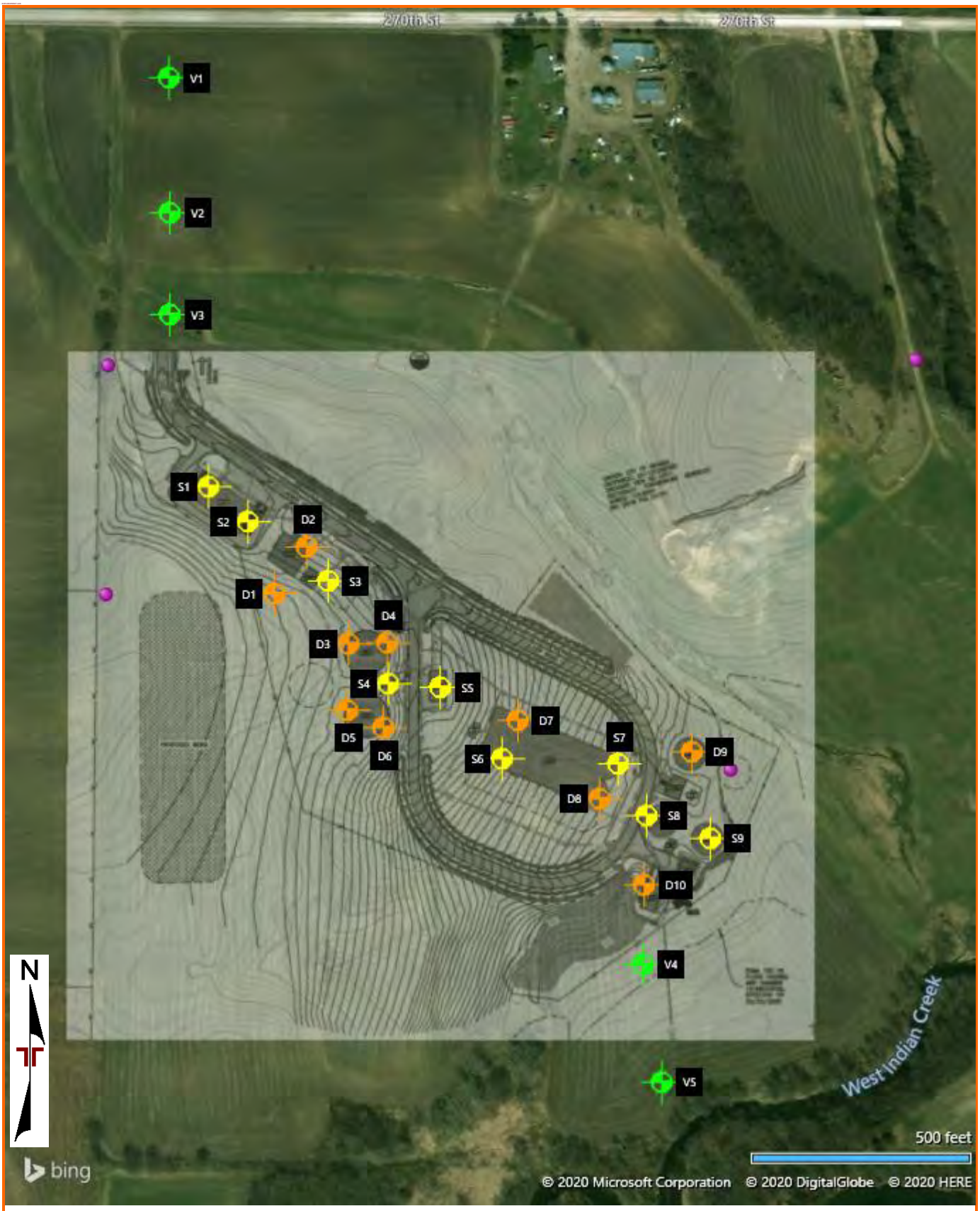


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

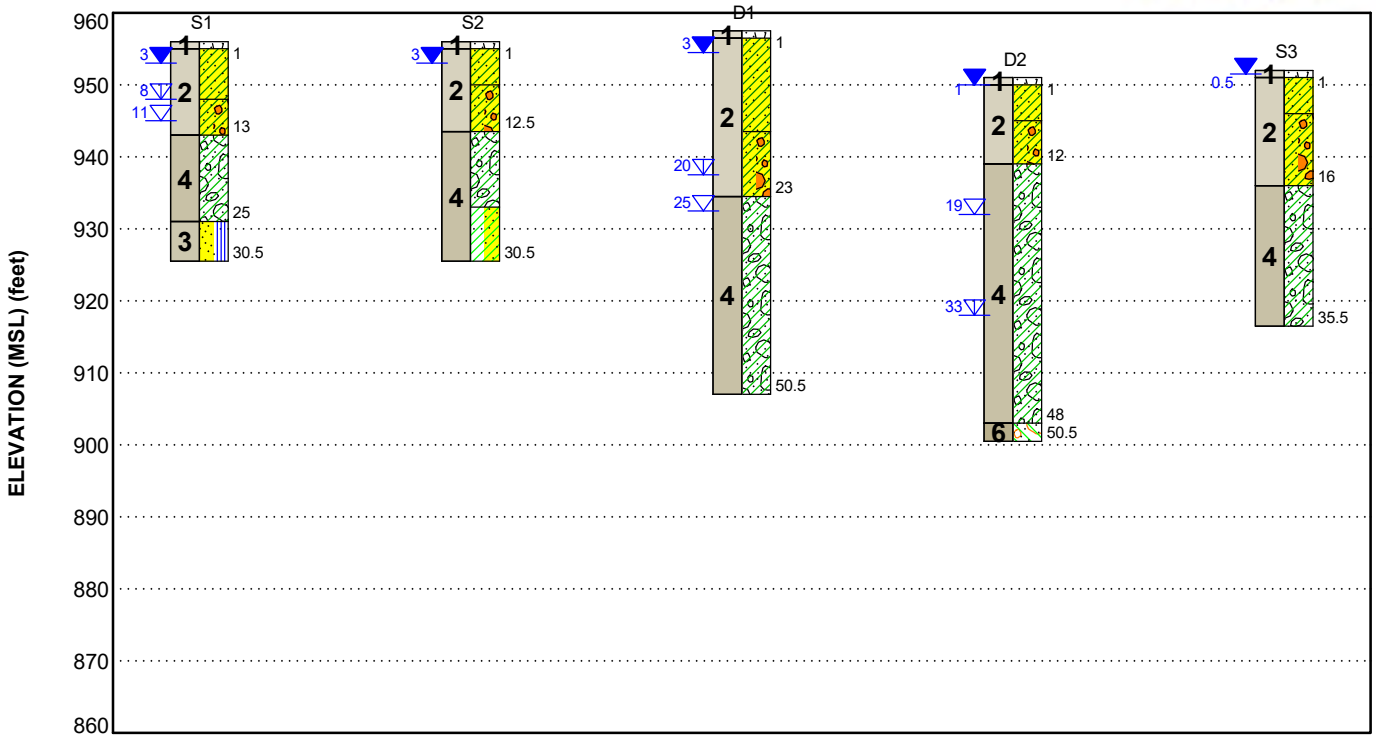
Contents:

GeoModels (5 pages)
Boring Logs (D1-D1, S1-S9 and V1-V5)
Grain Size Distribution

Note: All attachments are one page unless noted above.

GEOMODEL

Nevada WWTF Improvements ■ Story County, Iowa
Terracon Project No. 08205065



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil / Local Alluvium / Alluvium	Approx. 6" to 12" Root Zone/Plow Zone Lean Clay, trace to with sand, trace organics (CL) Lean to Fat Clay, trace sand, trace organics (CL/CH)
2	Wisconsinan Supraglacial Till	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	Glacial Outwash	Fine to Coarse Grained Sand, trace gravel (SP, SP-SM, SP-SC) With varying fines (silt and clay) content
4	Wisconsinan Subglacial Till	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and trace gravel (CL) Occasional sand seams
5	Loess	Lean Clay, trace sand (CL)
6	Pre-Illinoian Glacial Till	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

LEGEND

- Topsoil
- Sandy Lean Clay with Gravel
- Poorly-graded Sand with Silt
- Glacial Till
- Sandy Lean Clay
- Glacial Till
- Lean Clay with Sand

NOTES:

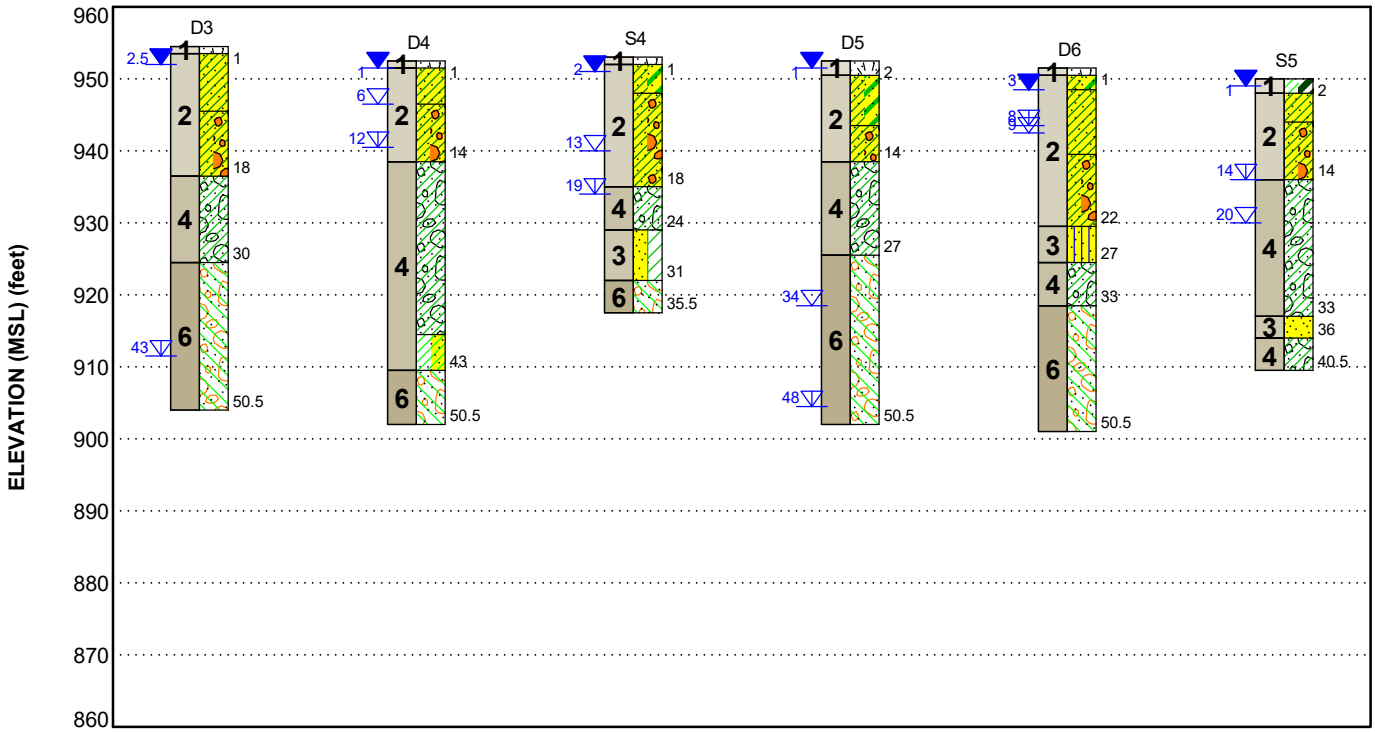
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

GEOMODEL

Nevada WWTF Improvements ■ Story County, Iowa
Terracon Project No. 08205065



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Model Layer	Layer Name	General Description
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2	Wisconsinan Supraglacial Till	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	Glacial Outwash	Fine to Coarse Grained Sand, trace gravel (SP, SP-SM, SP-SC) With varying fines (silt and clay) content
4	Wisconsinan Subglacial Till	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and trace gravel (CL) Occasional sand seams
5	Loess	Lean Clay, trace sand (CL)
6	Pre-Illinoian Glacial Till	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

LEGEND

- Topsoil
- Sandy Lean Clay with Gravel
- Glacial Till
- Sandy Lean Clay/Clayey Sand
- Silty Sand
- Poorly-graded Sand
- Sandy Lean Clay
- Glacial Till
- Lean Clay with Sand
- Poorly-graded Sand with Clay
- Lean Clay/Fat Clay

NOTES:

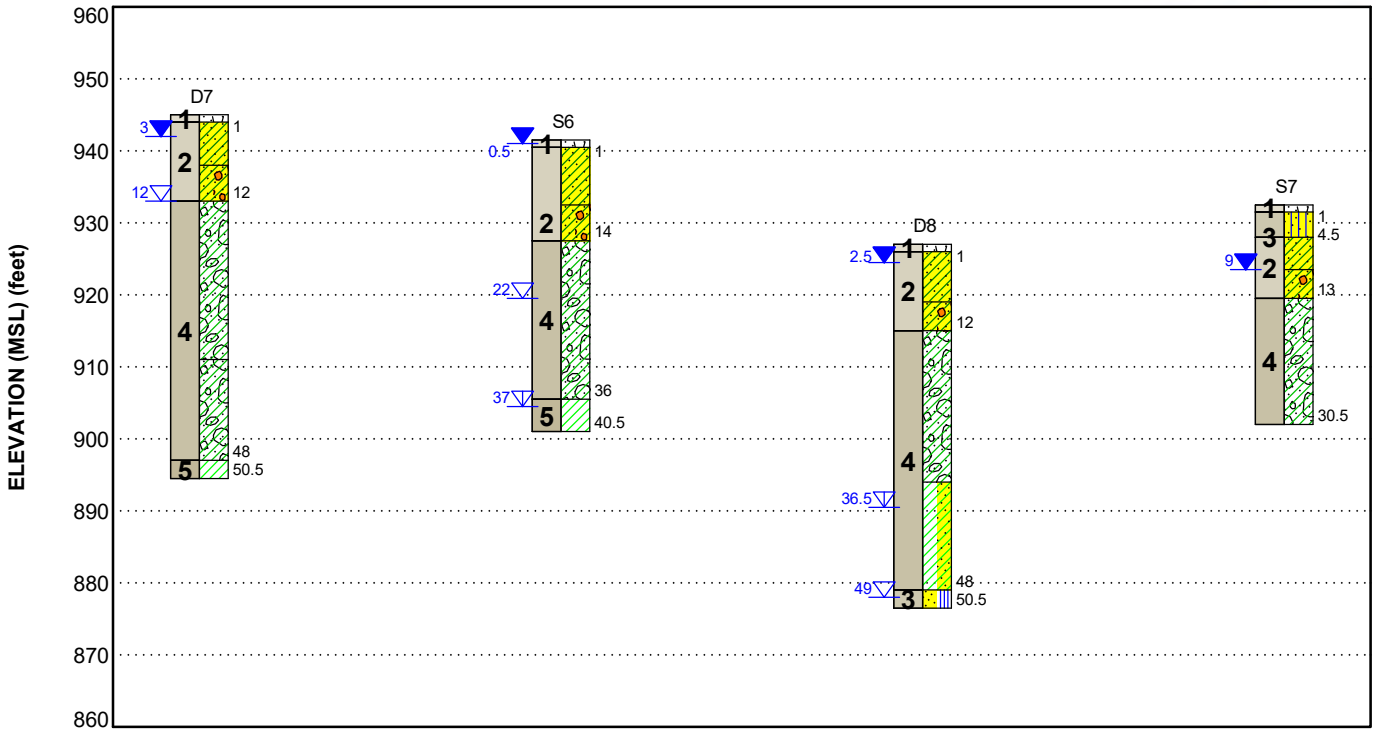
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

GEOMODEL

Nevada WWTF Improvements ■ Story County, Iowa
Terracon Project No. 08205065



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil / Local Alluvium / Alluvium	Approx. 6" to 12" Root Zone/Plow Zone Lean Clay, trace to with sand, trace organics (CL) Lean to Fat Clay, trace sand, trace organics (CL/CH)
2	Wisconsinan Supraglacial Till	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	Glacial Outwash	Fine to Coarse Grained Sand, trace gravel (SP, SP-SM, SP-SC) With varying fines (silt and clay) content
4	Wisconsinan Subglacial Till	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and trace gravel (CL) Occasional sand seams
5	Loess	Lean Clay, trace sand (CL)
6	Pre-Illinoian Glacial Till	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

LEGEND

- Topsoil
- Sandy Lean Clay
- Sandy Lean Clay with Gravel
- Glacial Till
- Lean Clay
- Lean Clay with Sand
- Poorly-graded Sand with Silt
- Silty Sand

NOTES:

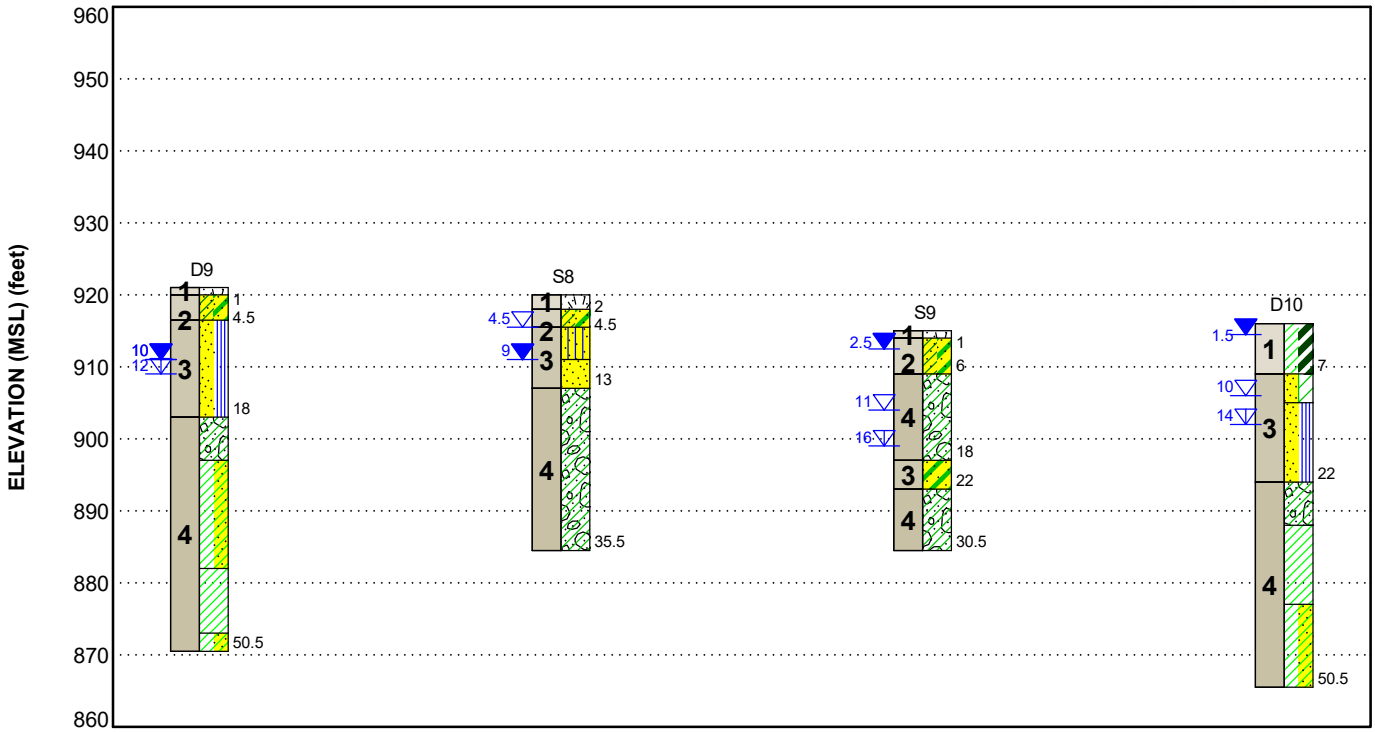
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

GEOMODEL

Nevada WWTF Improvements ■ Story County, Iowa
Terracon Project No. 08205065



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil / Local Alluvium / Alluvium	Approx. 6" to 12" Root Zone/Plow Zone Lean Clay, trace to with sand, trace organics (CL) Lean to Fat Clay, trace sand, trace organics (CL/CH)
2	Wisconsinan Supraglacial Till	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	Glacial Outwash	Fine to Coarse Grained Sand, trace gravel (SP, SP-SM, SP-SC) With varying fines (silt and clay) content
4	Wisconsinan Subglacial Till	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and trace gravel (CL) Occasional sand seams
5	Loess	Lean Clay, trace sand (CL)
6	Pre-Illinoian Glacial Till	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

LEGEND

- Topsoil
- Poorly-graded Sand with Silt
- Lean Clay with Sand
- Silty Sand
- Clayey Sand
- Poorly-graded Sand with Clay
- Sandy Lean Clay/Clayey Sand
- Glacial Till
- Lean Clay
- Poorly-graded Sand
- Lean Clay/Fat Clay

NOTES:

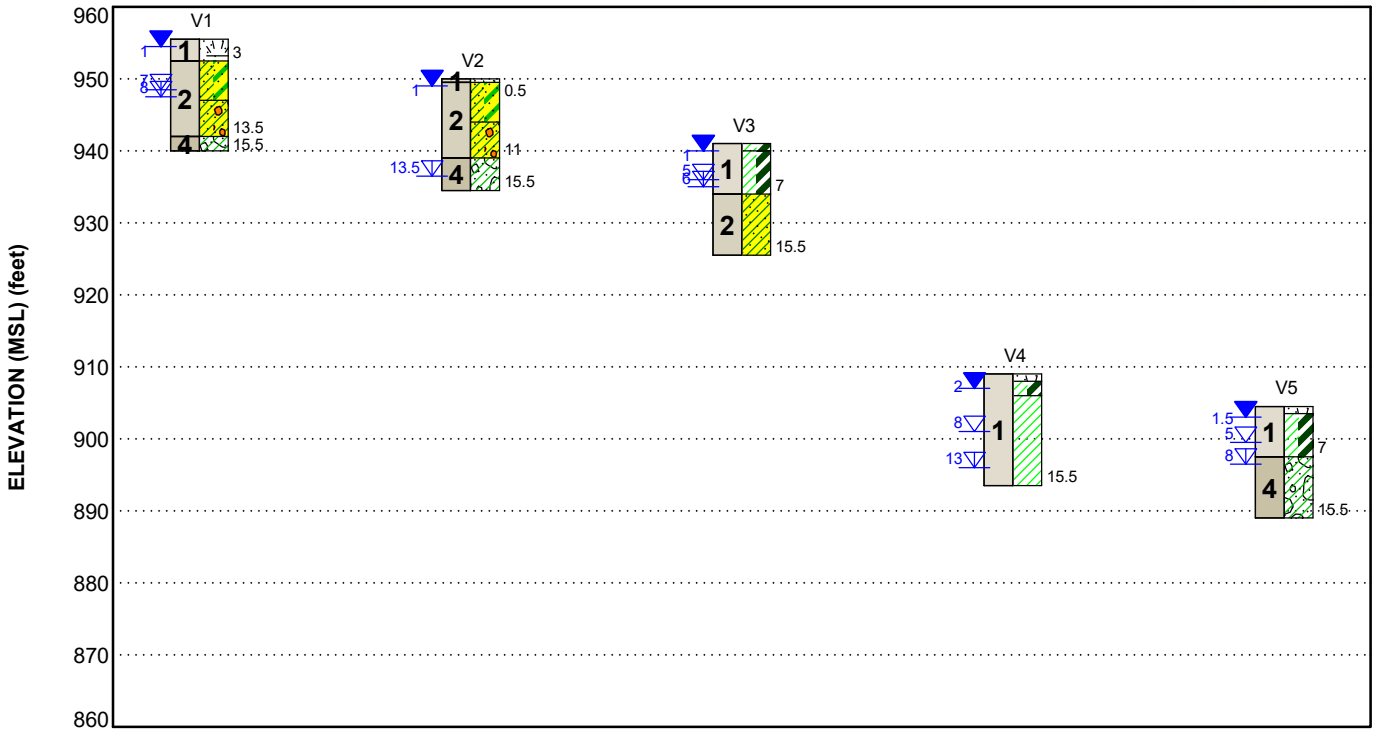
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

GEOMODEL

Nevada WWTF Improvements ■ Story County, Iowa
Terracon Project No. 08205065



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil / Local Alluvium / Alluvium	Approx. 6" to 12" Root Zone/Plow Zone Lean Clay, trace to with sand, trace organics (CL) Lean to Fat Clay, trace sand, trace organics (CL/CH)
2	Wisconsinan Supraglacial Till	Sandy Lean Clay/Clayey Sand, trace gravel (CL/SC) Sandy Lean Clay, trace gravel (CL) Occasional sand seams
3	Glacial Outwash	Fine to Coarse Grained Sand, trace gravel (SP, SP-SM, SP-SC) With varying fines (silt and clay) content
4	Wisconsinan Subglacial Till	Sandy Lean Clay, trace gravel (CL) Lean Clay, with sand to trace sand and trace gravel (CL) Occasional sand seams
5	Loess	Lean Clay, trace sand (CL)
6	Pre-Illinoian Glacial Till	Sandy Lean Clay, trace gravel (CL) Occasional sand seams and cobbles

LEGEND

- Topsoil
- Sandy Lean Clay with Gravel
- Lean Clay/Fat Clay
- Lean Clay
- Sandy Lean Clay/Clayey Sand
- Glacial Till
- Sandy Lean Clay

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

BORING LOG NO. D1

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9611° Longitude: -93.4528°

Approximate Surface Elev.: 957.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	956.5+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown to brown with light gray, soft to medium stiff
			WISCONSINAN SUPRAGLACIAL TILL
	14.0	943.5+/-	
			SANDY LEAN CLAY, trace gravel, gray-brown with rusty brown, medium stiff to stiff
			WISCONSINAN SUPRAGLACIAL TILL
	23.0	934.5+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, very stiff
			Light gray fine sand seam at about 24'-25' (Sample #7)
			WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			18	1-2-1 N=3	1		18			
	▼		18	1-2-2 N=4	2		18			
5			18	2-3-3 N=6	3		5			
10			18	2-3-4 N=7	4		15			
15			18	3-3-4 N=7	5		15			
20	▽		18	2-5-5 N=10	6		12			
25	▽		18	6-12-9 N=21	7		13			
30			18	4-9-11 N=20	8		13			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *25' (elev. 932.5') During Drilling*
- ▽ *20' (elev. 937.5') After Drilling*
- ▼ *3' (elev. 954.5') 5 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D1

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9611° Longitude: -93.4528°

Approximate Surface Elev.: 957.5 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, very stiff *(continued)* dark gray with dark brown below about 34'										
		35		X	18	4-6-12 N=18	9		12			
		40		X	18	6-10-12 N=22	10		12			
		WISCONSINAN SUBGLACIAL TILL										
		45		X	18	5-8-10 N=18	11		13			
		50.5 907+/- 50		X	18	4-9-10 N=19	12		13			
		Boring Terminated at 50.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

25' (elev. 932.5') During Drilling

20' (elev. 937.5') After Drilling

3' (elev. 954.5') 5 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020 | Boring Completed: 04-08-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. D2

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9614° Longitude: -93.4526°

Approximate Surface Elev.: 951.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	950+/-	**Approx 12" Root Zone/Plow Zone** trace sand, trace organics, very dark brown
2	6.0	945+/-	**SANDY LEAN CLAY (CL)**, trace gravel, brown with light gray, soft to medium stiff. Occasional sand seams to about 6' **WISCONSINAN SUPRAGLACIAL TILL**
4	12.0	939+/-	**SANDY LEAN CLAY**, trace gravel, gray-brown with rusty brown, medium stiff **WISCONSINAN SUPRAGLACIAL TILL**
			SANDY LEAN CLAY, trace gravel, dark gray, medium stiff to very stiff **WISCONSINAN SUBGLACIAL TILL** Gray fine sand seam near 29'-30'

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	WATER CONTENT (%)
		18	1-2-1 N=3	1	19
		18	1-2-2 N=4	2	23
5		18	2-3-3 N=6	3	17
10		18	2-3-3 N=6	4	17
15		18	2-3-4 N=7	5	16
20		18	3-6-7 N=13	6	13
		18	3-6-9 N=15	7	14
25		18	4-6-7 N=13	8	17
30		18	4-7-10 N=17	9	12

WATER LEVEL OBSERVATIONS: 1 (5 days after drilling); 19 (during drilling); 33 (after drilling)

UNCONFINED COMPRESSIVE STRENGTH (psf) / DRY UNIT WEIGHT (pcf) / ATTERBERG LIMITS LL-PL-PI / PERCENT FINES: not recorded

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *19' (elev. 932') During Drilling*
- *33' (elev. 918') After Drilling*
- *1' (elev. 950') 5 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D2

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9614° Longitude: -93.4526°

Approximate Surface Elev.: 951.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4														
				35		X	18	4-7-8 N=15	10		15			
				40		X	18	3-3-4 N=7	11		18			
				45		X	18	3-4-7 N=11	12		17			
				50		X	13	4-22-14 N=36	13		14			
6		48.0	903+/-											
		50.5	900.5+/-											

SANDY LEAN CLAY, trace gravel, dark gray, medium stiff to very stiff *(continued)*

WISCONSINAN SUBGLACIAL TILL

SANDY LEAN CLAY, trace gravel, dark gray with dark brown, hard

PRE-ILLINOIAN GLACIAL TILL

Boring Terminated at 50.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *19' (elev. 932') During Drilling*
- *33' (elev. 918') After Drilling*
- *1' (elev. 950') 5 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D3

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9608° Longitude: -93.4522°

Approximate Surface Elev.: 954.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	953.5+/-	**Approx 12" Root Zone/Plow Zone**
2	9.0	945.5+/-	**LEAN CLAY (CL)**, trace sand, trace organics, dark brown **SANDY LEAN CLAY (CL)**, trace gravel, brown, soft to medium stiff brown with light gray and medium stiff to stiff below about 3' **WISCONSINAN SUPRAGLACIAL TILL**
4	18.0	936.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, gray-brown with rusty brown, stiff **WISCONSINAN SUPRAGLACIAL TILL**
6	30.0	924.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff Stiff to very stiff below about 23' **WISCONSINAN SUBGLACIAL TILL**
			SANDY LEAN CLAY (CL), trace gravel, dark yellow brown with light gray, stiff to very stiff **PRE-ILLINOIAN GLACIAL TILL**

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼	X	7	1-2-2 N=4	1		20			
		■	13		2	2000	16	113		
5		X	13	2-2-3 N=5	3		16			
10		■	16		4	2460	16	116		
		X	18	2-3-5 N=8	5		16			
15		■	8		6	2800	15	113		
20		X	18	2-2-3 N=5	7		17			
25		X	18	3-7-8 N=15	8		13			
30		X	18	3-5-6 N=11	9		15			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling
43' (elev. 911.5') After Drilling
2.5' (elev. 952') 5 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D3

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9608° Longitude: -93.4522°

Approximate Surface Elev.: 954.5 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6		**SANDY LEAN CLAY (CL)**, trace gravel, dark yellow brown with light gray, stiff to very stiff *(continued)*										
		35		X	18	3-6-9 N=15	10		15			
		PRE-ILLINOIAN GLACIAL TILL										
		40	▽	X	18	4-5-7 N=12	11		3			
		45		X	18	3-8-9 N=17	12		12			
		Dark gray below about 47'										
		50.5 904+/- 50		X	18	4-8-10 N=18	13		12			
		Boring Terminated at 50.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling
43' (elev. 911.5') After Drilling
2.5' (elev. 952') 5 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. D4

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9608° Longitude: -93.4519°

Approximate Surface Elev.: 952.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	951.5+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown with light gray, soft to medium stiff Occasional sand seams to about 6' Sand seam in Sample #2
			WISCONSINAN SUPRAGLACIAL TILL
	6.0	946.5+/-	
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, medium stiff to stiff
			WISCONSINAN SUPRAGLACIAL TILL
	14.0	938.5+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff to stiff
			WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		11	1-1-1 N=2	1		26			
		9	Sand Seam	2		21	102		
5		18	2-2-3 N=5	3		15			
10		14		4	3320	15	118		
		18	3-4-6 N=10	5					
15		16		6	2900	15	118		
20		18	3-3-4 N=7	7		15			
25		18	3-4-5 N=9	8		14			
30		18	3-6-7 N=13	9		15			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *6' (elev. 946.5') During Drilling*
- *12' (elev. 940.5') After Drilling*
- *1' (elev. 951.5') 6 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D4

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9608° Longitude: -93.4519°

Approximate Surface Elev.: 952.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4														
				35		X	18	4-5-6 N=11	10		14			
		38.0	914.5+/-											
				40		X	18	3-5-7 N=12	11		17			
		43.0	909.5+/-											
6				45		X	18	3-8-16 N=24	12		16			
		50.5	902+/-	50		X	18	3-7-10 N=17	13		11			

SANDY LEAN CLAY (CL), trace gravel, dark gray, medium stiff to stiff *(continued)*

WISCONSINAN SUBGLACIAL TILL

LEAN CLAY (CL), with sand, gray, stiff

WISCONSINAN SUBGLACIAL TILL

SANDY LEAN CLAY (CL), trace gravel, dark gray with dark brown, very stiff

PRE-ILLINOIAN GLACIAL TILL

Boring Terminated at 50.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

6' (elev. 946.5') During Drilling

12' (elev. 940.5') After Drilling

1' (elev. 951.5') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. D5

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9604° Longitude: -93.4523°

Approximate Surface Elev.: 952.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	
1				**Approx 12" Root Zone/Plow Zone**
		2.0	950.5+/-	**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown, medium stiff
2				**SANDY LEAN CLAY/CLAYEY SAND (CL/SC)**, trace gravel, brown with light gray, stiff to medium stiff
				WISCONSINAN SUPRAGLACIAL TILL
		9.0	943.5+/-	
				SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, stiff
				WISCONSINAN SUPRAGLACIAL TILL
		14.0	938.5+/-	
4				**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, very stiff
				Dark gray with dark brown below about 19'
				WISCONSINAN SUBGLACIAL TILL
		27.0	925.5+/-	
6				**SANDY LEAN CLAY (CL)**, trace gravel, yellow brown with light gray and rusty brown, stiff
				PRE-ILLINOIAN GLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼									
		X	15	2-3-3 N=6	1		37			
		■	6		2	2250	21	98		
5										
		X	18	2-2-3 N=5	3		19			
10		■	12		4	2380	14	114		
		X	18	3-5-5 N=10	5		15			
15		■	13		6	4270	14	117		
20		X	1	6-9-10 N=19	7		13			
25		X	18	6-8-8 N=16	8		15			
30		X	18	3-5-7 N=12	9		17			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *34' (elev. 918.5') During Drilling*
- *48' (elev. 904.5') After Drilling*
- *1' (elev. 951.5') 3 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-10-2020
Boring Completed: 04-10-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D5

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9604° Longitude: -93.4523°

Approximate Surface Elev.: 952.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6														
		SANDY LEAN CLAY (CL), trace gravel, yellow brown with light gray and rusty brown, stiff *(continued)*												
				35			18	1-4-10 N=14	10		12			
		PRE-ILLINOIAN GLACIAL TILL		40			18	4-5-6 N=11	11		13			
				45			18	4-6-8 N=14	12		28			
		Dark gray and very stiff below about 48'												
			50.5 902+/-	50			18	4-6-9 N=15	13		13			
		Boring Terminated at 50.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *34' (elev. 918.5') During Drilling*
- *48' (elev. 904.5') After Drilling*
- *1' (elev. 951.5') 3 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-10-2020
Boring Completed: 04-10-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D6

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9603° Longitude: -93.452°

Approximate Surface Elev.: 951.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	950.5+/-	**Approx 12" Root Zone/Plow Zone**
2	3.0	948.5+/-	**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
			SANDY LEAN CLAY/CLAYEY SAND (CL/SC), trace gravel, brown to brown with light gray, soft to medium stiff
			SANDY LEAN CLAY (CL), trace gravel, brown with light gray, medium stiff to stiff
			WISCONSINAN SUPRAGLACIAL TILL
	12.0	939.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, gray-brown with rusty brown, stiff to very stiff
			WISCONSINAN SUPRAGLACIAL TILL
			No recovery in Sample #7
3	22.0	929.5+/-	**SILTY SAND (SM)**, fine to medium grained, trace coarse sand and gravel, gray, medium dense
			GLACIAL OUTWASH
4	27.0	924.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff
			WISCONSINAN SUBGLACIAL TILL
	33.0	918.5+/-	

SAMPLE ID	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		18	1-2-1 N=3		18			
2		15		2530	16	112		
3		18	2-3-3 N=6		17			
4		14		1130	18	112	27-15-12	53
5		18	2-3-4 N=7		17			
6		15		3960	16	116		
7		0	9-11-10 N=21					
8		18	21-16-10 N=26		22			
9		18	2-3-4 N=7		21			

DEPTH (Ft.): 5, 10, 15, 20, 25, 30

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

9' (elev. 942.5') During Drilling
8' (elev. 943.5') After Drilling
3' (elev. 948.5') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D6

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9603° Longitude: -93.452°

Approximate Surface Elev.: 951.5 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6		**SANDY LEAN CLAY (CL)**, trace gravel, yellow brown with light gray and rusty brown, stiff										
		35		X	18	3-4-5 N=9	10		17			
		PRE-ILLINOIAN GLACIAL TILL										
		40		X	18	3-5-7 N=12	11		14			
		Very stiff below about 44'										
		45		X	18	3-7-8 N=15	12		14			
		Large gravel/cobble at about 50' (Sample #13)										
		50.5 901+/- 50		X	9	5-16-38 N=54	13					
		Boring Terminated at 50.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

9' (elev. 942.5') During Drilling
8' (elev. 943.5') After Drilling
3' (elev. 948.5') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D7

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9603° Longitude: -93.4508°

Approximate Surface Elev.: 945.0 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	MODEL LAYER	GRAPHIC LOG	DESCRIPTION
1.0	944+/-	1		**Approx 12" Root Zone/Plow Zone**
		2		**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
				SANDY LEAN CLAY (CL), trace gravel, brown with light gray, soft Occasional very sandy zones and sand seams to about 6'
				WISCONSINAN SUPRAGLACIAL TILL
7.0	938+/-			
				SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, stiff
				WISCONSINAN SUPRAGLACIAL TILL
12.0	933+/-			
		4		**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff to very stiff
				WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼		7	2-1-1 N=2	1		19			
			9	1-2-1 N=3	2		26			
5			5	3-4-5 N=9	3		17			
10	▽		18	2-3-5 N=8	4		16			
15			18	4-4-5 N=9	5		14			
20			18	11-14-11 N=25	6		12			
25			18	5-7-9 N=16	7		14			
30			18	3-4-5 N=9	8		17			
			18	2-5-6	9		16			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

▽ *12' (elev. 933') During Drilling*

▼ *3' (elev. 942') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D7

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9603° Longitude: -93.4508°

Approximate Surface Elev.: 945.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
								N=11						
4		34.0	911+/-											
		SANDY LEAN CLAY (CL), trace gravel, dark gray, stiff		35			18	3-4-4 N=8	10		17		31-15-16	66
				40			18	2-4-4 N=8	11		17			
		WISCONSINAN SUBGLACIAL TILL												
				45			18	2-4-4 N=8	12		18			
		48.0	897+/-											
5		**LEAN CLAY (CL)**, trace sand and wood, gray, medium stiff **LOESS**												
		50.5	894.5+/-	50			18	2-4-5 N=9	13		24			
		Boring Terminated at 50.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

12' (elev. 933') During Drilling

3' (elev. 942') 7 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D8

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9599° Longitude: -93.4501°

Approximate Surface Elev.: 927.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	926+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown to light brown with light gray, medium stiff
			WISCONSINAN SUPRAGLACIAL TILL
	8.0	919+/-	
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, stiff
			WISCONSINAN SUPRAGLACIAL TILL
	12.0	915+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff to stiff
			WISCONSINAN SUBGLACIAL TILL
	33.0	894+/-	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼	X	18	2-2-2 N=4	1		19			
		X	18	2-2-3 N=5	2		17			
5										
		X	18	3-4-3 N=7	3		17			
10		X	18	3-4-5 N=9	4		15			
		■	11		5	3990	15	116		
15		X	18	3-4-4 N=8	6		17			
20		X	18	3-3-4 N=7	7		16			
25		X	18	3-4-4 N=8	8		17			
30		X	18	3-3-4 N=7	9		17			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *49' (elev. 878') During Drilling*
- *36.5' (elev. 890.5') After Drilling*
- *2.5' (elev. 924.5') 3 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-10-2020
Boring Completed: 04-10-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D8

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9599° Longitude: -93.4501°

Approximate Surface Elev.: 927.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**LEAN CLAY WITH SAND (CL)**, gray to dark gray, medium stiff to stiff											
				35			18	2-3-4 N=7	10		24			
					▽									
			WISCONSINAN SUBGLACIAL TILL	40			18	4-6-7 N=13	11		22			
				45			18	4-5-5 N=10	12		20			
		48.0	879+/-											
3			**SAND (SP-SM)**, fine to medium grained, trace coarse sand and fines, gray, very loose		▽									
		50.5	**GLACIAL OUTWASH** 876.5+/-	50			18	1-1-1 N=2	13		17			
			Boring Terminated at 50.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *49' (elev. 878') During Drilling*
- ▽ *36.5' (elev. 890.5') After Drilling*
- ▼ *2.5' (elev. 924.5') 3 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-10-2020
Boring Completed: 04-10-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. D9

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9602° Longitude: -93.4493°

Approximate Surface Elev.: 921.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	920+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
			SANDY LEAN CLAY/CLAYEY SAND (CL/SC), trace gravel, brown to brown with light gray, soft
	4.5	916.5+/-	**WISCONSINAN SUPRAGLACIAL TILL**
3			**SAND (SP-SM)**, fine to coarse grained, with fines, trace gravel, dark reddish brown, loose to medium dense Coarse sand and gravel content decreasing below about 6'
			GLACIAL OUTWASH
			No Recovery in Sample #5
	18.0	903+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff
			WISCONSINAN SUBGLACIAL TILL
	24.0	897+/-	
			LEAN CLAY WITH SAND (CL), gray to dark gray, stiff
			WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			18	2-2-3 N=5	1		18			
			18	2-2-1 N=3	2		5			
5			18	3-4-5 N=9	3		4			
10	▼ ▽		18	3-5-5 N=10	4		19		NP	7
15			0	3-4-5 N=9	5					
20			18	3-3-4 N=7	6		16			
			18	1-2-4 N=6	7		17			
25			18	3-4-5 N=9	8		19			
30			18	4-7-7 N=14	9		21			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *10' (elev. 911') During Drilling*
- ▽ *12' (elev. 909') After Drilling*
- ▼ *10' (elev. 911') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-09-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D9

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9602° Longitude: -93.4493°

Approximate Surface Elev.: 921.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4														
			LEAN CLAY WITH SAND (CL), gray to dark gray, stiff *(continued)* dark gray with brown below 34'											
				35		X	18	3-6-7 N=13	10		19			
			WISCONSINAN SUBGLACIAL TILL											
		39.0	882+/-											
			LEAN CLAY (CL), trace sand, gray to dark gray, stiff	40		X	18	3-5-6 N=11	11		21			
			WISCONSINAN SUBGLACIAL TILL	45		X	18	3-4-5 N=9	12		24			
		48.0	873+/-											
			LEAN CLAY WITH SAND (CL), dark gray, stiff											
			WISCONSINAN SUBGLACIAL TILL	50		X	18	3-4-5 N=9	13		16			
		50.5	870.5+/-											
			Boring Terminated at 50.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *10' (elev. 911') During Drilling*
- *12' (elev. 909') After Drilling*
- *10' (elev. 911') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-09-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D10

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9593° Longitude: -93.4497°

Approximate Surface Elev.: 916.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	
1				**Approx 12" Root Zone/Plow Zone**
				LEAN TO FAT CLAY (CL), trace sand, trace organics, very dark gray
				LOCAL ALLUVIUM
		7.0	909+/-	
3				**SAND (SP-SC)**, fine to coarse grained, with gravel and trace clay, gray with brown, loose
				GLACIAL OUTWASH
		11.0	905+/-	
				SAND (SP-SM), fine to coarse grained, with gravel and trace silt, brown with gray, medium dense to dense
				Occasional gravel or cobble seams to 22'
				GLACIAL OUTWASH
				Loose below at about 20' (No recovery in Sample #7)
		22.0	894+/-	
4				**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff
				WISCONSINAN SUBGLACIAL TILL
		28.0	888+/-	
				LEAN CLAY (CL), trace sand, dark gray, medium stiff
				WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼	X	18	2-2-4 N=6	1		29			
		■	17		2	2280	32	84		
5										
		X	18	2-2-3 N=5	3		29			
10	▽	■	11	Sand	4		13			
		X	10	6-7-10 N=17	5		12			
	▽									
15		X	2	12-24-12 N=36	6		14			
20		X	0	3-4-5 N=9	7					
25		X	18	2-3-3 N=6	8		20			
30		X	18	2-2-2 N=4	9		30			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *10' (elev. 906') During Drilling*
- ▽ *14' (elev. 902') After Drilling*
- ▼ *1.5' (elev. 914.5') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. D10

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9593° Longitude: -93.4497°

Approximate Surface Elev.: 916.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4														
			LEAN CLAY (CL), trace sand, dark gray, medium stiff *(continued)*											
				35		X	18	2-3-3 N=6	10		26			
			WISCONSINAN SUBGLACIAL TILL											
		39.0	877+/-											
			LEAN CLAY WITH SAND (CL), dark gray, stiff	40		X	18	2-4-4 N=8	11		25			
			WISCONSINAN SUBGLACIAL TILL	45		X	18	3-4-5 N=9	12		21			
		50.5	865.5+/-	50		X	3	4-5-6 N=11	13		29			
			Boring Terminated at 50.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *10' (elev. 906') During Drilling*
- *14' (elev. 902') After Drilling*
- *1.5' (elev. 914.5') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S1

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9618° Longitude: -93.4534°

Approximate Surface Elev.: 956.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	Description
1	1.0	955+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, with sand, trace organics, very dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown with light gray, medium stiff to stiff Occasional sand seams to about 8' **WISCONSINAN SUPRAGLACIAL TILL**
	8.0	948+/-	
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, stiff to very stiff **WISCONSINAN SUPRAGLACIAL TILL**
	13.0	943+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff Occasional sand seams to about 25' Very stiff below about 18' **WISCONSINAN SUBGLACIAL TILL**
	25.0	931+/-	
3			**SAND (SP-SM)**, with gravel, trace silt, gray, medium dense **GLACIAL OUTWASH**
	30.5	925.5+/-	
			Boring Terminated at 30.5 Feet

DEPTH (Ft.)	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	18	1-1-1 N=2	1		16			
	10		2	2240	16	114		
5	18	2-3-3 N=6	3		16			
10	17	5500 psf (HP)	4		16	117		
	2	3-5-6 N=11	5					
15	15		6	2850	13	119		
20	18	3-7-13 N=20	7		11			
25	24	3-6-12-21 N=18	8		14			
30	18	4-6-7 N=13	9		11			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *11' (elev. 945') During Drilling*
- *8' (elev. 948') After Drilling*
- *3' (elev. 953') 5 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S2

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9616° Longitude: -93.4531°

Approximate Surface Elev.: 956.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		1.0	955+/-											
2							2	1-2-2 N=4	1		17			
							15		2	2460	16	117		
				5										
		6.0	950+/-				18	2-2-3 N=5	3		16			
				10			15		4	3410	15	116		
		12.5	943.5+/-				18	2-4-4 N=8	5		15			
4				15			16		6	4090	15	118		
				20			18	2-4-4 N=8	7		10			
		23.0	933+/-											
				25			18	5-6-8 N=14	8		19			
		30.5	925.5+/-	30			18	2-3-4 N=7	9		24			

Approx 12" Root Zone/Plow Zone

LEAN CLAY (CL), with sand, trace organics, very dark brown

SANDY LEAN CLAY (CL), trace gravel, brown with light gray and rusty brown, medium stiff to stiff

WISCONSINAN SUPRAGLACIAL TILL

SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, medium stiff to stiff

WISCONSINAN SUPRAGLACIAL TILL

SANDY LEAN CLAY (CL), trace gravel, dark gray, very stiff to stiff

WISCONSINAN SUBGLACIAL TILL

LEAN CLAY (CL), with sand, gray, stiff

WISCONSINAN SUBGLACIAL TILL

Boring Terminated at 30.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling

None Observed After Drilling

3' (elev. 953') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020 | Boring Completed: 04-07-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. S3

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9612° Longitude: -93.4524°

Approximate Surface Elev.: 952.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	951+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown with light gray, medium stiff Occasional sand seams to about 6'
			WISCONSINAN SUPRAGLACIAL TILL
	6.0	946+/-	
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, soft to medium stiff
			WISCONSINAN SUPRAGLACIAL TILL
	16.0	936+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff
			WISCONSINAN SUBGLACIAL TILL

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		18	2-2-3 N=5	1		15			
		18	2-2-3 N=5	2		17			
5		18	2-2-3 N=5	3		35			
10		18	2-2-2 N=4	4		17			
15		5	2-3-4 N=7	5		16			
		16		6	3330	15	119		
20		18	2-4-5 N=9	7		13			
25		18	3-7-7 N=14	8		13			
30		18	3-5-5 N=10	9		12			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling

None Observed After Drilling

0.5' (elev. 951.5') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020 | Boring Completed: 04-07-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. S3

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9612° Longitude: -93.4524°

Approximate Surface Elev.: 952.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff *(continued)*											
		35.5	916.5+/-	35			18	2-5-5 N=10	10		14			
			Boring Terminated at 35.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling

None Observed After Drilling

0.5' (elev. 951.5') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020 | Boring Completed: 04-07-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. S4

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9606° Longitude: -93.4519°

Approximate Surface Elev.: 953.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	952+/-	**Approx 12" Root Zone/Plow Zone**
2			**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown
			SANDY LEAN CLAY/CLAYEY SAND (CL/SC), trace gravel, brown with light gray, soft
	5.0	948+/-	**WISCONSINAN SUPRAGLACIAL TILL**
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with light gray and rusty brown, medium stiff to stiff
			WISCONSINAN SUPRAGLACIAL TILL
	18.0	935+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, gray to dark gray with brown, stiff
			WISCONSINAN SUBGLACIAL TILL
			Very stiff to hard below 22'
	24.0	929+/-	
3			**SAND (SP-SC)**, fine to coarse grained, trace gravel, gray, medium dense
			GLACIAL OUTWASH
			Gravel and cobble content at about 28'-30'
	31.0	922+/-	
6			**SANDY LEAN CLAY (CL)**, trace gravel, olive gray, very stiff
			PRE-ILLINOIAN GLACIAL TILL

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼		8	2-2-1 N=3	1		25			
			12	1-1-1 N=2	2		25			
5			18	2-3-4 N=7	3		17			
10			18	2-4-4 N=8	4		15			
	▽									
15			18	3-6-7 N=13	5		14			
	▽									
20			18	2-4-4 N=8	6		15			
		■	21		7	8120	16	117		
25			18	4-10-7 N=17	8		17			
30			18	11-16-13 N=29	9		8			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *13' (elev. 940') During Drilling*
- ▽ *19' (elev. 934') After Drilling*
- ▼ *2' (elev. 951') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S4

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9606° Longitude: -93.4519°

Approximate Surface Elev.: 953.0 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6		**SANDY LEAN CLAY (CL)**, trace gravel, olive gray, very stiff *(continued)*											
		35.5 917.5+/-	35			18	4-8-10 N=18	10		12			
		Boring Terminated at 35.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

13' (elev. 940') During Drilling

19' (elev. 934') After Drilling

2' (elev. 951') 7 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020 Boring Completed: 04-07-2020

Drill Rig: 709 Driller: SK

Project No.: 08205065

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BORING LOG NO. S5

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9605° Longitude: -93.4515°

Approximate Surface Elev.: 950.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	2.0	948+/-	**Approx 12" Root Zone/Plow Zone** **LEAN TO FAT CLAY (CL/CH)**, trace sand, trace organics, very dark gray
2	6.0	944+/-	**SANDY LEAN CLAY (CL)**, trace gravel, brown with light gray, soft to medium stiff **WISCONSINAN SUPRAGLACIAL TILL**
2	14.0	936+/-	**SANDY LEAN CLAY (CL)**, trace gravel, gray-brown with rusty brown, stiff **WISCONSINAN SUPRAGLACIAL TILL**
4	33.0	917+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray with brown to dark gray, stiff **WISCONSINAN SUBGLACIAL TILL** Very stiff in Sample #7

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	WATER CONTENT (%)
		14	2-2-1 N=3	1	25
		8	1-2-2 N=4	2	19
5		18	2-4-4 N=8	3	14
10		15	2-5-6 N=11	4	16
15		15	3-4-6 N=10	5	15
20		15	1-4-4 N=8	6	14
25		18	3-7-8 N=15	7	13
		18	3-6-8 N=14	8	13
30		18	4-6-7 N=13	9	25

WATER LEVEL OBSERVATIONS

UNCONFINED COMPRESSIVE STRENGTH (psf)

DRY UNIT WEIGHT (pcf)

ATTERBERG LIMITS LL-PL-PI

PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *20' (elev. 930') During Drilling*
- *14' (elev. 936') After Drilling*
- *1' (elev. 949') 6 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020
Boring Completed: 04-07-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S5

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9605° Longitude: -93.4515°

Approximate Surface Elev.: 950.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3														
				35		X	18	8-10-7 N=17	10		8			
4														
				40		X	18	3-7-8 N=15	11		16			

SAND (SP), fine to coarse grained, trace gravel and fines, gray, medium dense

GLACIAL OUTWASH

36.0 914+/-

SANDY LEAN CLAY (CL), trace gravel, dark gray, very stiff

WISCONSINAN SUBGLACIAL TILL

40.5 909.5+/-

Boring Terminated at 40.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

20' (elev. 930') During Drilling

14' (elev. 936') After Drilling

1' (elev. 949') 6 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-07-2020 | Boring Completed: 04-07-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. S6

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9601° Longitude: -93.451°

Approximate Surface Elev.: 941.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	940.5+/-	**Approx 12" Root Zone/Plow Zone**
			LEAN CLAY (CL), trace sand, trace organics, very dark brown
			SANDY LEAN CLAY (CL), trace gravel, brown with light gray and rusty brown, medium stiff
			WISCONSINAN SUPRAGLACIAL TILL
2	9.0	932.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, gray-brown with rusty brown, stiff
			WISCONSINAN SUPRAGLACIAL TILL
4	14.0	927.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff
			Very stiff in Sample #6
			WISCONSINAN SUBGLACIAL TILL
			Large gravel/cobbles below about 30'

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	WATER CONTENT (%)
		10	2-2-2 N=4	1	19
		18	2-2-3 N=5	2	16
5		18	2-3-3 N=6	3	15
10		18	3-3-5 N=8	4	14
15		18	2-5-6 N=11	5	13
20		18	4-6-9 N=15	6	11
25		18	2-4-5 N=9	7	15
30		11	5-5-5 N=10	8	20

WATER LEVEL OBSERVATIONS

UNCONFINED COMPRESSIVE STRENGTH (psf)

DRY UNIT WEIGHT (pcf)

ATTERBERG LIMITS: LL-PL-PI

PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

22' (elev. 919.5') During Drilling

37' (elev. 904.5') After Drilling

0.5' (elev. 941') 5 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S6

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9601° Longitude: -93.451°

Approximate Surface Elev.: 941.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff *(continued)* **WISCONSINAN SUBGLACIAL TILL**	36.0 905.5+/-	35			4	2-4-4 N=8	9					
5		**LEAN CLAY (CL)**, trace sand, gray, medium stiff **LOESS**	40.5 901+/-	40			18	3-3-3 N=6	10		24			
		Boring Terminated at 40.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

22' (elev. 919.5') During Drilling
37' (elev. 904.5') After Drilling
0.5' (elev. 941') 5 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-08-2020
Boring Completed: 04-08-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S7

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9601° Longitude: -93.45°

Approximate Surface Elev.: 932.5 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	1.0	931.5+/-	**Approx 12" Root Zone/Plow Zone**
3			**LEAN CLAY (CL)**, trace sand, trace organics, dark brown
			SILTY SAND (SM), fine to medium grained, brown to light brown, loose Occasional sandy clay seams to about 4.5'
	4.5	928+/-	**GLACIAL OUTWASH**
2			**SANDY LEAN CLAY (CL)**, trace gravel, brown to light brown with light gray, medium stiff
			WISCONSINAN SUPRAGLACIAL TILL
	9.0	923.5+/-	
			SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, stiff
			WISCONSINAN SUPRAGLACIAL TILL
	13.0	919.5+/-	
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff
			Medium stiff at about 20' (Sample #7)
			WISCONSINAN SUBGLACIAL TILL
	30.5	902+/-	
			Boring Terminated at 30.5 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		X	18	2-3-3 N=6	1		14			
		X	18	3-4-3 N=7	2		14			
5		X	18	3-3-4 N=7	3		15			
	▼	X	18	3-4-5 N=9	4		16			
10										
		X	18	3-4-6 N=10	5		15			
15		■	16		6	3700	17	112		
		X	18	3-3-4 N=7	7		16			
20										
		X	18	3-5-7 N=12	8		14			
25										
		X	18	3-4-6 N=10	9		13			
30										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling

None Observed After Drilling

▼ *9' (elev. 923.5') 3 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-10-2020 | Boring Completed: 04-10-2020

Drill Rig: 709 | Driller: SK

Project No.: 08205065

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BORING LOG NO. S8

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9598° Longitude: -93.4497°

Approximate Surface Elev.: 920.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	
1				**Approx 12" Root Zone/Plow Zone**
		2.0	918+/-	**LEAN CLAY (CL)**, trace sand, trace organics, very dark brown, medium stiff
2				**SANDY LEAN CLAY/CLAYEY SAND (CL/SC)**, trace gravel, dark reddish brown, medium stiff
		4.5	915.5+/-	**WISCONSINAN SUPRAGLACIAL TILL**
3				**SILTY SAND (SM)**, fine to medium grained, trace coarse sand, dark yellowish brown, very loose
				GLACIAL OUTWASH
		9.0	911+/-	
				SAND (SP), fine to coarse sand, trace gravel and fines, brown, loose
				GLACIAL OUTWASH
		13.0	907+/-	
4				**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff
				WISCONSINAN SUBGLACIAL TILL
				Stiff at about 30' (Sample #9)

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		X	18	1-2-2 N=4	1		22			
	▽	X	12	2-2-2 N=4	2		19			
5		X	18	1-1-1 N=2	3		29			
	▼	X	18	3-4-4 N=8	4		17			
10										
15		X	18	2-3-3 N=6	5		19			
		X	18	2-2-2 N=4	6		18			
20		X	18	2-3-3 N=6	7		18			
25		X	18	2-3-4 N=7	8		17			
30		X	18	3-3-5 N=8	9		18			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4.5' (elev. 915.5') During Drilling*

▼ *9' (elev. 911') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-09-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S8

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9598° Longitude: -93.4497°

Approximate Surface Elev.: 920.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, medium stiff *(continued)*											
		35.5	884.5+/-	35			18	2-3-4 N=7	10		17			
			Boring Terminated at 35.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

4.5' (elev. 915.5') During Drilling

9' (elev. 911') 4 Days After Drilling

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-09-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. S9

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9596° Longitude: -93.4492°

Approximate Surface Elev.: 915.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1		1.0	914+/-	**Approx 12" Root Zone/Plow Zone**
2		6.0	909+/-	**LEAN CLAY (CL)**, with sand, trace organics, dark brown **SANDY LEAN CLAY/CLAYEY SAND (CL/SC)**, trace gravel, dark reddish brown, soft to medium stiff **WISCONSINAN SUPRAGLACIAL TILL**
4		18.0	897+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff **WISCONSINAN SUBGLACIAL TILL**
3		22.0	893+/-	**CLAYEY SAND (SC)**, fine to coarse grained, trace gravel, gray, loose **GLACIAL OUTWASH**
4		30.5	884.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff **WISCONSINAN SUBGLACIAL TILL**
				Boring Terminated at 30.5 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼	Split Spoon	18	2-2-1 N=3	1		15			
		Shelby Tube	20		2	550	19	106		
5		Split Spoon	18	3-3-5 N=8	3		15			
10	▽	Shelby Tube	11		4	2590	15	114		
		Split Spoon	18	3-3-5 N=8	5		15			
15	▽	Shelby Tube	9		6	3030	15	117		
20		Split Spoon	18	4-4-4 N=8	7		15			
25		Split Spoon	18	3-3-6 N=9	8		16			
30		Split Spoon	18	3-3-6 N=9	9		17			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25 ID Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *11' (elev. 904') During Drilling*
- ▽ *16' (elev. 899') After Drilling*
- ▼ *2.5' (elev. 912.5') 4 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-09-2020
Boring Completed: 04-09-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. V1

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9644° Longitude: -93.4538°

Approximate Surface Elev.: 955.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**Approx 12" Root Zone/Plow Zone** **LEAN CLAY (CL)**, with sand, trace organics, very dark brown, medium stiff												
		3.0	952.5+/-											
							8	2-3-3 N=6	1		23			
							8	1500 psf (HP)	2	430	20	90		
2		**SANDY LEAN CLAY/CLAYEY SAND (CL/SC)**, trace gravel, brown to brown with light gray, soft to medium stiff Occasional very sandy zones/sand seams to about 8.5' **WISCONSINAN SUPRAGLACIAL TILL**		5										
							18	2-3-3 N=6	3		18			
		8.5	947+/-											
		SANDY LEAN CLAY (CL), trace gravel, gray-brown with rusty brown, medium stiff **WISCONSINAN SUPRAGLACIAL TILL**		10			18	3-3-4 N=7	4		17			
		13.5	942+/-											
4		**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff **WISCONSINAN SUBGLACIAL TILL**		15			18	3-4-6 N=10	5		15			
		15.5	940+/-											
		Boring Terminated at 15.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" OD Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *7' (elev. 948.5') During Drilling*
- *8' (elev. 947.5') After Drilling*
- *1' (elev. 954.5') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

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BORING LOG NO. V2

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9635° Longitude: -93.4538°

Approximate Surface Elev.: 950.0 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	0.5	949.5+/-	**Approx 6" Root Zone/Plow Zone**
2	6.0	944+/-	**LEAN CLAY (CL)**, with sand, trace organics, very dark brown **SANDY LEAN CLAY/CLAYEY SAND (CL/SC)**, trace gravel, brown to brown with light gray and rusty brown, medium stiff to stiff **WISCONSINAN SUPRAGLACIAL TILL**
4	11.0	939+/-	**SANDY LEAN CLAY (CL)**, trace gravel, gray-brown with rusty brown, stiff **WISCONSINAN SUPRAGLACIAL TILL**
	15.5	934.5+/-	**SANDY LEAN CLAY (CL)**, trace gravel, dark gray, stiff **WISCONSINAN SUBGLACIAL TILL**
			Boring Terminated at 15.5 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	▼									
		X	18	2-3-3 N=6	1		16			
		■	23		2	2590	16	116		
5										
		X	18	3-4-6 N=10	3		16			
10		■	23		4	3910	16	116		
	▽									
15		X	18	3-4-4 N=8	5		14			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" OD Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

None Observed During Drilling
▽ *13.5' (elev. 936.5') After Drilling*
▼ *1' (elev. 949') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. V3

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9629° Longitude: -93.4538°

Approximate Surface Elev.: 941.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		1.0	940+/-											
		Approx 12" Root Zone/Plow Zone												
		LEAN TO FAT CLAY (CL/CH), trace sand and organics, very dark gray					9	2-3-3 N=6	1		31			
		LEAN TO FAT CLAY (CL/CH), trace sand, very dark gray, medium stiff to soft					10		2	730	24	85		
		LOCAL ALLUVIUM		5										
		7.0	934+/-				9	1-1-1 N=2	3		41			
2		**SANDY LEAN CLAY (CL)**, trace gravel, light gray, soft												
		Occasional sand seams to about 11'												
		No recovery in Sample #4		10			0		4					
		Brown with light gray and rusty brown below about 11', stiff												
		WISCONSINAN SUPRAGLACIAL TILL												
		15.5	925.5+/-	15			10	3-6-7 N=13	5		15			
		Boring Terminated at 15.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" OD Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *5' (elev. 936') During Drilling*
- *6' (elev. 935') After Drilling*
- *1' (elev. 940') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. V4

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9588° Longitude: -93.4497°

Approximate Surface Elev.: 909.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		1.0	908+/-											
1		**Approx 12" Root Zone/Plow Zone**												
		LEAN CLAY (CL), trace sand, trace organics, very dark gray					15	2-2-3 N=5	1		19			
		3.0	906+/-											
		LEAN TO FAT CLAY (CL/CH), trace sand, very dark gray, medium stiff to soft												
		LOCAL ALLUVIUM					8		2	560	17	91	33-20-13	58
		LEAN CLAY (CL), trace sand and roots, gray, soft		5										
							18	2-1-1 N=2	3		25			
		ALLUVIUM												
				10			24		4	890	29	88		
		Lean clay with sand and medium stiff below about 13'												
		15.5	893.5+/-	15			18	2-3-3 N=6	5		20			
		Boring Terminated at 15.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" OD Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *8' (elev. 901') During Drilling*
- *13' (elev. 896') After Drilling*
- *2' (elev. 907') 7 Days After Drilling*

Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

BORING LOG NO. V5

PROJECT: Nevada WWTF Improvements

CLIENT: HR Green, Inc.
Johnston, Iowa

SITE: R22W, T83N, NE 1/4 Sec 31 Nevada Twp
Story County, Iowa

LOCATION See Exploration Plan

Latitude: 41.9581° Longitude: -93.4496°

Approximate Surface Elev.: 904.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY ()	FIELD TEST RESULTS	SAMPLE ID	UNCONFINED COMPRESSIVE STRENGTH (psf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		1.0	903.5+/-											
1		**Approx 12" Root Zone/Plow Zone**												
		LEAN CLAY (CL), trace sand, trace organics, very dark gray					12	2-2-2 N=4	1		30			
		LEAN TO FAT CLAY (CL/CH), trace sand, very dark gray, medium stiff to soft					19		2	860	34	82		
		LOCAL ALLUVIUM		5										
		7.0	897.5+/-				18	2-3-4 N=7	3		18			
4		**SANDY LEAN CLAY (CL)**, trace gravel, dark gray with brown, very stiff to stiff												
				10			24		4	7330	19	117		
		WISCONSINAN SUBGLACIAL TILL												
		15.5	889+/-	15			18	3-4-6 N=10	5		14			
		Boring Terminated at 15.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" OD Continuous Flight Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by HR Green.

Notes:

WATER LEVEL OBSERVATIONS

- *5' (elev. 899.5') During Drilling*
- *8' (elev. 896.5') After Drilling*
- *1.5' (elev. 903') 7 Days After Drilling*

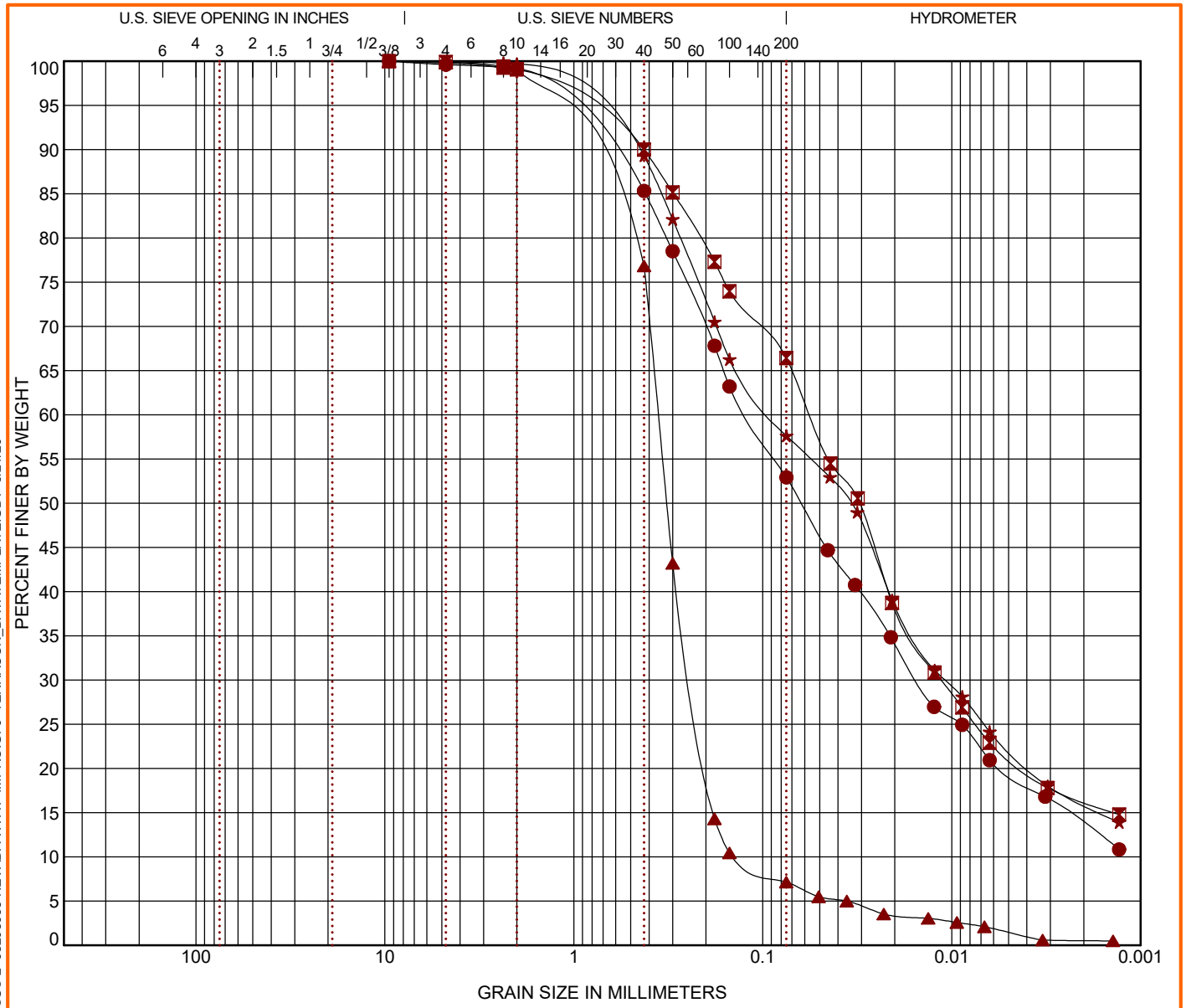
Terracon
600 SW 7th St, Ste M
Des Moines, IA

Boring Started: 04-06-2020
Boring Completed: 04-06-2020
Drill Rig: 709
Driller: SK
Project No.: 08205065

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 08205065 NEVADA D1-V5 COPY.GPJ TERRACON_DATATEMPLATE.GDT 5/15/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	D6	SANDY LEAN CLAY (CL)	18	27	15	12		
⊠	D7	SANDY LEAN CLAY (CL)	17	31	15	16		
▲	D9	POORLY GRADED SAND with SILT (SP-SM)	19	NP	NP	NP	1.15	2.61
★	V4	LEAN CLAY, trace SAND (CL)	17	33	20	13		

	Sample ID	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	D6	9.5	0.121	0.015		0.0	0.4	46.7	33.4		19.5
⊠	D7	9.5	0.056	0.011		0.0	0.1	33.5	45.2		21.2
▲	D9	9.5	0.357	0.238	0.137	0.0	0.2	92.7	5.7		1.5
★	V4	9.5	0.091	0.011		0.0	0.1	42.3	35.5		22.2

PROJECT: Nevada WWTF Improvements

SITE: R22W, T83N, NE 1/4 Sec 31
Nevada Twp
Story County, Iowa

Terracon
600 SW 7th St, Ste M
Des Moines, IA

PROJECT NUMBER: 08205065-01

CLIENT: HR Green, Inc.
Johnston, Iowa

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 08205065 NEVADA WWTF IMPRO.GPJ TERRACON_DATATEMPLATE.GDT 5/21/20

SUPPORTING INFORMATION

Contents:

General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING		WATER LEVEL	FIELD TESTS	
Auger	Split Spoon	Water Initially Encountered	(HP)	Hand Penetrometer
Shelby Tube	Macro Core	Water Level After a Specified Period of Time	(T)	Torvane
Ring Sampler	Rock Core	Water Level After a Specified Period of Time	(b/f)	Standard Penetration Test (blows per foot)
Grab Sample	No Recovery	Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(PID)	Photo-Ionization Detector
			(OVA)	Organic Vapor Analyzer
			(DCP)	Dynamic Cone Penetrometer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve) Consistency determined by laboratory shear strength testing, field visual-manual procedures, or standard penetration resistance		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, tsf	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 – 3	Very Soft	Less than 0.25	0 – 1
Loose	4 – 9	Soft	0.25 to 0.50	2 – 4
Medium Dense	10 – 29	Medium Stiff	0.50 to 1.00	4 – 8
Dense	30 – 50	Stiff	1.00 to 2.00	8 – 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 – 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive term(s) of other constituents	Percent (%) of dry weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major component of sample	Particle size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive term(s) of other constituents	Percent (%) of dry weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 – 10
Medium	11 – 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ³ 4 and 1 £ Cc £ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ³ 6 and 1 £ Cc £ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N]
						Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P]
						Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ³ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add "sandy" to group name.

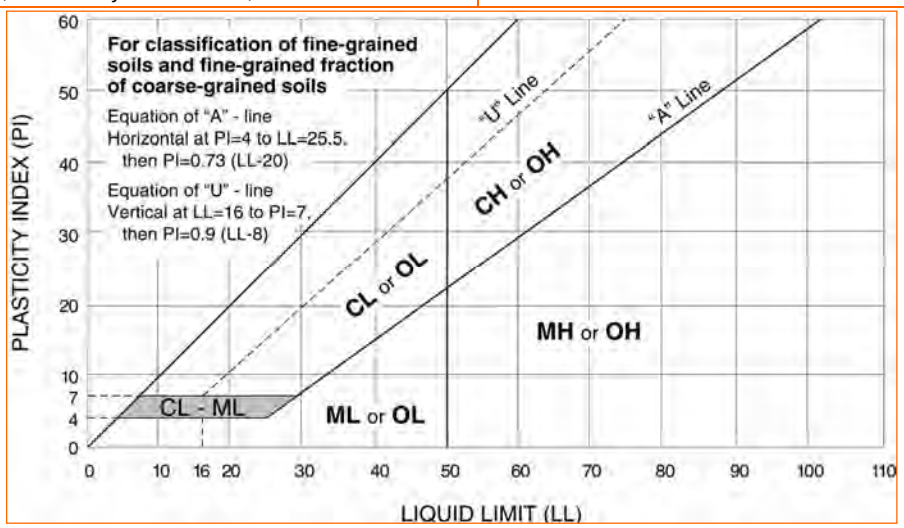
[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ³ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Appendix B

DRAFT

Nevada WWTP

Existing Topography

Legend

- Rivers
- Proposed Nevada WWTP Design
- Parcels
- Building Footprint

0 300 600 Feet

1 inch = 300 feet

HRGreen

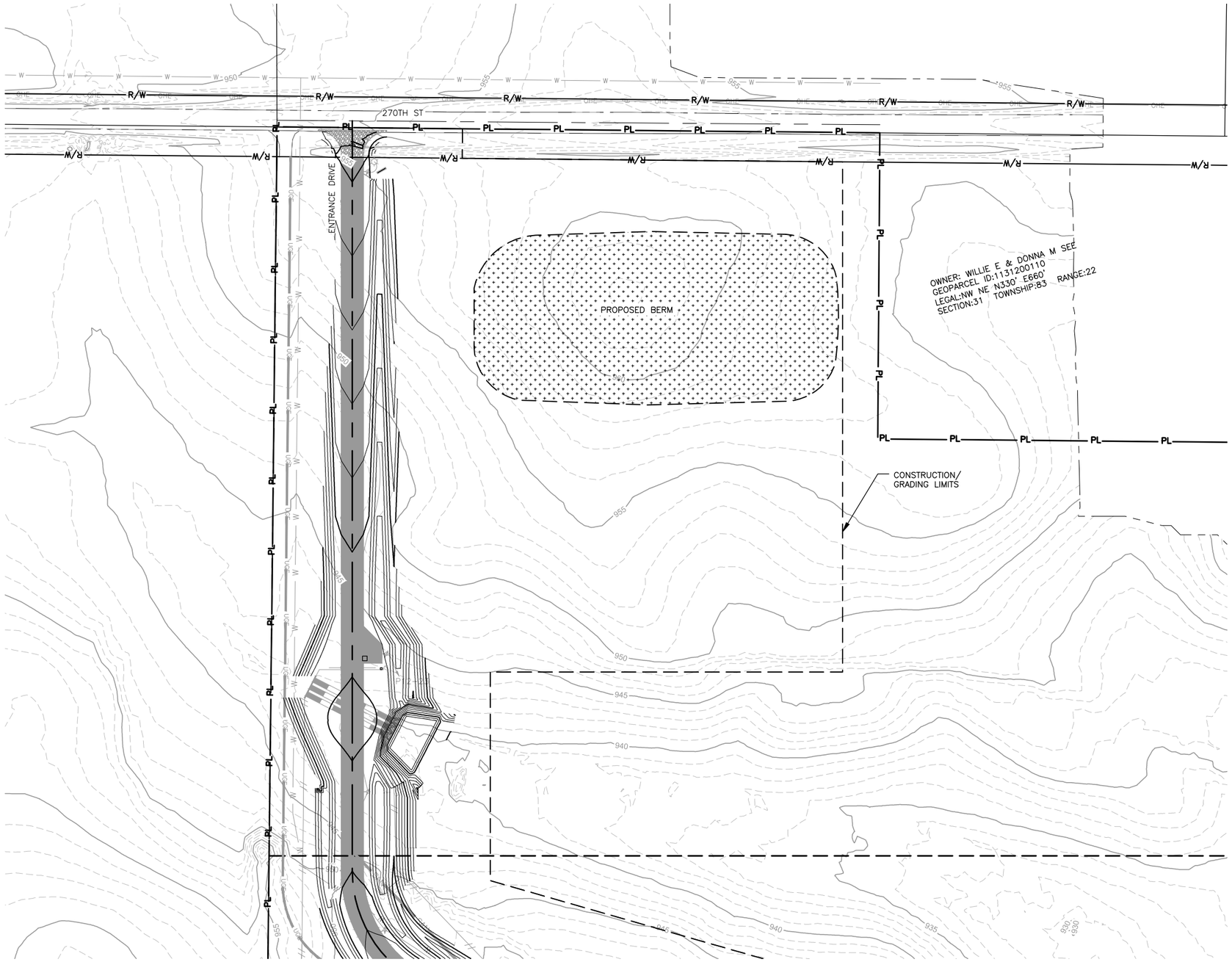
HRG PLOT: 2:41:10 PM 8/7/2020 BY: jgutman FILE: J:\2016\160473\Design\Meeting\Drainage Meeting\90%\Stormwater Management Plan\Topography\Topography.mxd

Appendix C

DRAFT

GENERAL NOTES:

1. REFER TO C.04 PLANT GRADING PLAN FOR GENERAL NOTES REGARDING SITE GRADING REQUIREMENTS.



1 SITEWORK
ENTRANCE GRADING PLAN
SCALE: 1"=60'

NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: MAR	JOB NUMBER: 160473	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD DATE: 8/2/2020 6:44:18 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.03 ENTRANCE GRADING PLAN.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

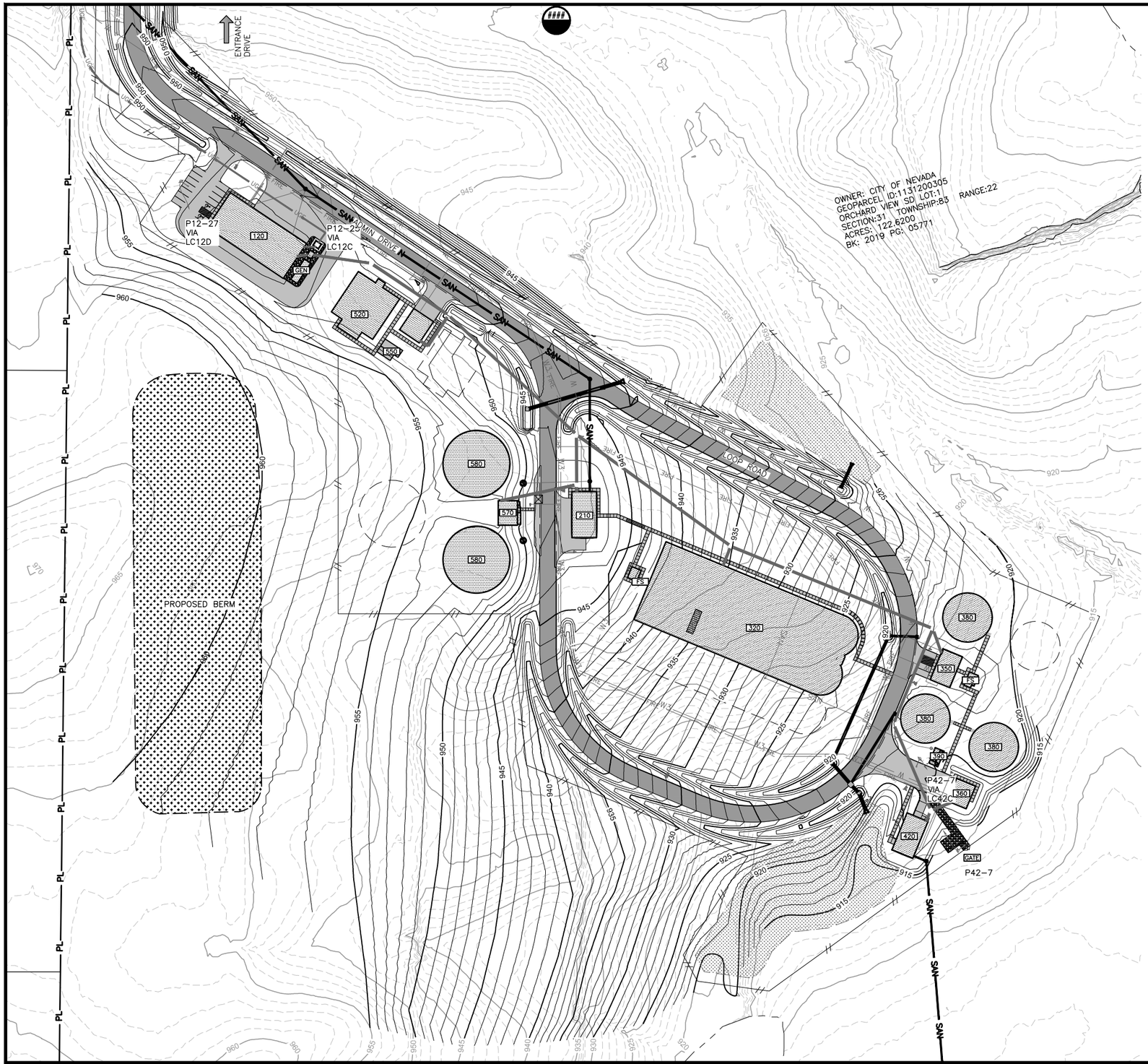
HRGreen.com
HRGreen

NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
ENTRANCE GRADING PLAN

SHEET NO.
C.03

Xrefs: xg1-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-VIEWFRAME; XCU-ELEC; XCP-PATT; XCU-WATR; XCU-SANI; XCU-STRM; XCT-ALIGNMENT; XVG-CONT-EG; XCG-CONSTRUCTION-LIMITS; XLS-PATT; XLS-DSGN; XCG-CONT-FG



GENERAL NOTES:

1. SEE SHEET X.XX FOR GEOTECHNICAL REQUIREMENTS AROUND BUILDINGS AND TANKS.
2. CONTRACTOR SHALL COMPLY WITH SPECIFICATION SECTION XX XXXX FOR SUPPORTS AND PROTECTION.
3. CONTRACTOR SHALL COMPLY WITH ALL SPECIFICATIONS FOR DEWATERING, GRADING, EXCAVATION, FILL AND BACKFILL, AND TRENCHING. SEE GEOTECHNICAL INVESTIGATION REPORT FOR EARTHWORK RECOMMENDATIONS. INSTALL EARTHWORK ACCORDING TO SPECIFICATION AND RECOMMENDATIONS OF GEOTECHNICAL INVESTIGATION REPORT.
4. WATER LEVELS WERE OBSERVED WITHIN THE DEPTHS OF PLANNED EXCAVATION FOR THE PROPOSED STRUCTURES. DEWATERING WILL BE REQUIRED WHERE SEEPAGE IS ENCOUNTERED. GROUNDWATER LEVELS SHOULD BE MAINTAINED AT LEAST TWO FEET BELOW BOTTOM OF EXCAVATION UNTIL FOUNDATION SLABS ARE COMPLETED. THE CONTRACTOR IS RESPONSIBLE FOR EMPLOYING APPROPRIATE DEWATERING METHODS TO CONTROL SEEPAGE INTO THE EXCAVATION. SEE GEOTECHNICAL REPORT FOR MORE INFORMATION ON DEWATERING.
5. IN AREAS TO ACCEPT FILL, THE TOP 12 INCHES OF THE GROUND SURFACE SHALL BE SCARIFIED AND COMPACTED TO ELIMINATE A PLANE OF WEAKNESS ALONG THE CONTACT SURFACE. EACH LIFT PLACED ABOVE THE FOUNDATION LEVEL SHOULD BE COMPACT TO AT LEAST 95 PERCENT OF THE SOIL'S STANDARD PROCTOR DRY DENSITY (ASTM D698). THE MOISTURE CONTENT OF THE COHESIVE SOILS SHOULD BE MAINTAINED WITHIN A RANGE OF 0 PERCENT BELOW TO 4 PERCENT ABOVE THE MATERIAL'S STANDARD PROCTOR OPTIMUM MOISTURE CONTENT. GENERAL FILL MATERIAL TO COMPLY WITH SPECIFICATIONS AND SHALL BE FREE OF FOREIGN SUBSTANCE, DEBRIS, LARGE STONES, ROCKS, ROOTS, ORGANIC OR FROZEN MATERIAL, EXPANSIVE MATERIAL AND OTHER DELETERIOUS MATERIALS. UNSUITABLE SHALL BE DISPOSED OF BY THE CONTRACTOR.
6. FILL SHOULD NOT BE FROZEN AND SHOULD NOT BE PLACED ON A FROZEN SURFACE. ALL COHESIVE SOILS USED AS FILL AT THIS SITE SHOULD HAVE A MAXIMUM LIQUID LIMIT OF 45 AND A MAXIMUM PLASTICITY INDEX OF 20.
7. ENSURE THAT PREVIOUSLY COMPACTED LIFTS ARE SCARIFIED 2 INCHES DEEP PRIOR TO COMPACTING THE NEXT LIFT.
8. USE EXISTING TOPSOIL STOCKPILE PLACED UNDER PRIOR CONTRACT TO PLACE 8" TOPSOIL TO MATCH FINAL GRADE ELEVATIONS AS SHOWN ON PLANS, EXCEPT IN AREAS TO BE SURFACED WITH GRAVEL, PAVEMENT, RIPRAP, OR OTHER DESIGNATED MATERIALS. REMOVE, STOCKPILE, AND REPLACE NATIVE MATERIAL 8 INCHES (TOPSOIL) BELOW EXISTING SURFACE FOR ALL AREAS DISTURBED (NOT SURFACED WITH GRAVEL, RIPRAP, OR OTHER DESIGNATED MATERIALS) WITHIN THE LIMITS OF CONSTRUCTION. NO ADDITIONAL PAYMENT WILL BE MADE FOR TOPSOIL OR MATERIAL THAT THE CONTRACTOR NEEDS TO IMPORT FROM OFFSITE.
9. SITE GRADING SHALL PROVIDE FOR POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES AND FOUNDATIONS UNLESS NOTED OTHERWISE.
10. CONTRACTOR SHALL CLEAR AND GRUB AREAS OF THE SITE AS NECESSARY TO PERFORM WORK. CLEARING AND GRUBBING SHALL BE PER SPECIFICATIONS.

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

1 SITEWORK
PLANT GRADING PLAN
SCALE: 1" = 80'

NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST
APPROVED: MAR
CAD DATE: 8/1/2020 2:42:24 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.04 PLANT GRADING PLAN.dwg
JOB DATE: 2020
JOB NUMBER: 160473

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
PLANT GRADING PLAN

SHEET NO.
C.04

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-INDEX; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XVG-CONT-EG; XLS-DSGN; XLS-PATT

Appendix D

DRAFT

Nevada WWTP

Floodplains

Legend

- Rivers
- Proposed Nevada WWTP Design
- Parcels
- Building Footprint
- Floodplain Boundary

0 300 600 Feet

1 inch = 300 feet

HRGreen

HRG PLOT: 2:54:31 PM 8/7/2020 BY: jgutman FILE: J:\2016\160473\DesignMeeting\Drainage Meeting\90%\Stormwater Management Plan\Topography\Topography.mxd

H. Appendix H - Fire Protection Approval

NEVADA PUBLIC SAFETY DEPARTMENT

1209 6th Street – P.O. Box 530 Nevada, Iowa 50201 Tele: 515-382-4593

Ricardo Martinez II
Public Safety Director
Chief of Police

Josh Cizmadia
Police Sergeant

Chris Brandes
Police Sergeant

Ray Reynolds
Director of Fire & EMS

Cathy Jager
Chief's Assistant

July 21, 2020

HR Green
Michael Roth, PE
5525 Merle Hay Road. Suite 200
Johnston, IA 50131-1448

Mr. Roth:

I received the fire flow calculations for the proposed Nevada Waste Water Treatment Facility. The two issues reviewed involve the installation of an automatic fire sprinkler system to the chemical storage building and the acceptance of effluent water for a temporary solution to achieve required fire flows.

COMPLY AS FOLLOWS:

Permanent Variance:

The AHJ for the City of Nevada Fire Protection District approves the request *not* to sprinkle the chemical storage building. The approval of this variance request is based on the following conditions having been met:

1) Install a shutoff or switch accessible to firefighters outside the chemical storage building which will allow the discontinuance of electrical current to the building during a fire event (including back-up emergency electrical power). The shut off shall be located near or on the exterior of the chemical storage building.
Exemption: If ventilation fans are required to mitigate fire events, they can remain on emergency generator circuits.

2) Assure the building is properly labeled to show the hazard classification for the chemicals stored inside.

3) Assure the chemical tanks inside the chemical storage building are provided with secondary containment capable of holding 110% of the largest tank capacity.

4) Chemical leak detection and heat detection shall be installed to notify plant staff of an emergency situation in this building.

Justification:
The SDS sheets for chemical MicrocC2000 shows it to be a reducing agent for biological processes. The chemical is classified as a non-flammable solution. The chemical Ferric Chloride is a stable substance

which is also classified as non-flammable. The tank storage system is designed for the chemicals being stored. The building is non-combustible or ordinary combustible with high hazard classification electrical wiring. The building is not intended for routine human occupancy and serves no purpose other than for chemical storage. The approved omission of the automatic sprinkler system benefits the plant by directing water to fire flows needed for the human occupied spaces of the administration building. The tank size of 3,000 gallons, and 6,000 gallons do not pose a fire hazard. The fire risk remains electrical only. Installing the control measures above will mitigate any emergency in this building.

The priority of this office remains to provide the highest level of protection to spaces where workers will likely spend a majority of their time. The administration building and attached garage space will be high traffic areas for the workers. Thus, it is most important to make this building a priority with automatic sprinkler protection.

Temporary Variance:

The AHJ for the City of Nevada Fire Protection District temporarily approves the use of effluent water treated by the plant for non-potable fire protection needs. This variance approval shall be reviewed in 5 years (7-21-2025) to determine if fire protection remains adequate or to determine if additional water capabilities are provided.

Justification*:*
There have been documented issues regarding the inadequate flow of water provided by rural water associations in the area of Nevada. The installation of this plant is outside of the City of Nevada city limits. As such, the city is dependent upon water flow rates provided by rural water. This variance is needed due to the economic hardship of piping adequate water from the City of Nevada. The solution offers equivalent safety by providing an average 750 gpm fire flow when needed. This approval shall not serve as a permanent solution to inadequate potable water on site. If there is an increase of water capacity piped to the treatment plant by either the city or rural water association, or water storage capabilities are added, this variance may not be needed.

If you have questions, contact me at 515-382-4593.

Respectfully,

Ray Reynolds
Fire Chief

May 22, 2020

Mr. Matt Mardesen
City Administrator
City of Nevada
1209 6th Street
Nevada, IA 50201

RE: **City of Nevada Wastewater Treatment facility Improvements**
DNR Project #2019-0233A
Subject: **Facilities Plan Review and Approval Letter**

Dear Mr. Mardesen:

The Iowa Department of Natural Resources (DNR) has reviewed the facilities plan for the City of Nevada wastewater treatment facility improvements and all subsequent correspondence for the above-referenced project. The department is in agreement with the project as currently proposed. The proposed facility plan and the concept are officially approved. The City of Nevada conducted an alternative analysis in accordance with the Iowa Anti-degradation Implementation Procedure (567 IAC 61.2(2)) and department approved the final report on October 23, 2019.

Project Background:
The City of Nevada, Iowa has proposed to replace their existing wastewater treatment system to accommodate industrial and population growth that will exceed the current design capacity. The existing wastewater treatment facility has two significant industrial wastewater contributors, Burke Corporation and Du Pont. The approved project has addressed the required nutrient reduction strategy. The approved project also included construction of a new outfall structure that discharges the treated effluent directly into West Indian Creek few miles downstream of the existing outfall.

The following is a brief summary of the approved facilities plan:

Facility Design Flows and Loads

Design Flows MGD			30 day max average lbs/day	Daily Max lbs/day	
ADW	1.64	MGD	BOD 6,692	BOD	12,130
AWW	3.02	MGD	TSS 4,300	TSS	7,987
MWW	6.13	MGD	TKN 869	TKN	1,491
PHWW	8.23	MGD			

The approved facilities plan is for the process of an activated sludge, three stage oxidation ditch, with enhanced biological phosphorus removal system. From the existing wastewater collection system a new raw influent lift station will pump water to the new preliminary treatment system at the new facility through a 30 inch interceptor sewer. The preliminary treatment system will have parshall flume for flow measurement and automatic composite sampler at the head-works building. The influent screening will have two mechanical fine screens followed by two vortex grit removal units with three grit pumps and with two grit washing and dewatering units.

The splitter box will guide wastewater flow from the primary treatment system to the two oxidation ditches, three stage- anaerobic, anoxic and aeration stages. From the oxidation ditches for settling and solids removal water will be transferred to three circular, center feed, and peripheral draw secondary clarifiers. The clarifiers will have six centrifugal return sludge pumps and two centrifugal waste sludge pumps.

Waste sludge will be transferred to two aerobic digesters which operates in series flow and will receive adequate aeration from three blowers. The digested, thickened sludge will be transferred to the sludge storage tank for final disposal.

The approved project also includes a UV disinfection system installed in a single open channel that has the capability to treat 8.5 mgd peak flow and an emergency stand-by diesel power generator. The UV system will have 65% minimum UV transmittance to meet the required 126 E.coli per 100 ml treated effluent. The UV system will have two banks and each with six modules and eight lamps per module thus bringing total number of 96 UV lamps and associated electrical control system.

The treated effluent will be discharged to West Indian Creek, designated as Class B(WW-2) A2, through a new outfall structure approximately three miles south of the existing outfall. The wasteload allocation calculated Water Quality Based Effluent discharge criteria for the approved project that has been included in the facilities plan.

On November 12, 2019 the IDNR Field Office in Des Moines, Iowa, conducted a preliminary site investigation for the above-referenced project. The site survey was done in accordance with the Sub rule 567 IAC Chapter 64.2(3) for the proposed wastewater treatment facilities improvements including the construction of the new plant at a new location in Story County, Iowa. The preliminary site approval was done by the department on November 27, 2019.

The City has opted to utilize State Revolving Loan Funds (SRF) for financing the proposed project. Therefore, an environmental review (ER) is necessary to assess the environmental impacts of the project in accordance with procedures in 40 CFR Part 6, and is required for all loan recipient s. A decision will be made by the department to determine if the project qualifies for a categorical exclusion (CX) or if a finding of no significant impact (FNSI) is required. Please contact Mike Sullivan, Environmental Review Staff, at 515-725-8304 or michael.sullivan@dnr.iowa.gov for questions about the ER status.

Our approval is limited to the treatment and disposal alternatives as described in the analysis under the approved flows and loads. Our approval does not constitute an agreement with the proposed treatment processes that will be further reviewed and evaluated. However, if the design conditions or selected alternatives are modified subsequent to this approval a new or revised alternatives analysis may be required.

You may proceed with the plans and specification preparation and submittal of associated construction permit application for our review to obtain the required construction permit for your project.

If you have any further questions, please feel free to call me at 515-725-8429 or email me at Suresh.Kumar@dnr.iowa.gov.

Sincerely,

Suresh Kumar, Environmental Engineer/Industrial Coordinator

C: Iowa DNR Field Office 5
City of Nevada Wastewater File 6856200101
Nevada SRF File # CS192094501
HR Green engineering, consultant

FACILITY PLAN

WWTF Improvements – FACILITY PLAN

City of Nevada, Iowa

August 2019

Prepared By:

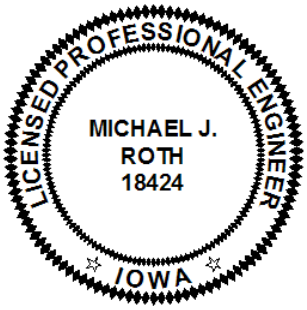
HRGreen

CERTIFICATION

PRELIMINARY ENGINEERNIG
FOR
WWTF Improvements – Facility Plan

CITY OF NEVADA, IOWA

August 2019



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

_____ Date:_____

MICHAEL J. ROTH, P.E.

License No. **18424**

My renewal date is **December 31**, **2020**

Pages or sheets covered by this seal:

Entire Document

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REFERENCES

(1) Table 3-12, *Wastewater Engineering Treatment and Reuse,* Metcalf & Eddy, 4th Ed

1. EXECUTIVE SUMMARY

1.1. SCOPE AND BACKGROUND

This Facility Plan is required by the Iowa Department of Natural Resources (IDNR) as the official document to evaluate and recommend improvements to Nevada's wastewater treatment system infrastructure. The report projects the wastewater produced by the City's residential, commercial and industrial wastewater contributors and presents a wastewater treatment plan to meet the treatment needs and environmental protection for the 20 year planning period and beyond.

The City's Wastewater Treatment Facility (WWTF) has served the community for approximately 60 years. The WWTF has undergone many modifications over its lifetime in order to increase capacity to a continually growing population. Some of the facility's improvements include the addition of a peak flow clarifier in 1992, a mechanical screen and a vortex grit removal system that was installed in 1995, replacement of a primary clarifier in 2004, addition of a 960,000 gallon biosolids storage tank in 2004, and most recently a roughing filter upgrade in 2010. The roughing filter upgrade in 2010 was the basis for a capacity re-rating by the City of Nevada in 2013.

The 2013 facility plan and Antidegradation Analysis evaluated whether the City of Nevada would need further modifications in order to treat increased loadings from industry and population growth. The approved facility plan concluded no improvements were needed to the facility at that time with a re-rated capacity. The facility plan did conclude that disinfection would be required for the plant during the next permitting cycle; the solids treatment process was very close to capacity; and the facility would not meet future limits that will be implemented for Total Nitrogen and Total Phosphorous removal from Iowa's Nutrient Reduction Strategy. The facility's re-rated capacity was projected for a design year of 2027 based on population growth.

Since the approval of the 2013 Facility Plan, Significant Industrial User (SIU) Burke Corporation has recently informed the City of planned process expansions. These process expansions will produce loadings to the wastewater treatment facility that will exceed the re-rated WWTF organic loading capacity. Burke's expansion is expected to be completed and fully operational in 2021. In order to help expedite the implementation of a new waste water treatment facility the City of Nevada has already purchased a new site approximately three miles south of the current facility. Review of the current facility has shown a new facility is necessary for the following reasons:

- **Limited Space on Current Site.** In order to accommodate the increased loadings from Burke, major upgrades and additions will be needed at the existing facility. The current facility already has limited space available for expansion and new processes.
- **The Iowa Nutrient Strategy Applies.** In addition to capacity increases for Burke's expansion, the existing facility will eventually need major and costly modifications in order to meet more stringent effluent requirements for Total Nitrogen and Phosphorus Removal. A new facility will address these requirements simultaneously while addressing other requirements.

- **Encroachment on the Existing WWTF Site.** The current facility already resides within 1000 feet of multiple inhabitable residences. A new facility will relieve pressure and scrutiny of the current facility's location.
- **Disinfection Still Needed.** The existing facility's new discharge permit requires addition of effluent disinfection process to meet new permit limits. A new facility will address this need simultaneously while addressing other requirements.

1.2. EVALUATIONS

The Facility Plan was developed based on the requirements of the IDNR Design Standards. The existing loads and flows were reviewed and design flows and loads were established for the future residential projected population; non-Burke industrial loading limits; and the SIU Burke design loadings from their expansion.

A Waste Load Allocation (WLA) was developed for West Indian Creek as the proposed receiving stream adjacent to the new site. This new outfall will be downstream of the existing outfall that goes into an unnamed creek before discharging to West Indian Creek. The WLA limits along with the Iowa Nutrient Strategy goals were used to evaluate wastewater treatment technologies considered in this report.

Two interceptor sewer alternatives and two WWTF alternatives were evaluated in detail in this report. No evaluations of the existing collection system were included in this report. The City of Nevada is currently implementing improvements to the existing collection system to reduce I&I flows.

The interceptor sewer alternatives propose to either follow West Indian Creek with a gravity sewer before being pumped with a lift station to the headworks of the proposed WWTF or to use a force main to pump flow from the existing WWTF site to Country Road S14 and subsequently conveyed via a gravity interceptor sewer to the new site.

The main objective of the WWTF alternatives evaluation was to find an economical solution (capital and life-cycle costs) that best met the City's qualitative criteria of:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically Enhanced Biological Phosphorus Removal (EBPR)

The evaluations for preliminary, primary, secondary, solids treatment, solids processing, biosolids storage, and effluent disinfection treatment processes were focused during a conceptual design workshop with the City at the beginning of this planning effort. Since the Antidegradation Analysis found the less degrading alternative to be practical, reasonable, and economical, secondary treatment systems with nutrient removal capability were the only alternatives evaluated herein. Evaluated alternatives were Five-stage Bardenpho (P1) and Three-stage Oxidation Ditch (P2).

The same preliminary treatment and disinfection processes were used for both alternatives' (P1 and P2) overall cost development as these processes are not influenced by the secondary treatment system. Final design and equipment selections for preliminary treatment will be determined in final design. Several options were available for disinfection. Use of ultraviolet (UV) disinfection was ultimately chosen for both alternatives based on the City's preferences from the design workshop.

Primary treatment was eliminated from both alternatives due to the negative impact on secondary treatment to achieve EBPR. Neither alternative includes primary treatment.

Solids treatment is most influenced by the type(s) of sludge produced. Due to no primary treatment processes, only waste activated sludge (WAS) from the secondary treatment system was anticipated. This resulted in evaluation of aerobic digestion processes for solids treatment. Solids thickening processes were also evaluated in lieu of aerobic digestion and the City's continued preference for liquid biosolids disposal. Continued land application of biosolids was anticipated, influencing biosolids storage requirements for a minimum of 180 days of storage.

1.3. RECOMMENDATIONS

The recommended interceptor sewer between the existing and new WWTF sites is Alternative S2 which locates the lift station at the existing WWTF site; force main along US Highway 30 to the intersection of County Road S14; and gravity interceptor sewer along County Road S14 to the new WWTF site.

The recommended WWTF alternative is Alternative P2. Alternative P2 is recommended for the WWTF design because of the best relative ability for:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically EBPR

The opinion of probable construction cost for the recommended WWTF and interceptor sewer is **$41,741,100.00.**

2. INTRODUCTION

2.1. BACKGROUND

The City of Nevada's Wastewater Treatment Facility (WWTF) does not have sufficient capacity for planned industry expansion (Burke Corporation) and projected population growth within the design period. The existing WWTF configuration is readily amenable for the additional effluent disinfection and nutrient removal requirements currently required by the Iowa Department of Natural Resources (IDNR). Additionally, the facility is near the end of its life due to infrastructure age. The facility treats the residential, commercial and industrial wastewater flows that are collected and conveyed through the City's sanitary sewer collection system.

The City of Nevada purchased a123.5-acre parcel of farmland approximately three miles south of the existing Wastewater Treatment Facility along West Indian Creek. The new wastewater treatment plant will be located on this property.

The existing collection system consists of approximately 30 miles of sanitary sewer, 550 manholes, one lift station, and one equalization basin. The City's two permitted SIUs discharge to the City's collection system. The City continues to improve and rehabilitate the collection system and reduce wet weather flows received at the WWTF.

Due to the design capacity of the current WWTF (> 1.0 million gallons per day (mgd) AWW), the City is required as part of the Iowa Nutrient Reduction Strategy to evaluate the feasibility to reduce nutrients discharged from the WWTF. If the current facility were to remain in operation, the ability to provide nutrient reduction would require major upgrades to the WWTF. This Facility Plan includes an alternative treatment scenario for nutrient removal at the proposed WWTF to achieve effluent discharge levels of 10 mg/l Total Nitrogen (TN) and 1 mg/l Total Phosphorus (TP). A brief nutrient reduction feasibility analysis is included in **Appendix I**.

2.2. PURPOSE AND SCOPE

The purpose of the Facility Plan is two-fold: First, the City of Nevada will use it as a guide to planning and designing the new wastewater treatment facility to meet the City's wastewater treatment needs for industry expansion and population growth; second, the Facility Plan will be used by IDNR to review the proposed technologies with respect to discharge limits and wastewater design standards.

Due to an aggressive expansion plan/timeline by Burke Corporation, the replacement of the existing WWTF has an accelerated implementation schedule. The increased loadings will exceed the current WWTF capacity earlier than previously planned. Burke's expansion expected to be fully operational in 2021. The City hopes to begin construction on the new WWTF by July 2021. Burke is planning to transport "excess" pretreated wastewater above its permitted discharge capacity from its facility to the Ames WWTF until the new WWTF is operational. This will allow the current WWTF to operate at or below its design capacity after Burke's expansion is operational during the interim period.

This Facility Plan was developed to provide a reliable wastewater treatment system to meet projected NPDES discharge limits in the most cost effective manner. The Facility Plan was developed around a reliable and flexible secondary treatment system and the necessary preliminary treatment and solids processing systems to support plant operation. Due to high organic loadings from industry, it is possible to design a secondary treatment process that incorporates biological nutrient removal to meet Iowa Nutrient Reduction Strategy targets.

A sewer rate analysis was not part of this report's scope, though project construction cost estimates will help the City of Nevada to define future sewer rates and industry contribution to fund recommended improvements. Evaluation of the existing collection system was not part of this report's scope.

3. EXISTING CONDITIONS AND PROJECTIONS

3.1. PLANNING PERIOD

Per IDNR requirements, the planning period for this project with respect to design flows and loads is 20 years from completion of construction activities. Construction activities are anticipated to be completed by 2024; therefore, the design year is 2044. Per IDNR Design Standards, a 50-year design life for the interceptor sewer infrastructure is used.

3.2. LAND USE

Land use within the City of Nevada's corporate limits is a mix of residential, commercial, industrial, and civic (schools, parks, etc.) land use/zoning. Residential, commercial, industrial, and civic proportions are approximately 35-, 4-, 6-, and 20-percent of developed land, respectively. Road ROW within corporate limits accounts for approximately 33-percent. There is approximately 1,250 acres total of "undeveloped" land area within the corporate limits designated as "Agriculture and Open Space" and "Vacant Urban Land".

The main industrial corridors are in the northwest (along old Highway 30), west, and southwest (along U.S. Highway 30) areas of town. Commercial districts are found primarily in the "downtown" along 8th Street and south of U.S. Highway 30 along G Avenue.

Future residential development may occur south of the current corporate limits along Country Club Road. This area(s) would either tie into to the City's existing collection system or new interceptor sewer to the new WWTF.

3.3. DEMOGRAPHIC AND ECONOMIC DATA

The population serviced by the WWTF is assumed based on census information and projected population growth.

According to the U.S. Bureau of the Census, in 2010 the total population of Nevada was 6,798. Since 1920, Nevada has experienced an annual average population growth of 1.25%, with growth slowing from 2000 – 2010. In the 2013 Facility Plan submitted by HR Green, an average annual growth rate of 0.75% was determined to be a reasonable estimation of 20-year growth for design purposes. City staff have affirmed the validity of this assumption. Applying this growth rate will result in a 2044 population of 8,764 which is used as the reference population for flow and loading projections. Census population data for the past 100 years as well as projections to 2044 are shown in **Figure 3-1**, below.

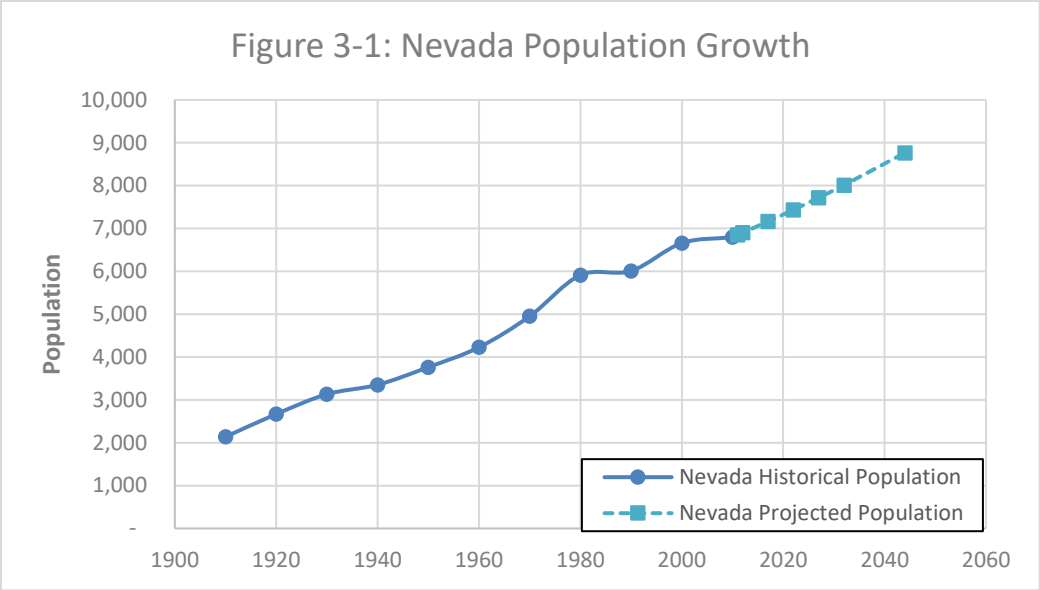

Figure 3-1: Nevada Population Growth

The Median Household Income (MHI) in Nevada, Iowa is estimated to be $61,876. This value was determined during the Antidegredation Analysis based on the 1999 census's MHI being $42,527 and the Consumer Price Index ratio from 1999 to 2019 being 1.455. In 2013 HR Green completed a sewer rate study for the City of Nevada with proposed increases in sewer rates through 2018. The City of Nevada has used this study to define rates. Currently the City has standard rates for basic monthly charges, quantity use charges, connection fees, and sewer construction fees. In addition to these standard fees, the City of Nevada has a treatment agreement with Significant Industrial User (SIU) Burke Corporation for pretreatment of its process wastewater to defined limits prior to discharge to the City's collection system with industry surcharge fees for cBOD, TSS, TKN, and Oil and Grease exceeding those defined limits. If Burke exceeds the loading agreements, additional penalty fees (surcharges) may be applied. Using 12-month service charges from March 2019 and prior, SIU Burke currently accounts for approximately 34-percent of all sewer charges. With no outstanding wastewater-related loans, the City of Nevada currently gains an annual net revenue of approximately $650,000 from sewer service charges. **Appendix B** provides the City of Nevada's existing ordinance for service charges. See **Section 5.7: Project Financing** for more information regarding future sewer rates and funding for the recommended alternatives.

4. EXISTING FACILITIES EVALUATION

4.1. EXISTING COLLECTION SYSTEM

The existing collection system consists of approximately 30 miles of sanitary sewer, 550 manholes, one lift station, and one equalization basin. The sanitary sewer piping ranges from 6- to 24-inch diameter of varying material types. All flow is directed to the wastewater treatment plant located on the south side of town at the north west corner of U.S. Highway 30 and West Indian Creek.

A map of the system is shown in **Figure 4-1**. The map also shows the location of Burke Corporation, as they are a beneficiary to this project.

The one existing lift station within the collection system is located near the Nevada high school/middle school complex (H Avenue and 15th Street.) This lift station serves the area around the high school/middle school complex.

The one equalization basin is located in the central area of town (southwest of E Avenue and 4th Street.) The basin is a concrete tank with a storage capacity of 1.0 million gallons. The basin is filled by gravity flow during wet weather events. Submersible pumps are used to return stored flow to the collection system after wet weather events. There are no flow measurement devices at the equalization basin.

The scope of this facility plan does not include an evaluation to the existing collection system. All existing flows and loadings contributed by the existing collection system can be found in **Section 4.4. Existing Wastewater Flows and Characteristics**. These historic flows will be used as the basis of design for the future facility's capacity.

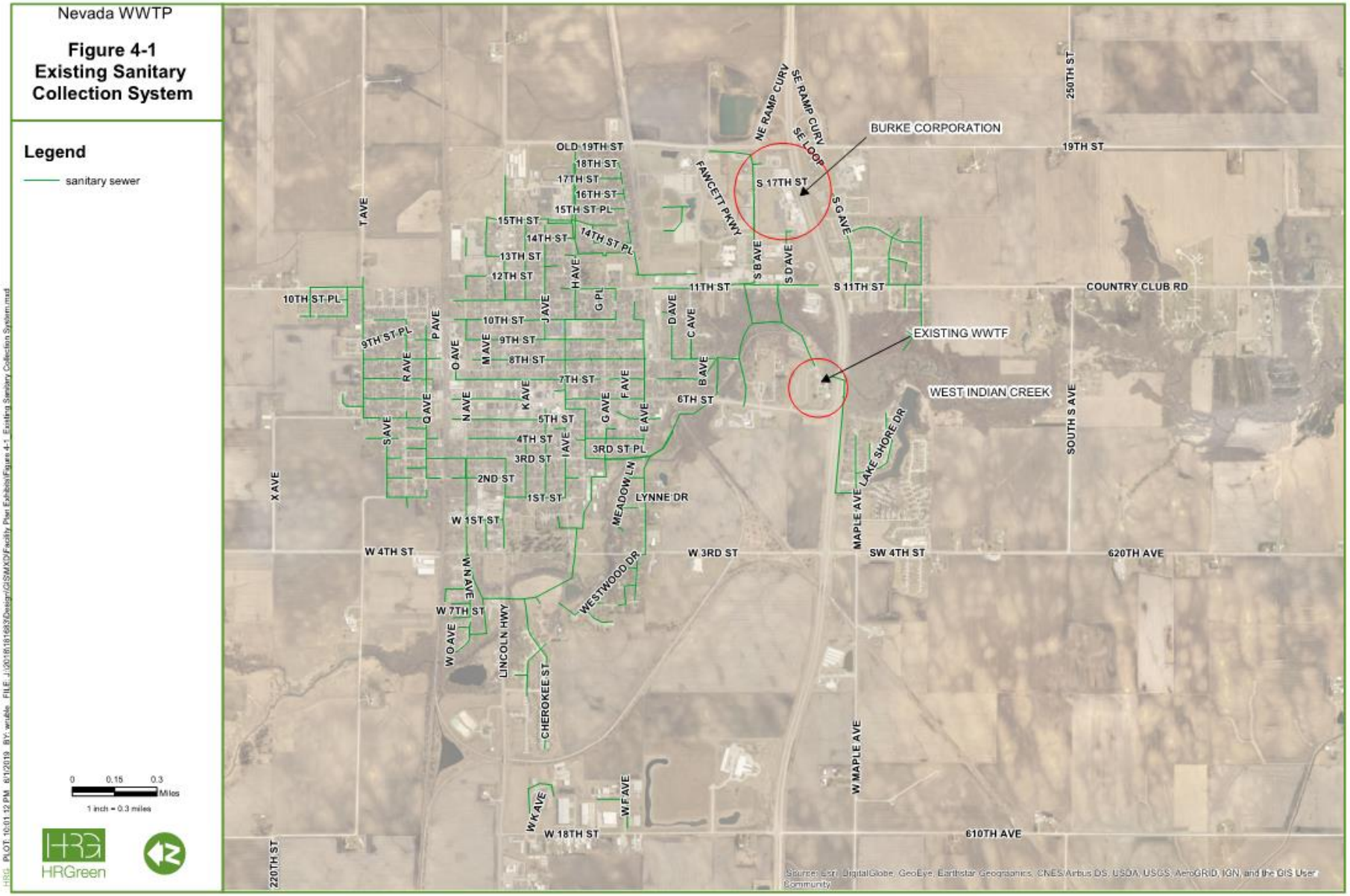

Figure 4-1: Existing Sanitary Collection System

4.2. EXISTING TREATMENT PLANT SITE

The City of Nevada WWTF's current site is located northeast of the US Highway 30 and 6th Street intersection. The WWTF site currently does not meet the IDNR 1000-foot site separation requirements between inhabitable structures and treatment processes. There is very little space for the WWTF to expand on the existing site and maintain the required 90% of existing separation distance.

The lowest portion of the treatment plant is located at approximately 950.00 feet above sea level in the southern part of the city near the West Branch of Indian Creek. According to Federal Emergency Management Association (FEMA), the National Flood Protection Insurance Program has established the 100-year flood elevation to be 948.00. **Figure 4-2** Below shows an aerial image of the existing site.

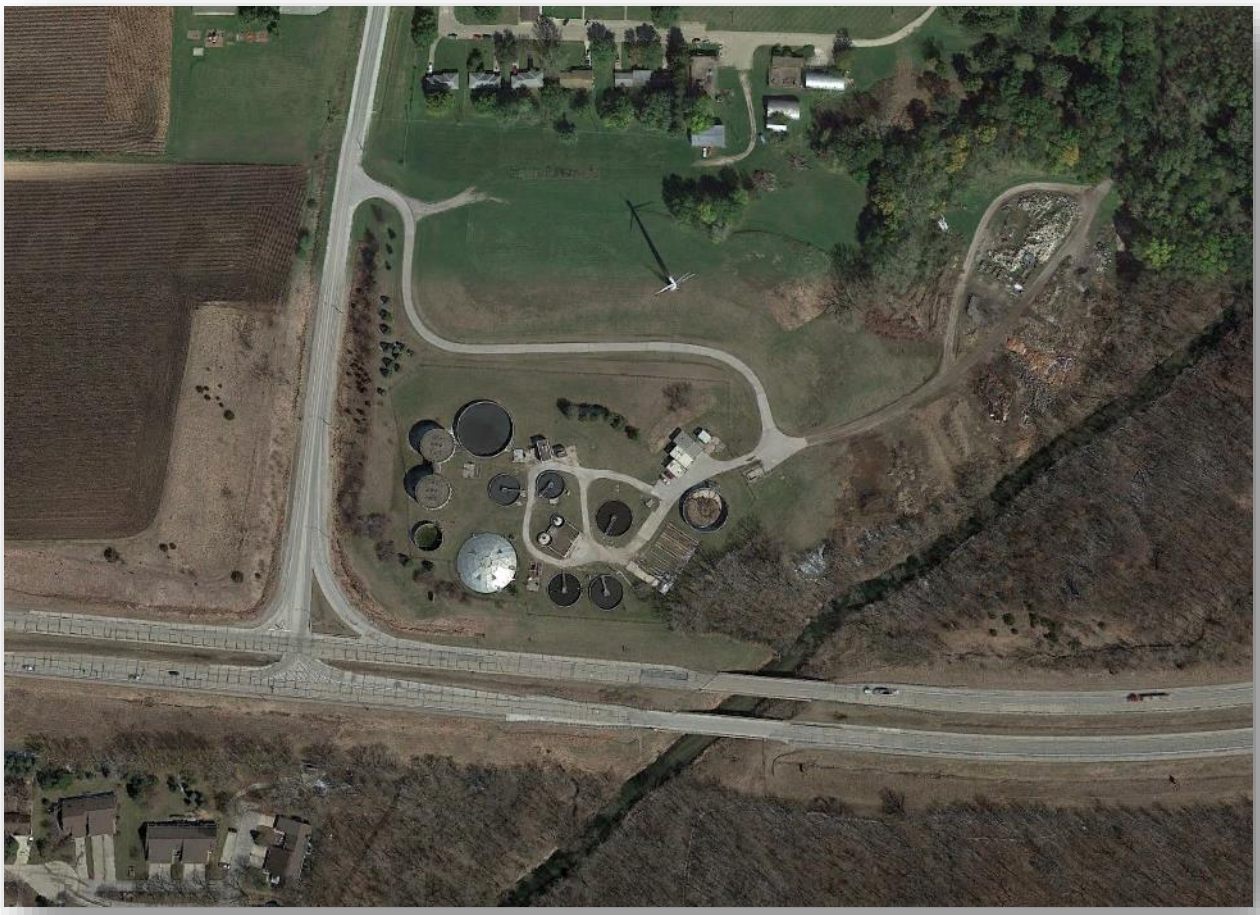

Figure 4-2: Exiting WWTF Site Plan

4.3. EXISTING TREATMENT FACILITIES

The City of Nevada, Iowa utilizes a fixed film treatment facility to treat the wastewater generated by the community. Preliminary treatment includes screening and grit removal. Primary treatment is provided by two primary clarifiers; one of which was replaced in 2004. Secondary treatment is completed by a two-stage trickling filter process with an intermediate clarifier, and two final clarifiers. The two stage trickling filter system consists of a roughing filer for removal of biochemical oxygen demand (BOD) and second-stage trickling filter towers for nitrification (removal of ammonia –N). The second-stage trickling filters have been converted to operate in series. Solids treatment includes two anaerobic digesters and two large liquid sludge storage tanks. The existing drying beds are not currently in use for sludge drying but are available for emergency use if needed.

In 2013 the City of Nevada requested a re-rate of the plant's capacity due to previous improvements from a roughing filter upgrade and the conversion of the second-stage trickling filters to operate in series. **Table 4-1** shows the current plant's permitted capacity.

Table 4-1: Existing Permitted Capacity

FLOWS (mgd)	Organic Loading (lbs/day)
ADW = 1.6580	BOD = 4,871
AWW = 3.7100	TKN = 1004.00
MWW = 6.2180	

4.3.1. Influent Pump Station

Collection system flows enter the plant and are pumped by the raw influent pumps (capacity of 3.75 mgd) to preliminary treatment. Flows in excess of this amount are pumped by the excess flow pumps (5.2 mgd) to the peak flow clarifier. All flows entering the Influent Pump Station are measured using a Parshall Flume; bypass flows are also measured with a Parshall flume. Peak flow pumping capacity of the plant is 8.95 mgd.

4.3.2. Flow Equalization

A peak flow clarifier was constructed in 1992. This clarifier is 80-feet in diameter and has a 13 feet sidewater depth (SWD). Volume of the clarifier is 490,000 gallons. Any flow in excess of the raw wastewater pumping capacity (3.75 mgd) overflows and is pumped to this clarifier. Wastewater is returned by gravity from the peak flow clarifier to the raw wastewater pumping station. If the clarifier fills completely, wastewater is able to overflow to the second-stage trickling filter wet well, where it is pumped up to the second-stage trickling filter towers for treatment, prior to being discharged. The second-stage towers would be operated in parallel under this condition.

4.3.3. Preliminary Treatment

Wastewater enters the raw wastewater pump station and is pumped to the Headworks Building for preliminary treatment. Preliminary treatment consists of a mechanical screen and a vortex grit removal system that was installed in 1995. The mechanical screen can be bypassed through a manually raked bar rack.

The mechanical screen has 5/8-inch openings and is sized to handle the current pumping capacity of 3.75 mgd. Grit removal consists of a forced vortex (Pista-Grit) grit system. Grit is pumped out and dewatered before final disposal. A 12-inch Parshall flume and ultrasonic transducer are used for influent flow measurement.

4.3.4. Primary Treatment

There are two primary clarifiers that receive an equal split of flows. Both are 50-feet in diameter with a 12-foot SWD. One is original and the other was constructed in 2004 to a replace a shallower clarifier. Additional work included splitter modifications to evenly divide the flow between the two clarifiers. The clarifiers are in good condition.

Table 4-2: Existing Clarifier Capacity

Primary Clarifiers	
Items	**Value**
Qty	2
Diameter, ft	50
Depth, ft	12
Area, sf, ea	1,963
Volume, gal, ea	176,256
AWW flow capacity per IDNR, mgd	3.92
Overflow Rate @3.75 mgd, gpd/sf	956

It is expected that the primary clarifiers remove 30% of incoming BOD and 65-70% of incoming TSS.

4.3.5. Secondary Treatment

Secondary treatment is a two-stage trickling filter process with intermediate and final clarifiers.

<u>Roughing Filter</u>
The roughing filter is designed to remove BOD. The roughing filter is 105 feet in diameter with a media depth of 8.25 feet. In 2010, the original rock media was replaced with higher specific surface area plastic media. Also in 2010, the underdrains, ventilation fan, and distributor arm were replaced. The roughing filter components are in good condition. These upgrades were the basis for a capacity re-rating requested by the City of Nevada in 2013.

Effluent BOD concentration from the roughing filter should be 20 milligrams per liter (mg/L) in order for the nitrifying towers to provide full capacity for ammonia removal. When BOD levels in the roughing filter effluent exceed 20 mg/L, the nitrifying towers must first remove this additional BOD, prior to ammonia removal taking place, which ultimately reduces the plant's ammonia capacity. The sizing of the roughing filter was reviewed with respect to the Germain and Schultz equation to give an organic loading capacity for the packed plastic media roughing filter. The evaluation was completed for winter (12 deg-C) and summer (20 deg-C) wastewater temperatures. A reduction of flows was also considered

for the winter condition; however, this reduction has little effect on the capacity. The installation and capacity specifics are presented in the **Table 4-3** below.

Table 4-3: Roughing Filter Capacity

Items	Value
Qty	1
Diameter, ft	105
Depth, ft	8.25
Area, sf	8,659
Volume, cf	71,436
Media specific surface area, sf	2,143,106
Hydraulic Loading @ AWW, gpd/sf	391
Winter BOD Removal capacity, ppd	**4,270**
BOD Loading Rate, ppd/sf	493

The IDNR roughing filter hydraulic loading rate is 700-4,200 gpd/sf and organic loading rate is 100-500 ppd/1,000 sf. The winter condition with high BOD loading and low flow will control and should be used for design. Based on the primary clarifier BOD removal being 30%, the influent max day BOD capacity of the plant is 6,100 ppd.

Intermediate Clarifier

After the roughing filter, flow goes through the intermediate clarifier which is 60-feet in diameter and 10-feet deep. Intermediate clarifier capacity is given in **Table 4-4** below.

Table 4-4: Intermediate Clarifier Capacity

Items	Value
Qty	1
Diameter, ft	60
Depth, ft	10
Area, sf	2,830
Volume, gal	211,700
PHWW flow capacity per IDNR, MGD	4.25
Overflow Rate @ AWW, gpd/sf	1,195

The IDNR max overflow rate for intermediate clarifiers is 1,500 gpd/sf. The intermediate clarifier capacity is acceptable for flows through the plant. The clarifier's purpose is to remove any TSS that would be associated with the roughing filter sloughed solids.

Secondary Trickling Filters

Flow from the intermediate clarifier goes to a wet well to be pumped up through two second-stage trickling filter towers. The towers are each 60 feet in diameter with a 24-foot depth of plastic cross-flow media. The media has a specific surface area of 30 sf/cf. Each tower uses a two-arm distributor to apply the wastewater to the media. The trickling filter towers can be run in series or parallel mode. Current operation is in series for additional ammonia- nitrogen removal. Parallel operation would allow higher flows. The installation specifics are presented below in **Table 4-5**.

Table 4-5: Second Stage Trickling Filter Specifics

Items	Value
Qty	2
Diameter, ft	60
Depth, ft	24
Area, sf	2,830
Volume, cf, ea	67,600
Media specific surface area, sf, ea	2,028,000

The effluent flow from the intermediate clarifier is designed to target a maximum BOD of 20 mg/L. This allows the second-stage tricking filter system to remove ammonia-nitrogen at the greatest efficiency. However, as mentioned above, when BOD levels in the roughing filter effluent exceed 20 mg/L, the second-stage towers must first remove this additional BOD, prior to ammonia removal taking place, which lowers the ammonia removal capacity of the trickling filter towers.

The capacity of the second-stage trickling filters depends on the target effluent Ammonia-N and temperature. See **Table 4-6** below for design capacity.

Table 4-6: Second Stage Trickling Filter Capacity

Parameter	Summer[1] (Max Day) (6 mg/L)	Winter [2] (Max Day) (7 mg/L)	Summer [1] (Max Month) (1.0 mg/L)	Winter [2] (Max Month) (3.0 mg/L)
Ammonia-N, ppd	1,168	851	1,113	847
TKN, ppd [3]	1,946	1,418	1,854	1,412

(1) Summer wastewater temps = 20 deg-C.
(2) Winter wastewater temps = 12 deg-C.
(3) TKN was assumed to be 1.66 of Ammonia-N. This is based on typical domestic flows.

The controlling scenario for second-stage trickling filter capacity is during winter months with low flows and high loading. Assuming a 10% removal in the primary clarifier and roughing filter, the ammonia capacity is 941 ppd and TKN capacity is 1,569 ppd. This assumes adequate airflow can be provided to the second-stage trickling filters to remain at 75% of oxygen saturation in the wastewater.

Final Clarifiers

Following the trickling filter towers, flow continues to two final clarifiers. Both of the final clarifiers are 60 feet in diameter with a 10 foot SWD. The second clarifier was constructed in 2004 and replaced a shallow final clarifier. **Table 4-7** below shows final clarifier capacity. After final clarification, plant effluent flows by gravity to an isolated channel and beyond to the creek.

Table 4-7: Final Clarifier Capacity

Items	Value
Qty	2
Diameter, ft	60
Depth, ft	10
Area, sf, ea	2,830
Volume, gal, ea	211,700
PHWW flow capacity per IDNR, mgd	6.8
Overflow Rate @ AWW, gpd/sf	598

4.3.6. Solids Treatment

Solids from the primary, intermediate, and final clarifiers are pumped to two anaerobic digesters using air-operated diaphragm pumps. The digesters are 24 feet in diameter with a 26 feet SWD. The digesters are operated in the mesophilic temperature range to stabilize biosolids through the consumption of organic matter in the absence of oxygen. In 2008, the floating digester cover was replaced in-kind due to corrosion of the original covers and damage to piping in the tank due to a tipped cover. Additionally, the WWTF also operates a 200,000 gallon aerobic storage tank which provides additional solids treatment.

Originally, the anaerobic digesters operated in primary-secondary arrangement. Currently, they both are operated in parallel as primary anaerobic digesters since the 2004 addition of a large liquid sludge storage tank. This additional storage capacity was increased to match the overall solids digestion capacity of the WWTF as discussed below. The capacity of the solids treatment system is 5,520 dry pounds per day, which assumes a minimum 15-day solids retention time in the primary digesters, 60-days in the aerobic tank, and a solids concentration of 4.28-percent. Treatment was assumed in the aerobic storage tank with the aeration equipment installed.

4.3.7. Solids Storage and Digester Gas Equipment

Stabilized biosolids storage was expanded in 2004 with the addition of a 960,000 gallon storage tank. The tank is a cast-in-place, open top storage tank with pumped recirculation and jet nozzle system provided for mixing. The tank is 100 feet in diameter with a 16.5 foot SWD. The WWTF also uses an existing 200,000 gallon aerated storage tank. Total available storage is approximately 136 days at the projected solids digestion capacity of 5,520 dry pounds per day and a sludge concentration of 4.28-percent.

The current sludge drying beds at the plant are not in use for sludge drying at this time, but can be used in emergency situations.

The digester waste gas burner system and gas safety equipment were upgraded in approximately 2007. A new waste gas burner, piping, condensate traps and other digester gas safety equipment were installed. The WWTF currently burns all their biogas produced by the anaerobic digesters through the waste gas burner. The WWTF does not recover biogas for reuse at this time.

4.3.8. Disinfection

The existing facility does not currently operate any disinfection process. The City of Nevada planned on incorporating UV disinfection to the existing facility before knowledge of the proposed industry expansion and subsequent decision to construct a new treatment facility.

4.3.9. Existing Facilities Summary

In summary, the existing facility for the City of Nevada has had many upgrades and process changes over the past 20-plus years in order to increase the existing facility's capacity and efficiency. In 2013, the facility was able to request a rerated capacity from the Iowa DNR due to previous process improvements with the roughing filter upgrade and extend the expected life of the treatment plant to 2027 when projected loadings from population growth were expected to exceed the re-rated capacity. Due to recent expansion plans by Burke Corporation, the capacity of the treatment plant will be exceeded in 2021 instead of 2027. With the existing treatment plant already upgraded to maximize capacities there is little room on the site for additional capacity upgrades to account for the new loads. In addition, the existing WWTF will require major modifications in order to achieve targeted effluent TN and TP reduction as outlined in the Iowa Nutrient Reduction Strategy. Required disinfection upgrades will also be challenging and costly to incorporate into the existing WWTF layout.

Given the proposed new WWTF is located at a different site, the entire existing WWTF will be decommissioned. The potential exception is to repurpose the existing influent pump station as all existing influent sewers will still route flow to the existing WWTF site. There is a need to convey flows from the existing WWTF site to the beginning of the proposed gravity interceptor sewer to new WWTF site. Further evaluation is planned during detailed design phase to determine if this repurposing is practicable and economically efficient compared to construction of a new influent pump station at the existing WWTF site.

4.4. EXISTING WASTEWATER FLOWS AND CHARCTERISTICS

4.4.1. Hydraulic Loading

Table 4-8 is a summary of the total influent wastewater flows discharged to the WWTF for the period from October 2015 through October 2018. Per IDNR Design Standards, the Average Dry Weather (ADW), Average Wet Weather (AWW), and Maximum Wet Weather (MWW) flows identified. The average of the three years will be used as the basis for the existing ADW and AWW flows when determining the design ADW and AWW flows. The maximum of the MWW flows will be used as the basis for the existing MWW when determining the design MWW flows.

Table 4-8: Influent Total Flows Summary

	2015–2016	2016–2017	2017–2018	Average	Current NPDES Permit Limit
ADW, mgd	1.164	0.963	0.862	0.996	1.658
AWW, mgd	2.389(1)	1.973	2.785	2.382	3.710
MWW, mgd	4.776(1)	3.720	5.219	4.572	6.218

(1) Flow meter was submerged on 12/14/15. Data point excluded.

Historical flows and current WWTF NPDES permit limits are plotted in **Figure 4-3** (12/14/15 data point excluded). Industrial flow is the combined daily total of the City's two permitted SIUs (Du Pont and Burke Corporation.)

Precipitation data for Nevada, Iowa from the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service databases and is also shown in Figure 3-2 to determine correlation of influent flow peaks. Figure 3-2 shows that Nevada's sanitary collection system is subject to significant inflow and infiltration (I&I) loading as the major peaks in influent flow to the WWTF are highly correlated with heavy precipitation events.

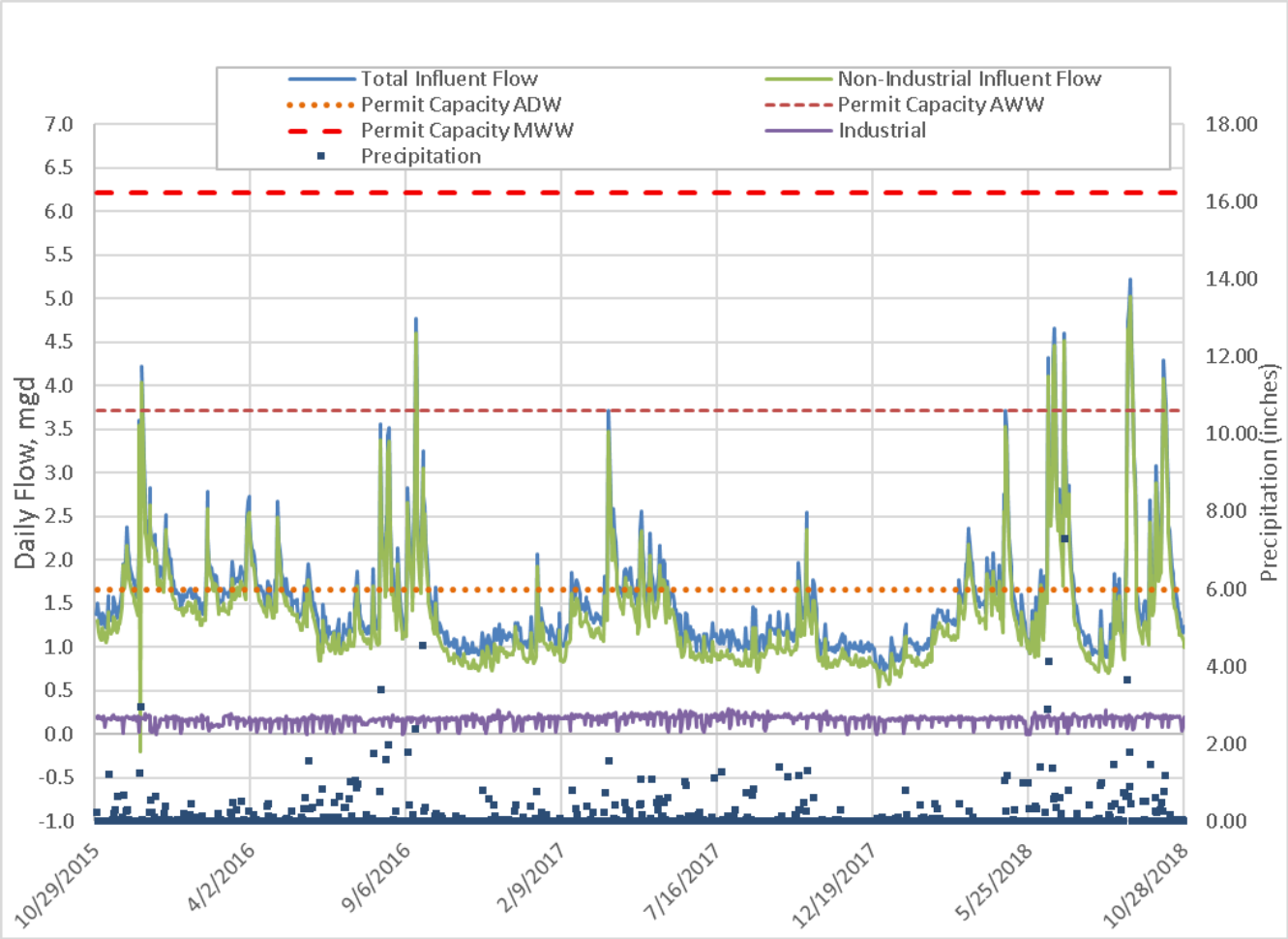

Figure 4-3: Historical Flows (2015-2018) – Nevada, IA

4.4.2. Organic Loading

Historic Influent organic loadings into the City's WWTF are derived from domestic, commercial, and the two SIU's (Burke and Du Pont). The Du Pont facility was recently purchased by Verbio and after the period of data review. Verbio has not gone into operation since acquiring the Du Pont facility. Historical data references Du Pont instead of Verbio for clarity.

Historical per capita loadings for the non-industrial component of influent loading was calculated by subtracting the historical total industrial maximum 30-day average load (SIU-1 maximum 30-day average + SIU-2 maximum 30-day average) from the historical total influent maximum 30-day average load, divided by the most recent (2010) census population estimate for Nevada. Equation 1 is the generic equation for the per capita non-industrial load calculation.

$$Non - Industrial\ Load, lb/cap \cdot d = \frac{(Total\ Infl\ Load) - (SIU{-}1\ Infl\ Load + SIU{-}2\ Infl\ Load), lb/d}{2010\ population} \quad \text{(Eqn 1)}$$

For several of the organic loading constituents, loadings from Burke exceeded the total influent load to the WWTF. Loading from any input to the WWTF should not exceed the total influent load measured at the WWTF. Reasons for these inconsistencies where Burke's loadings exceeded the WWTF loadings could be:

1. WWTF sample not collected on the same day as the SIU sample (e.g. WWTF samples on Monday and Wednesday; SIU sample on Tuesday)
2. Delay of SIU loading reaching the WWTF due to collection system residence time
3. Unrepresentative sample event/sampling error

In an effort to eliminate these anomalies, an outlier analysis was performed on Burke's historical data. Data points found to be outside of 1.5 times the interquartile range (middle 2 parts of the data distribution, Q1-Q3) were eliminated from the data set and analysis.

<u>Biochemical Oxygen Demand & Carbonaceous Biological Oxygen Demand</u>
Total influent Carbonaceous Biochemical Oxygen Demand (cBOD) data was reviewed from October 2015-October 2016. Total influent Biological Oxygen Demand (BOD) was reviewed from November 2016-October 2018. Due to the City's renewed NPDES permit in 2016, influent WWTF constituent measurement was changed from cBOD to BOD per IDNR requirements. Burke Corporation provided both cBOD and BOD data for the entire period. Du Pont's historical BOD data is from November 2016 to October 2018. Du Pont historically discharged only a fraction of the allowable loading to the WWTF. It is assumed that the new Verbio facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Figures 4-4 and 4-5 below show the trends of the 30-day average loading for BOD and cBOD, respectively. The trends indicate that Du Pont's loadings have a negligible effect on the overall loading of BOD observed at the WWTF.

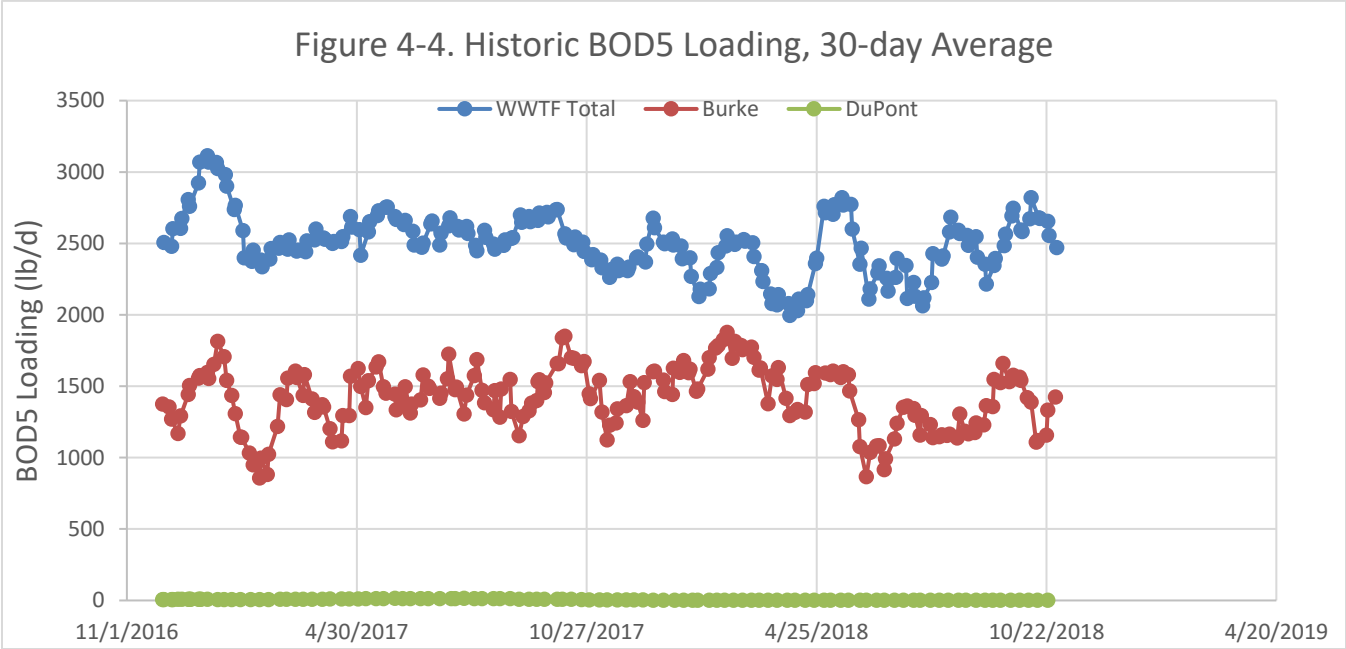

Figure 4-4: Historic BOD5 Loading, 30-day Average

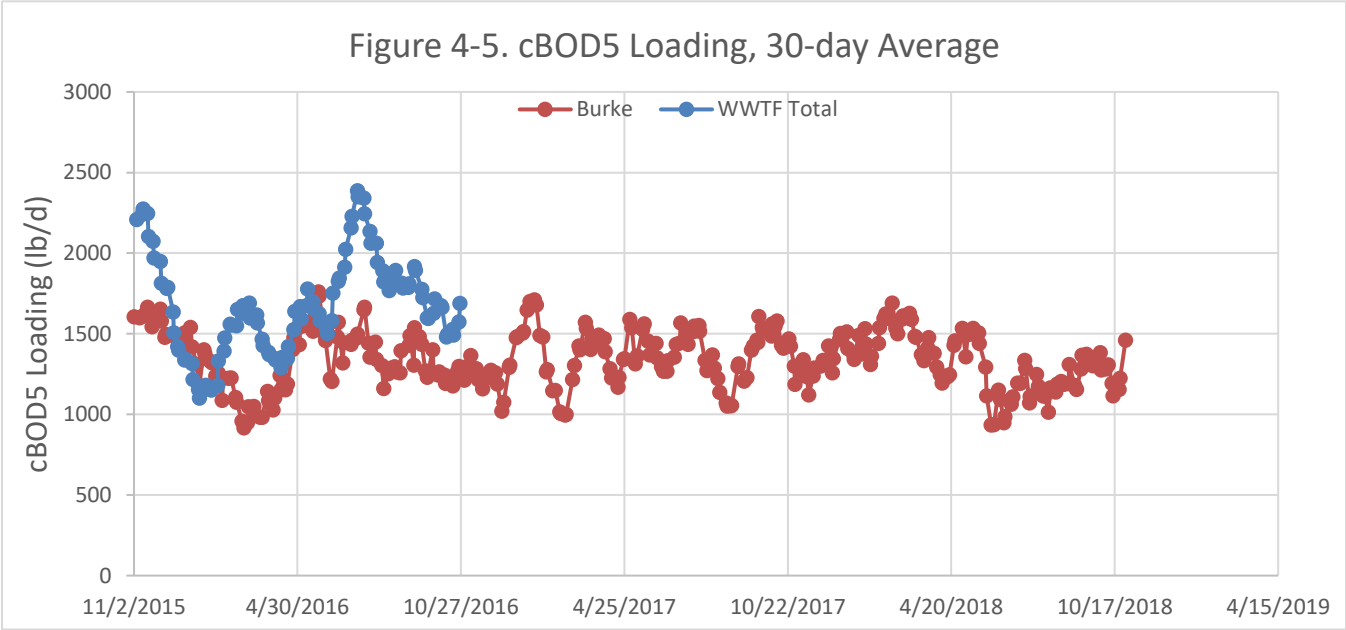

Figure 4-5: cBOD5 Loading, 30-day Average

Tables 4-9 and 4-10 below show the tabulated results of the data. Table 4-9 shows the historical industrial loadings and Table 4-10 shows the historical total influent loading. Burke contributes a significant fraction of the total cBOD/BOD to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's BOD input accounted for an average of 57% or the total BOD.

Table 4-9: Historical Industrial BOD Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
cBOD, mg/L	1323	1900	-	-
cBOD, lb/d	1762	2694	3073	3750
BOD, mg/L	1284	1900	-	-
BOD, lb/d	1877	3439	-	-
Du Pont de Nemour Corp (SIU-2)				
BOD, mg/L(1)	116	170	-	-
BOD, lb/d(1)	15	41	76	114

(1) MOR data from 11/1/16 - 10/30/18

Table 4-10: Historical Total Influent BOD Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
cBOD, mg/L(1)	227	320		-	-
cBOD, lb/d(1)	2388	3366		0.09	0.09
BOD, mg/L(2)	327	440		-	-
BOD, lb/d(2)	3114	5287	4871	0.18	0.27

(1) Measured from 10/1/2015 - 10/31/2016

(2) Measured from 11/1/2016 - 10/30/2018

As seen in **Table 4-10**, the calculated historic 30-day average non-industrial loading per capita for BOD is 0.18 lb/day. This is within typical values for municipal wastewater[1].

(1)Table 3-12, Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, 4TH Ed.

Total Suspended Solids

Total Suspended Solids (TSS) data was obtained for the entire design period from October 2015 to October 2018.

Figure 4-6 below show the trends of the 30-day average loading for TSS. The trends indicate that Du Pont's and Burke's loadings have a negligible effect on the overall loading of TSS observed at the WWTF.

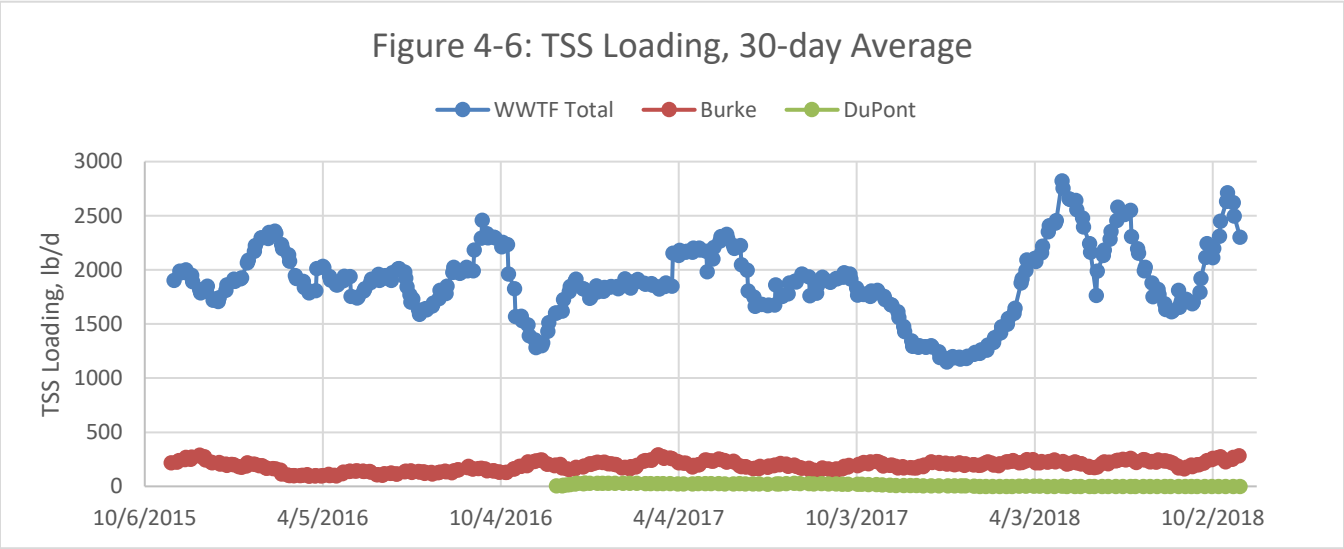

Figure 4-6: TSS Loading, 30 day Average

Tables 4-11 and 4-12 below show the tabulated results of the data. Table 4-11 shows the historical industrial loadings and Table 4-12 shows the historical total influent loading.

Table 4-11: Historical Industrial TSS Loadings

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
TSS, mg/L	205	330	-	-
TSS, lb/d	293	548	646	750
Du Pont de Nemour Corp (SIU-2)				
TSS, mg/L(1)	119	180	-	-
TSS, lb/d(1)	31	77	129	194

(1) MOR data from 11/1/16 - 10/30/18

Table 4-12: Historical Total Influent TSS Loadings

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
TSS, mg/L	210	320		-	-
TSS, lb/d	2822	5976		0.37	0.79

As seen in **Table 4-12**, the calculated historic 30-day average non-industrial loading per capita for TSS is 0.37 lb/day. This is at the upper range for typical loadings for municipal wastewater[1].

<u>Nutrient Loadings</u>
Nutrient loading data was obtained for Total Kjedahl Nitrogen (TKN), Total Nitrogen (TN), and Total Phosphorous (TP). There was no TN or TP data from Du Pont to review. TKN data was reviewed for the entire design period of October 2015-October 2018. TN and TP data was reviewed from November 2016-November 2018.

Figures 4-7, 4-8, and 4-9 below show the trends of the 30-day average loading for TKN, TN, and TP, respectively. The trends indicate that Du Pont's TKN loadings have a negligible effect on the overall TKN loading observed at the WWTF. The trends indicate Burke's loading of TKN, TN, and TP have a significant effect on the overall loadings for these parameters at the WWTF

(1)Table 3-12, Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, 4TH Ed.

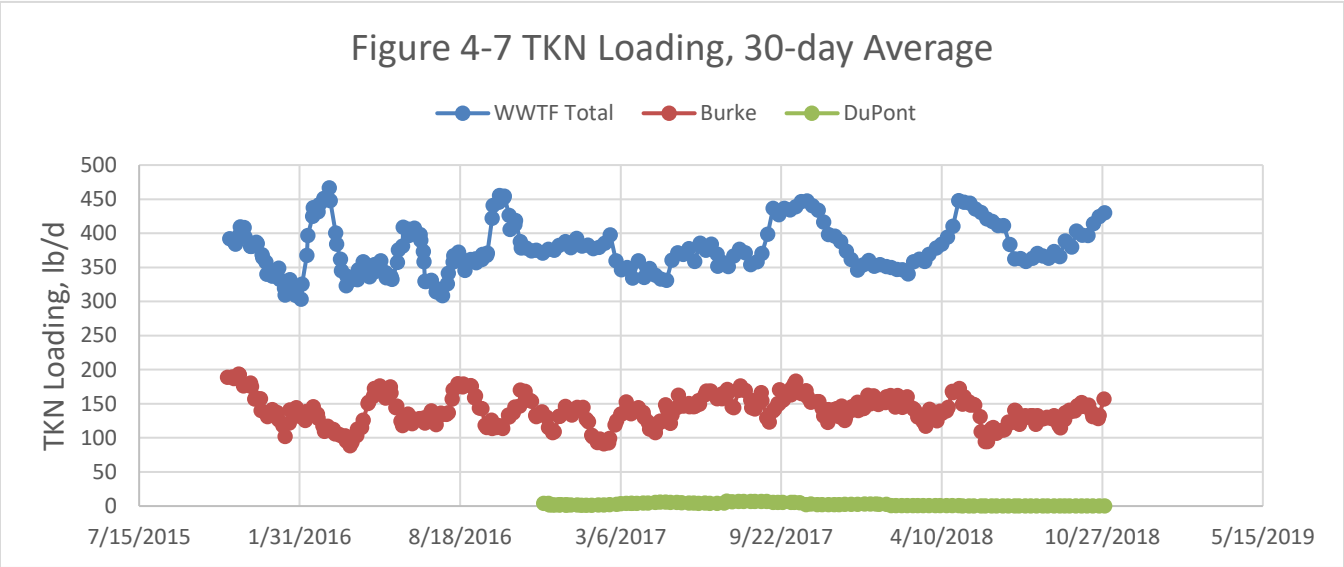

Figure 4-7: TKN Loading, 30-day Average

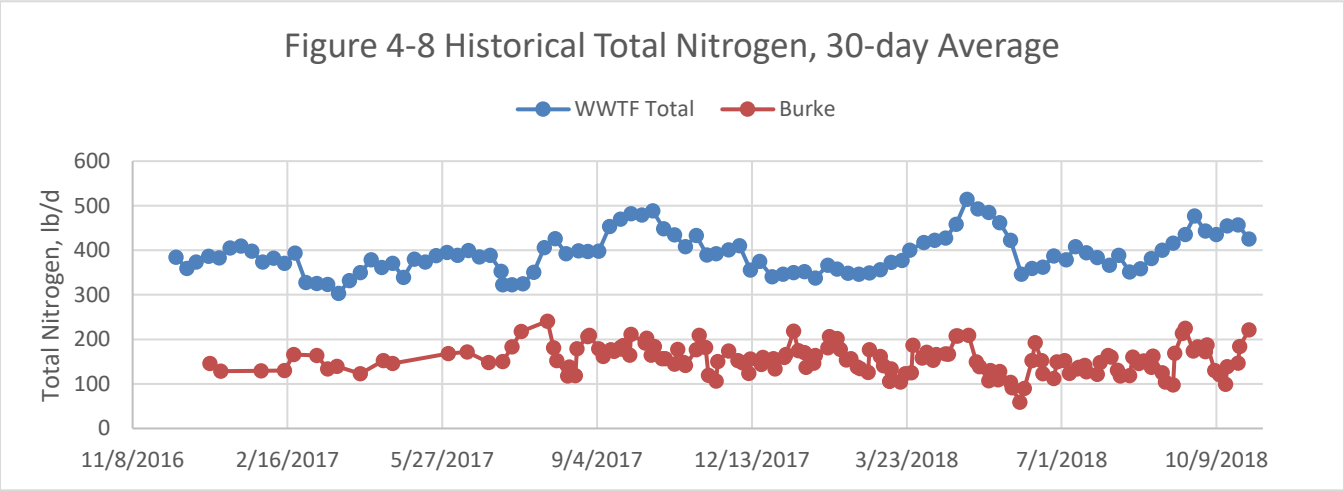

Figure 4-8: Historical Total Nitrogen, 30-day Average

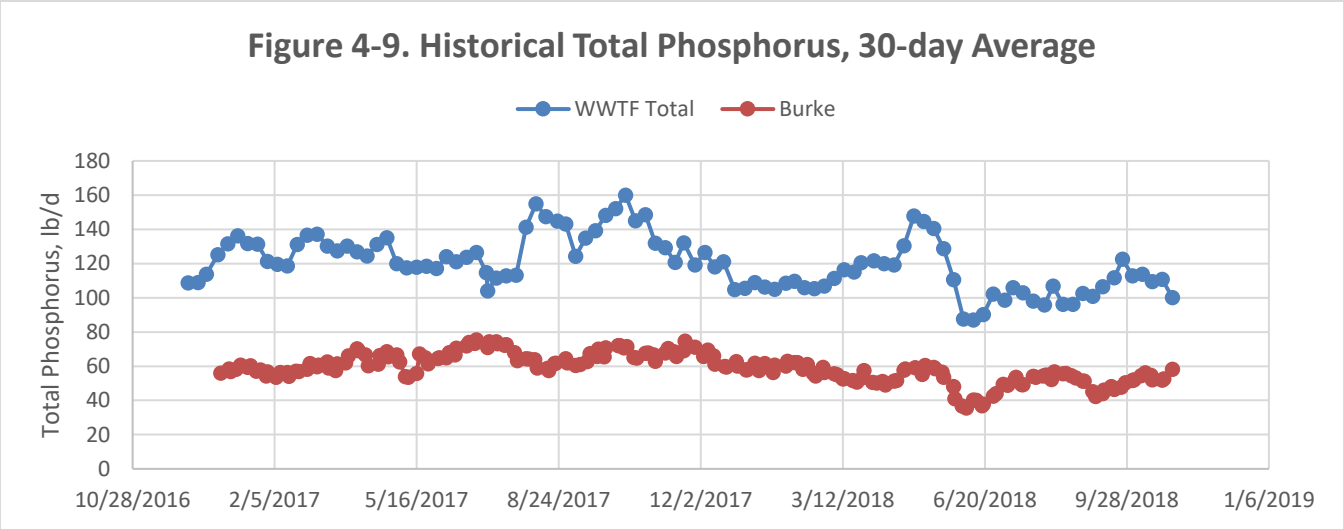

Figure 4-9: Historical Total Phosphorus, 30-day Average

Tables 4-13 and 4-14 below show the tabulated results of the data. Table 4-13 shows the historical industrial loadings and Table 4-14 shows the historical total influent loading. Again, Burke contributes a significant fraction of the total TKN, TN, and TP to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's input accounted for an average of 40% of the TN and 49% of the TP loads to the WWTF.

Table 4-13: Historical Industrial Nutrient Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
TKN, mg/L	137	200		
TKN, lb/d	194	292	570	750
TN, mg/L	154	182	-	-
TN, lb/d	241	304	-	-
TP, mg/L	51	77	-	-
TP, lb/d	75	113	-	-
Du Pont de Nemour Corp (SIU-2)				
TKN, mg/L(1)	111	140	-	-
TKN, lb/d(1)	7	37	26	38

(1) MOR data from 11/1/16 - 10/30/18

Table 4-14: Historical Total Nutrient Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
TKN, mg/L	47	61		-	-
TKN, lb/d	467	762	1004	0.039	0.064
TN, mg/L(1)	61	72		-	-
TN, lb/d(1)	515	719		0.040	0.061
TP, mg/L(2)	17	21		-	-
TP, lb/d(2)	160	205		0.012	0.013

(1) Measured from 11/29/2016 - 5/30/2018

(1) Measured from 11/8/2016 - 10/30/2018

The calculated historical 30-day average non-industrial loading per capita loading for TKN, TN, and TP are at the upper range for typical loadings for municipal wastewater[1].

Loadings Summary

Historical loadings of BOD, cBOD, TSS, TKN, TN, and TP were evaluated from the period of October 2015 through October 2018. Data from industrial loadings and total influent loadings were obtained. The historical data indicates that all organic loadings from Du Pont can be considered negligible compared to the total influent load to the WWTF. BOD, cBOD, TKN, TN, and TP loadings from Burke were found to have a significant impact on the WWTF total influent loadings. Burke's BOD, TN, and TP loadings averaged 57%, 40%, and 49% of the total influent loads, respectively.

5. PROPOSED FACILITIES EVALUATION

5.1. DESIGN WASTEWATER CHARACTERISTICS

5.1.1. Design Flows

Flow projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by calculating the average per capita hydraulic loading rate and the projected 2044 population. Per capita flow was assumed to be stable over the design period. Historical per capita flow for the non-industrial component of ADW flow was calculated using the 2015-2018 ADW divided by the most recent (2010) census population estimate for Nevada. This is calculated to be 121.7 gallons per capita per day (gpcd).

Future AWW and MWW flows to the WWTF were projected by calculating historical AWW Infiltration & Inflow (I&I) and MWW I&I values and adding them to the design ADW flow. These historical I&I values were calculated as the difference between the AWW and ADW flows and MWW and ADW flows, respectively. Given the City's efforts to rehabilitate the existing sanitary sewer collection system in conjunction with street projects, the I&I fractions are anticipated to remain constant over the design period. The design peak hourly wet weather (PHWW) flow was estimated using the IDNR peaking factor formula and the 2044 population of Nevada of 8,764.

Future industrial flows are based on the two existing SIUs. No new SIUs are anticipated during the planning period. An expansion of the WWTF would be required to accommodate any new SIUs in the future. Industrial flows are based on information from or assumptions about each major industrial contributor. Projected flows and loads from Burke Corporation were provided on December 31, 2018 by their engineering consultant (Bolton & Menk). Projected Burke Corporation flows are given in **Table 5-1**.

Projected flows from Verbio following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable flow to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Table 5-1: 2044 Design Flows

Parameter	Non-Industrial(2)	SIU-1 (Burke)	SIU-2 (VERBIO)	Total
ADW, mgd	1.07	0.5	0.072	1.64
AWW, mgd	2.45	0.5	0.072	3.02
MWW, mgd	5.29	0.7	0.144	6.13
PHWW(1), mgd	7.38	0.7	0.144	8.23

(1) The ratio of PHWW:AWW non-industrial flow is calculated by using the equation found in Appendix I, Chapter 12 of the Iowa Wastewater Facility Design Standards Peak:Average=(18+ √P)/(4+ √P), where P is population in thousands.
(2) Includes I&I component of total flow for AWW and MWW conditions

5.1.2. Design Wastewater Loads

Design wastewater loads were based on increased loadings from population growth and industry expansion.

The maximum 30-day average organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic maximum 30-day average per capita organic loading rate and the projected 2044 population. The maximum day organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic daily maximum per capita organic loading rate and the projected 2044 population. Per capita loading was assumed to be stable over the design period.

The design industrial loading for Burke Corporation is based on the planned expansion and related loadings outlined by Burke's design engineer (Bolton & Menk) in the letter dated February 27, 2019. Loading from Verbio North American Corporation are assumed to remain within the permit limits established for Du Pont in the NPDES permit issued November 1, 2016 and amended September 1, 2018. Design industrial loadings are summarized in **Table 5-2**.

Maximum 30-day design loading at the WWTF were estimated by combining industrial loading projections with non-industrial (residential/commercial) projections. Maximum day design loadings at the WWTF for process sizing, except for the aeration system sizing, were estimated by combining industrial maximum 30-day loading projections with non-industrial (residential/commercial) maximum day loading projections. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously. Review of the historical data support this assumption as well. The secondary treatment process aeration system sizing is based on the industrial maximum day loading projection only. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously; however, the aeration capacity must match

the demand for the largest of the two maximum day loadings. Design loadings are summarized in **Table 5-3** .on the next page.

Table 5-2: Design Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum
Burke Corporation (SIU)-1)(1)		
cBOD, lbs/d	5,040	10,440
TSS, lb/d	950	2500
TKN, lbs/d	500	1110
TP, lb/d	200	350
VERBIO (SIU-2)(2)		
BOD, lb/d	76	114
TSS, lb/d	129	194
TKN, lb/d	26	38

(1) From Bolton & Menk February 27, 2019 projected loading letter
(2) From the Nevada STP NPDES Permit Issued 11/1/2016 and amended 9/1/2018

Table 5-3: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day(1)					
BOD, lb/d(3)	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d(4)	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum(2)					
BOD, lb/d	2,329	10,440	114	NA	10,554
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d(4)(5)	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.83

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

5.2. RECEIVING STREAM CONSIDERATIONS

The existing wastewater effluent is discharged to an outfall ditch (unnamed creek) that flows to West Indian Creek. West Indian Creek ultimately discharges to the Indian Creek. Indian Creek flows to the South Skunk River which becomes the Skunk River and eventually flows into the Mississippi River. The current stream designations can be found in **Table 5-4**. Indian Creek, South Skunk River, Skunk River, and the Mississippi River are currently on Iowa's 2016 Section 303(d) list as an impaired water. The proposed wastewater treatment facility will have a new outfall that will discharge into West Indian Creek approximately 3 miles south of the existing outfall. This new outfall location will reduce the stream length that is impacted by the outfall since it is downstream of the existing outfall. A Waste Load Allocation (WLA) for West Indian Creek has been developed by the IDNR and is attached in **Appendix C** of this report. This report will help determine the necessary limits needed at the outfall to protect the existing stream's classification and water quality.

Table 5-4: Stream Designations

Stream	Designation
Outfall Ditch	Class B(WW-2) A3
West Indian Creek	Class B(WW-2) A2
Indian Creek	Class B(WW-2) A1
South Skunk River	Class B(WW-1) A1 (HH)
Skunk River	Class B(WW-1) A1 (HH)
Mississippi River	Class B(WW-1) A1 (HH)

5.3. TREATMENT PLANT SITE REQUIREMENTS

The City of Nevada has purchased a 122.6 acre parcel approximately three miles south of the existing WWTF. This site will comply with all applicable siting requirements in Subrules 567 IAC 64.2 (2) and (3) and Rule 567 IAC 64.4. This site was selected in order to expedite the process as there was a willing seller at the location. One inhabitable residence is within the1,000- foot site separation requirement. The City has already obtained permission from the owner of this site to construct new treatment facilities within the limit. The majority of the site lies outside of the 100-year floodplain. Some work will be required within the flood plain in order to extend the outfall sewer to West Indian Creek. All process structures will be outside the 100-year flood plain**.** **Figure 5-1** shows the new site and nearby items of importance.

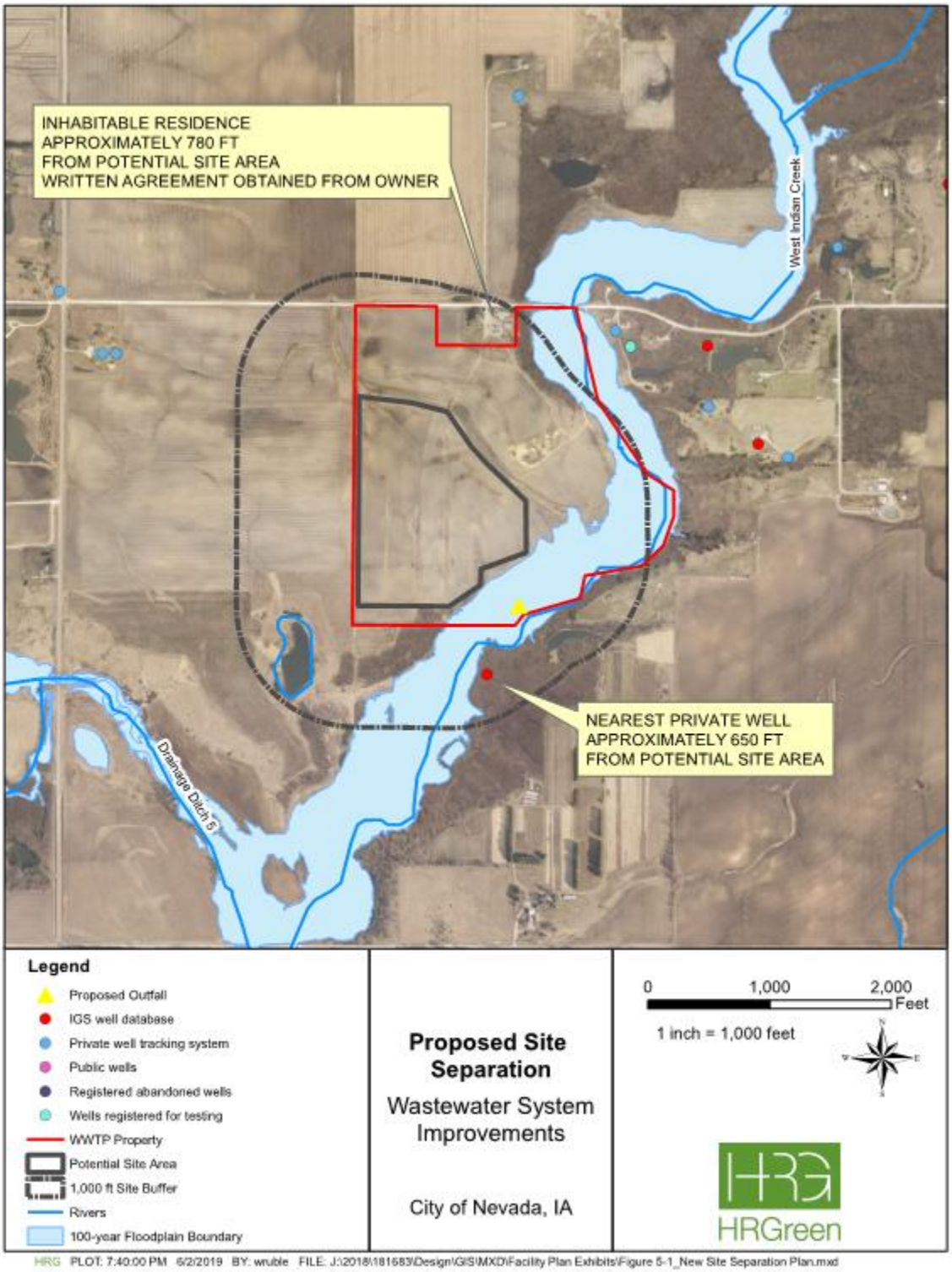

Figure 5-1: Proposed Site Separation Plan

5.4. PROPOSED INTERCEPTOR ALTERNATIVES

This chapter discusses the feasibility of the proposed gravity interceptor sewer to the new WWTF site. The design of the gravity sewer interceptor follows Chapter 12 of the IDNR Wastewater Facilities Design Standards (Design Standards.) The feasibility of the construction of this project is based on the ability to meet the requirements of IDNR Design Standards, permitting requirements, and considerations to the existing conditions to produce a cost effective solution.

The new interceptor sanitary sewer shall have capacity for the projected influent wastewater flows for the wastewater treatment facility design period. Projected flows outside of the 20-year design period are unknown. An additional trunk line and additional pumps may be added at the end of the design period if the design flows are exceeded. Two alignment alternatives are discussed below. Property acquisition costs for temporary and final easements for the sanitary sewer are not included in project cost estimates at this time.

The following components will be included in the project:

- Connection(s) to the existing sanitary network at the existing WWTF
- Approximately 18,000-21,000 linear feet of interceptor sewer between the existing and proposed WWTF sites
- One boring with steel casing pipe under U.S. Highway 30 (both alternatives)
- Two additional boring with steel casing pipe (Alternative 2 only)
- Stream crossings (Alternative 1 only)
- One lift station (both alternatives)
- Clearing, grubbing, and access
- Erosion control and surface restoration

5.4.1. Alternative S1

5.4.1.1. Sewer Alignment

See **Figure 5-2** for the proposed sanitary sewer alignment. In order to minimize bury depths and reduce the necessary excavation, the majority of the sanitary sewer alignment will follow West Indian Creek. The placement of the sewer is determined by the existing conditions. Some of the factors considered in alignment placement include accessibility of construction, proximity to West Indian Creek, and depth of the sewer.

As seen in **Figure 5-2:**
Starting from the north, the sanitary sewer alignment goes under U.S. Highway 30. The starting elevations of the sewer is based on the feasibility to connect to the existing sanitary network. The sewer then runs under West Indian Creek in order to avoid the large impoundment to the west of West Indian Creek. Two alignment options are shown in **Figure 5-3** near the impoundment. The sewer will continue to run along West Indian Creek while undergoing several stream crossings in order to improve accessibility and constructability of the sewer. Roughly two-thirds of the way towards the proposed WWTF site, the interceptor will exit the creek valley and run across farmland to the proposed WWTF site. This will require deeper excavation or a boring, but is proposed to avoid the

large bend in West Indian Creek that veers away from the WWTF site, which would result in additional pipe length.

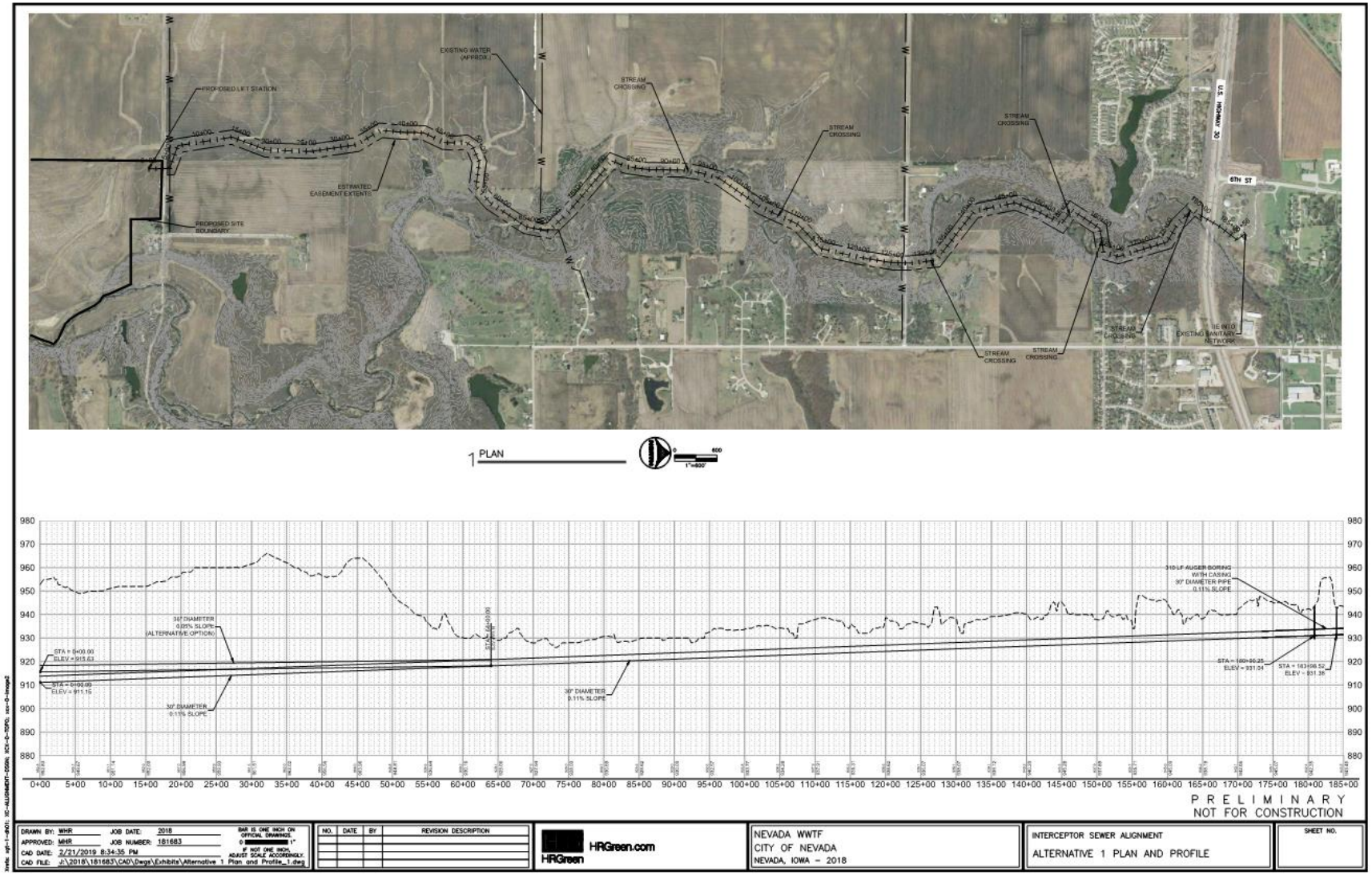

Figure 5-2: Alternative S1 Interceptor Alignment

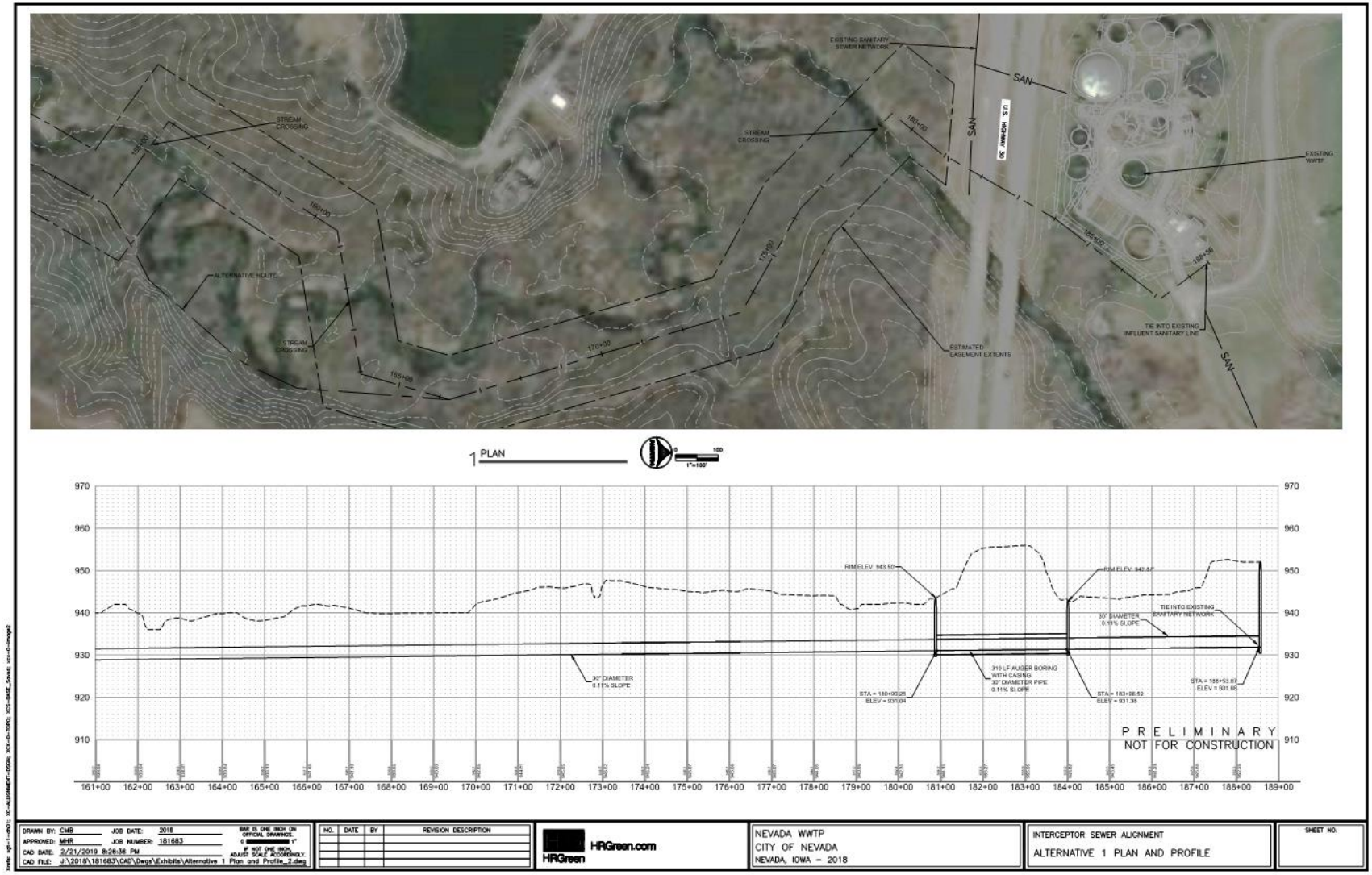

Figure 5-3: Alternative S1 Interceptor Route Options

5.4.1.2. Sewer Sizing

The sanitary sewer will be sized for the design PHWW flow while also following IDNR standards for flow velocity and pipe slope. In order to reduce excavation and costs, the design will aim to minimize the pipe slope while also maintaining a maximum of ¾ pipe flow depth at PHWW flow. **Table 5-5** below shows the projected pipe sizes, slopes, and velocities for the PHWW and ADW flows as well as the IDNR limits for pipe slopes and velocities.

Table 5-5: Alternative S1 Proposed Gravity Sewer Pipes

Pipe Diameter	Slope Range (ft/100ft)	Velocities at ADW (fps)	Velocities at PHWW (fps)	Minimum Slope (ft/100ft)	Min Velocity (@ PHWW) (fps)	Max Velocity (fps)
30-Inch	0.11	2.10	3.19	0.058	2	15
36-Inch	0.05	1.55	2.39	0.046	2	15

5.4.1.3. Manhole Spacing

Manholes will be spaced according to IDNR design standards and the feasibility to clean the sewer segments. The City of Nevada owns and operates a vacuum/water jet truck (VAC truck) with a hose capable of reaching 900 feet. In areas where the manholes are accessible to the VAC truck, the manholes will be spaced at the maximum allowed spacing of 800 feet when conditions allow. When the sewer is placed in areas not accessible to the necessary cleaning equipment, the manholes will be placed at the maximum spacing of 400 feet.

5.4.1.4. Lift Station

Based on the topography of the new WWTF site, an on-site lift station will be required at the end of the gravity interceptor sewer to convey influent flow to the headworks (beginning) of the proposed treatment facility.

The lift station will consist of an influent sump (wetwell) with submersible pumps and a valve vault or a wetwell and drywell with pumps and valves. The wetwell would be approximately 42 feet deep. A minimum of three pumps would be provided. The lift station force main would discharge all flow to the WWTF Headworks building. The Headworks building would be located within the northwest quarter of the new WWTF site.

5.4.1.5. Engineer's Opinion of Probable Construction Cost

An estimate of probable construction cost for this alternative is presented in **Table 5-6** below. This cost opinion assumes the following:

- Auger boring with steel casing for U.S. Highway 30 crossing
- Trenched construction for gravity sewer installation
- New submersible-style lift station at the new WWTF site

Table 5-6: Alternative S1 Opinion of Probable Construction Cost

Description	Approximate Quantity	Unit	Unit Price	Item Price
Mobilization	1	LS	$ 701,200	$ 701,200
Clearing & Grubbing	20	ACRE	$ 10,000	$ 200,000
Temporary Construction Entrances	1	LS	$ 50,000	$ 50,000
Sanitary Sewer Gravity Interceptor, Trenched, 25' Maximum Depth, CCFRPM, 30" Diameter	13855	LF	$ 255	$ 3,533,025
Sanitary Sewer Gravity Interceptor, Trenched, 25' Minimum Depth, CCFRPM, 30" Diameter	5000	LF	$ 510	$ 2,550,000
Sanitary Manhole, 60" Diameter	48	EA	$ 8,000	$ 384,000
Sanitary Manhole, 72" Diameter	6	EA	$ 10,000	$ 60,000
Creek Crossing	6	EA	$ 25,000	$ 150,000
SWPPP	1	LS	$ 25,000	$ 25,000
Seeding & Restoration	30	ACRE	$ 2,000	$ 60,000
Horizontal Auger Boring Pit	2	EA	$ 20,000	$ 40,000
Steel Casing Pipe, Trenchless, Auger Boring	310	LF	$ 850	$ 263,500
Lift Station	1	LS	$ 1,000,000	$ 1,000,000
General Requirements	1	LS	$ 721,300	$ 721,300
			Sub-Total	$ 9,738,025
			30% Contingency	$ 2,921,400
			Total	**$ 12,659,425**

5.4.2. Alternative S2

5.4.2.1. Sewer Alignment

See **Figures 5-4 and 5-5** for the proposed sanitary sewer alignment. This alternative will use a force main to convey all influent flow from the existing WWTF site to the gravity interceptor sewer. The gravity interceptor sewer alignment will follow ~~260th~~ Avenue (County Road S14) the majority of the way to the new WWTF. 620th Ave

.

As seen in **Figure 5-4 and 5-5:**
Starting from the north, the existing sanitary network will be directed to a new lift station at the existing WWTF site and head south under U.S. Highway 30. The force main follows the south side of U.S. Highway 30 and runs to the west until ~~260th~~ Avenue (Country Road S14). The force main than follows ~~260th~~ Avenue to the south for approximately 300 feet to the gravity interceptor sewer receiving manhole on the east side of ~~260th~~ Avenue. The gravity interceptor follows ~~260th~~ Avenue to the south within both the east and west Right-of-Ways, with several road crossings in order to avoid an existing water main. Approximately a half-mile before the intersection with 270th Street the gravity interceptor heads east across a farm field for roughly a half-mile before turning south again to eventually cross 270th Street and end at the headworks of the proposed WWTF. The route through the farm field avoids a large elevation increase along ~~260th~~ Avenue that would require deep excavation and an additional road crossing to avoid the existing water main.

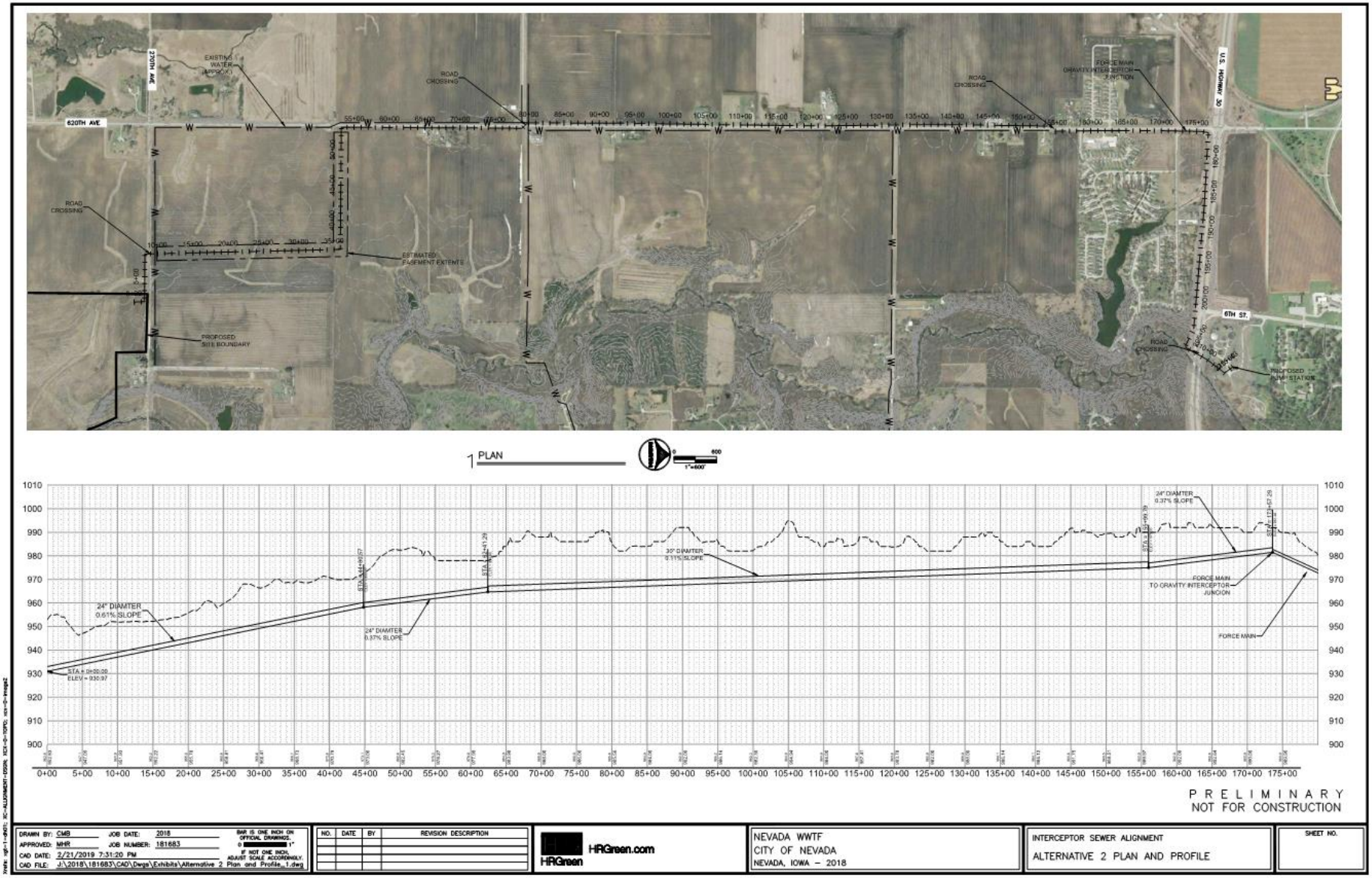

Figure 5-4: Alternative S2 Interceptor Alignment

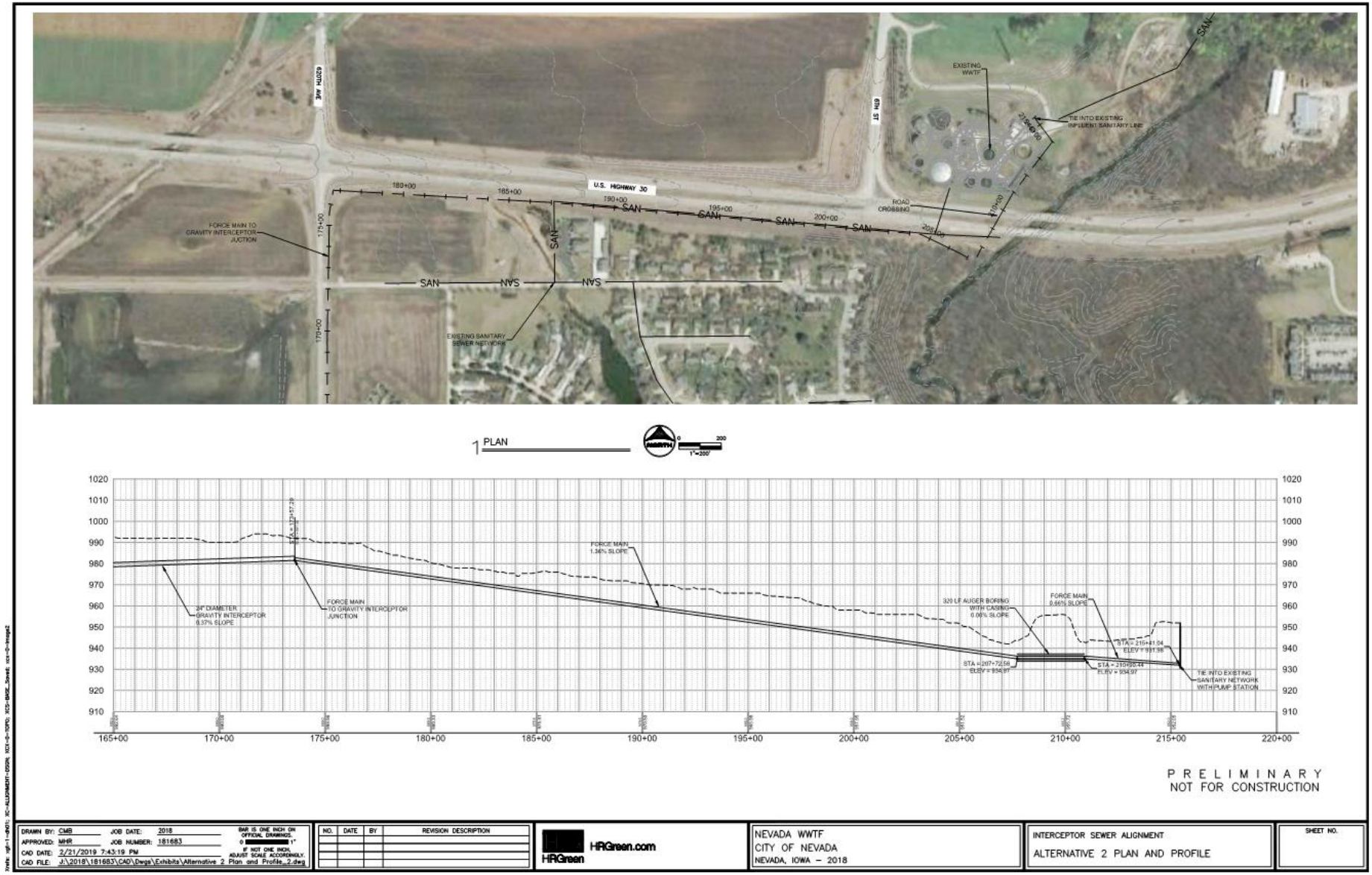

Figure 5-5: Alternative S2 Interceptor Alignment

5.4.2.2. Sewer Sizing

The sanitary sewer will be sized for the design PHWW flow while also following Iowa DNR standards for flow velocity and pipe slope. In order to reduce excavation and costs, the design will aim to minimize the pipe slope while also aiming for a maximum of ¾ pipe flow depth at PHWW flow. The force main will be sized to meet Iowa DNR standards for flow velocity while also reducing the total dynamic head to allow for the most efficient pump sizes. **Table 5-7** below shows the projected gravity interceptor pipe sizes, slopes, and velocities for the PHWW and ADW flows as well as the Iowa DNR limits for pipe slopes and velocities.

Table 5-7: Alternative S2 Proposed Gravity Sewer Pipe

Pipe Diameter	Slope Range (ft/100ft)	Velocities at ADW (fps)	Velocities at PHWW (fps)	Minimum Slope (ft/100ft)	Minimum Velocity (@ PHWW) (fps)	Maximum Velocity (fps)
24-Inch	0.37-0.61	3.29-3.91	5.04-6.17	0.08	2	15
30-Inch	0.11	2.10	3.19	0.058	2	15

5.4.2.3. Manhole Spacing

Manholes will be spaced according to Iowa DNR standards and the feasibility to clean the sewer segments. The City of Nevada owns and operates a VAC truck with a hose capable of reaching 900 feet. In areas where the manholes are accessible to the VAC truck, the manholes will be spaced at the maximum allowed spacing of 800 feet when conditions allow. This alternative will allow for the maximum spacing of 800 feet in most locations due to its proximity to the road. When the sewer is placed in areas not accessible to the necessary cleaning equipment, the manholes will be placed at the maximum spacing of 400 feet.

5.4.2.4. Lift Station

As the elevations at the intersection of 260th Avenue and U.S. Highway 30 are higher than at the existing WWTF site, a lift station will be required at the existing WWTF. The existing WWTF influent lift station pumps do not have sufficient firm capacity for the design flows. It may be possible to replace the existing pumps with larger pumps and reuse the existing lift station structure with modifications; however, this analysis assumes construction of a new lift station structure, pumps, valves, piping, etc. at the existing WWTF site.

The lift station will consist of an influent sump (wetwell) with submersible pumps and a valve vault or a wetwell and drywell with pumps and valves. The wetwell would be approximately 35 feet deep. A minimum of three pumps would be provided. The lift station force main would discharge all flow to the junction of the proposed force main and gravity interceptor. The gravity interceptor will convey the flow the rest of the way to the

headworks building, which would be located within the northwest quarter of the new WWTF site.

5.4.2.5. Engineer's Opinion of Probable Construction Cost

An estimate of probable construction cost for this alternative is presented below. This cost opinion assumes the following:

- Auger boring with steel casing for U.S. Highway 30 crossing
- Horizontal Directional Drilling construction for force main installation
- Trenched construction for gravity sewer installation
- New submersible-style lift station at the existing WWTF site

Table 5-8: Alternative S2 Opinion of Probable Construction Cost

Description	Approximate Quantity	Unit	Unit Price	Item Price
Mobilization	1	LS	$ 470,100	$ 470,100
Clearing & Grubbing	1	ACRE	$ 5,000	$ 5,000
Temporary Construction Entrances	1	LS	$ 6,500	$ 6,500
Sanitary Sewer Force Main, Trenchless	4190	LF	$ 100	$ 419,000
Sanitary Sewer Gravity Interceptor, Trenched, CCFRPM, 24" Diameter	8000	LF	$ 203	$ 1,624,000
Sanitary Sewer Gravity Interceptor, Trenched, CCFRPM, 30" Diameter	9360	LF	$ 255	$ 2,386,800
Sanitary Manhole, 48" Diameter	15	EA	$ 6,500	$ 97,500
Sanitary Manhole, 60" Diameter	13	EA	$ 8,000	$ 104,000
Sanitary Manhole, 72" Diameter	4	EA	$ 10,000	$ 40,000
SWPPP	1	LS	$ 18,000	$ 18,000
Seeding and Restoration	33	ACRE	$ 2,000	$ 66,000
Horizontal Auger Boring Pit	6	EA	$ 20,000	$ 120,000
Steel Casing Pipe, Trenchless, Auger Boring, Gravity Interceptor	400	LF	$ 850	$ 340,000
Steel Casing Pipe, Trenchless, Auger Boring, Force Main	320	LF	$ 765	$ 244,800
Lift Station	1	LS	$ 1,000,000	$ 1,000,000
General Requirements	1	LS	$ 555,300	$ 555,300
			Sub-Total	$ 7,497,000
			30% Contingency	$ 2,249,100
			Total	**$ 9,746,100**

5.5. PROPOSED TREATMENT FACILITY ALTERNATIVES

Due to the increased loadings from Burke that will greatly exceed the capacity of the existing WWTF and the limited feasibility to expand the current WWTF to accommodate the design loadings, it has been determined that a new WWTF is the only practicable solution to treat the increased loadings. Additional pretreatment from the industry was determined to not be practicable or reasonable. The City has already purchased a reasonable site for the planned WWTF as discussed in **Section 5.3**. No additional sites will be evaluated for these alternatives. This Facility Plan proposes two wastewater treatment process alternatives. Each alternative was designed around the proposed secondary treatment process. Based on the antidegredation analysis, it was determined that the less degrading alternative (nutrient removal) was a practicable, reasonable, and economically efficient alternative for the new WWTF. This alternatives evaluation is based on the secondary treatment processes with nutrient removal. The alternatives evaluated herein complete the feasibility analysis of effluent nutrient reduction for the City of Nevada as required by the Iowa Nutrient Reduction Strategy. The proposed preliminary treatment and disinfection processes are the same for each alternative. This section contains analysis of two nutrient removal secondary treatment alternatives (five-stage Bardenpho process and three-stage oxidation ditch).

5.5.1. Alternative P1 Overview: Activated Sludge with Enhanced Biological Phosphorous Removal (EBPR): Five-Stage Bardenpho Process

Alternative P1 involves constructing a new WWTF at a City-owned site approximately three miles south of the existing WWTF site. The new WWTF would consist of preliminary treatment, secondary treatment, disinfection, and solids treatment processes based on the approved design flows and loads and to achieve the effluent limits established by the WLA. Preliminary treatment would consist of influent screening and grit removal. Primary treatment is not recommended as influent organic loads are necessary for the secondary treatment process. Secondary treatment would consist of a 5-Stage Bardenpho process, and subsequent secondary clarification, for removal of BOD, Total Nitrogen (TN), and Total Phosphorus (TP). Disinfection would consist of ultraviolet (UV) disinfection of secondary effluent. Solids treatment would consist of aerobic digestion to attain Class B biosolids. Liquid biosolids storage would be provided for ultimate land application disposal. A flow diagram of this alternative is provided in **Figure 1** of **Appendix E**. See **Section 5.5.3 and Appendix D** for detailed information of each process component.

Burke Corporation would maintain pretreatment of their wastewater to meet limits established by their pretreatment agreement with the City prior to discharge to the City's collection system. This agreement shall be revised to reflect the increased loading. Pretreatment consists of BOD, TSS, and FOG removal.

This alternative will provide treatment capacity for the increased loadings and results in less degradation of water quality within the receiving stream as characterized by the existing water quality assessment and limits established by the WLA. The WLA does not establish effluent TN or TP limits. Target effluent limit for TN and TP based on the Iowa Nutrient Reduction Strategy would be 10 mg/L and 1 mg/L, respectively.

The Engineer's Opinion of Probable Construction Cost for the alternative is **$32,986,000**, which includes contingency and engineering costs.

Operation and maintenance costs are included in this alternative. These costs include electricity, equipment replacement/parts, and additional labor costs to run the new plant over the design period. Existing annual operation and maintenance costs that will be the same for both plants are not included in this analysis. Existing annual costs that will be the same for the existing and proposed facilities include, but are not limited to: existing collection system maintenance costs, general maintenance costs, existing labor costs, and general administrative costs. Additional labor costs for the proposed facility is based on the number of employees needed to operate the new WWTF above the current number of employees, which is estimated to be an additional two full-time employees. Present worth for this alternative is **$10,781,000**. **Table 5-9** shows the combined opinion of construction and life cycle costs for this alternative. **Appendix F** provides a detailed breakdown of the operation and maintenance costs.

Table 5-9: Alternative P1 OPCC and Life Cycle Costs

Item	Cost
General Requirements	$ 2,241,000
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Bardenpho	$ 5,526,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 5,092,000
Alternative 1 Total Construction Cost	$ 32,986,000
O&M Present Worth	$ 10,781,000
Total PW of Alternative 1	$ 43,767,000

This alternative was determined to be a practicable solution because the project would be constructed on City-owned property; the proposed treatment processes are well-established and accepted; and the treatment system can easily be expanded for future growth and/or additional regulatory driven permit changes.

5.5.2. Alternative P2 Overview: Activated Sludge with Enhanced Biological Phosphorous Removal (EBPR): Three-Stage Oxidation Ditch

Alternative P2 is similar to the system as proposed in Alternative P1, with the following exceptions:

1. Replace the 5-Stage Bardenpho Process with a three-stage oxidation ditch for nutrient removal.

This alternative will provide treatment capacity for the increased loadings and results in less degradation of water quality within the receiving stream as characterized by the existing water quality assessment and limits established by the WLA. The WLA does not establish effluent TN or TP limits. Target effluent limits for TN and TP based on the Iowa Nutrient Reduction Strategy would be 10 mg/L and 1 mg/L, respectively. A flow diagram of this alternative is provided in **Figure 2** of **Appendix C**. See **Section 5.5.3 and Appendix D** for a detailed breakdown of each process component.

The Engineer's Opinion of Probable Cost for the alternative is **$31,995,000.00**, which includes contingency and engineering costs.

Operation and maintenance costs are included in this alternative. These costs include electricity, equipment replacement/parts, and additional labor costs to run the new plant over the design period. Existing annual operation and maintenance costs that will be the same for both plants are not included in this analysis. Existing annual costs that will be the same for the existing and proposed facilities include, but are not limited to: existing collection system maintenance costs, general maintenance costs, existing labor costs, and general administrative costs. Additional labor costs for the proposed facility is based on the number of employees needed to operate the new WWTF above the current number of employees, which is estimated to be an additional two full-time employees. Present worth for this alternative is **$8,480,000**. **Table 5-10** shows the combined opinion of construction and life cycle costs for this alternative. **Appendix F** provides a detailed breakdown of the operation and maintenance costs.

Table 5-10: Alternative P2 OPCC and Life Cycle Costs

Item	Cost
General Requirements	$ 2,150,000
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Oxidation Ditches	$ 4,756,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 4,885,000
Alternative 2 Total Construction Cost	$ 31,995,000
O&M Present Worth	$ 8,480,000
Total PW of Alternative 2	$ 40,475,000

This alternative was determined to be a practicable solution because the project would be constructed on City-owned property; the proposed treatment processes are well-established and accepted; and the treatment system can easily be expanded for future growth and/or additional regulatory driven permit changes.

5.5.3. Alternative P1 and P2 Process Units Analysis

5.5.3.1. Preliminary Treatment

Alternatives P1 and P2 both require the same kind of pre-treatment process. A new Headworks building with fine screens and grit removal is required for both alternatives. The preliminary treatment system will be designed to handle the influent PHWW flow of 8.23 mgd.

The Headworks building will be located with the highest hydraulic elevation in order to provide gravity flow throughout the downstream treatment processes. This elevation will be dependent on the 100-year floodplain elevation and the influent interceptor sewer elevation. If the floodplain elevation and related hydraulics through the downstream treatment processes result in a water surface elevation at the Headworks that exceeds the flow depth in the influent interceptor sewer, a lift station will be required at the Headworks building to provide the necessary elevation for gravity flow to the remainder of the plant.

The Headworks building will include two fine screens. A fine screen with ¼-inch or less openings shall be used ahead of secondary activated sludge treatment systems. The final fine screen selection will be based on factors such as: channel depth, design flow rate per screen, desired capture rate, and owner preferences.

Fine screenings increase the amount of organic material that is removed with the screenings. A screenings washer/compactor can be used to remove the organic material, dewater, and compact the screenings prior to disposal. This can be accomplished using an ancillary screenings washer/compactor. Selection of fine screenings manufacturers will occur during final design.

An influent sampling station will be located after the fine screens before the grit removal system.

The grit removal system will be provided as part of the Headworks building. Grit removal is used to remove fine particulate inorganics from the waste stream. Removal of these materials from the wastewater reduces wear and maintenance on the downstream processes such as pumps, tanks, etc. Grit not removed from the wastewater will end up in the downstream processes and reduce the capacity of these facilities. Also, land application of solids containing inorganic grit material is not desirable. Design criteria for the grit removal is 100% for particles 65 mesh or greater with a specific gravity of 2.65. Final selection of screening and grit removal equipment will occur in final design.

There are no differences between the screening and grit removal equipment that will be selected for either alternative.

5.5.3.2. Primary Treatment

No primary treatment will be required for either alternative. Both alternatives' secondary treatment processes require high organic loadings for enhanced biological nutrient removal that would be significantly removed in a primary treatment process. The proposed secondary treatment processes will be able to adequately remove BOD and TSS that would otherwise be removed in the primary treatment process.

5.5.3.3. Secondary Treatment

Given the current NPDES permit requirements with respect to the Iowa Nutrient Reduction Strategy, a priority of this Facility Plan was to determine means to economically, reasonably, and practically meet existing water quality standards, and achieving the Strategy's nutrient reduction targets. Since the Antidegredation Analysis found the less degrading alternative to be feasible this Facility Plan only evaluated secondary treatment with enhanced biological nutrient removal alternatives. Several activated sludge options were discussed and evaluated at a design workshop with the City of Nevada. Fixed-film options are not feasible for nutrient removal and were not considered. **Table 5-11** below compares the nutrient removal options that were discussed with the City of Nevada at the design workshop.

Table 5-11: Secondary Treatment Design Workshop Alternatives

Activated Sludge Process	Advantages	Disadvantages
Modified Lutzack Ettinger (MLE) or Bardenpho	-nutrient removal (TN) -separate zone addition for EBNR	-Requires more stringent process monitoring -Can be susceptible to upsets with varying flows -Proprietary designs
Sequencing Batch Reactors (SBR)	-No Final Clarifiers or RAS pumping -Low Capital Cost -Flexible Operation -Can incorporate nutrient removal	-Complicated process control, especially with nutrient removal -Flow Equalization may be needed -Sensitive to upsets/shock hydraulic loadings
Oxidation Ditches (multi-stage for nutrient removal)	-Simple Operation -Very forgiving process due to long sludge age and HRT -Less chance of bleed through -easily convertible to EBNR	-Long detention times -Potential settling issues -Possible filament issues -Large footprint

During the design workshop the City of Nevada indicated the following key secondary treatment process criteria:

1. Ease of operation
2. Process reliability to handle flow/loading spikes

Based on these preferences, oxidation ditches were suggested for further evaluation as part of the Antidegredation Analysis and Facility Plan. With the Antidegredation Analysis determining nutrient removal as a feasible alternative another criterion was included for the Facility Plan analysis: "Ability to perform nutrient removal, specifically EBPR." The five-stage Bardenpho process and three-stage Oxidation Ditch were chosen as reasonable alternatives to be evaluated against the City's criteria. Although SBRs are capable of handling flow/loading spikes and nutrient removal, they do not meet the City's preference for "ease of operation" and therefore were not evaluated. The two secondary treatment alternatives are evaluated further in the following sections.

Alternative P1: Five-Stage Bardenpho Process with Final Clarifiers

Alternative P1 proposes an activated sludge system with the use of a five-stage Bardenpho process for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The five-stage oxidation ditch consists of five zones: anaerobic, first-stage anoxic, first-stage aerobic, second-stage anoxic, and second-stage aerobic. Within these zones phosphorus release, denitrification (TN removal), BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The Bardenpho zones were sized according textbook design guidance and examples. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 10,554 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed five-stage Bardenpho process.

Three final clarifiers will follow the Bardenpho process. Clarifiers were designed in accordance with IDNR standards to account for the PHWW flow of 8.23 mgd. Three 70-feet diameter clarifies with a 14.5-feet SWD are proposed. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed final clarifiers.

The five-stage Bardenpho and final clarifier process are designed to meet Facility Reliability Class I.

Alternative P2: Three-Stage Oxidation Ditch with Final Clarifiers

Alternative P2 proposes an activated sludge system with the use of a three-stage oxidation ditch for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The three-stage oxidation ditch consists of three zones: anaerobic, anoxic, and aerobic. Within these zones phosphorus release, denitrification (TN removal), and BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The aerobic volume for extended aeration activated sludge system is based on a maximum organic loading of 15 ppd BOD/1,000 cft of aerobic reactor volume. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 10,554 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed three-stage Oxidation Ditch.

Three final clarifiers following the same design standards as in Alternative P1 will be required for this alternative as well.

The Three-Stage Oxidation Ditch and final clarifier process are designed to meet Facility Reliability Class I.

Secondary Treatment Comparison

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process is relatively more simple in terms of operational control. The “return/recycle” streams are integrated into the overall design of the oxidation ditch layout with minimal pumping required. There are fewer zones to maintain with the oxidation ditch as well.

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process has a relatively better ability to accommodate flow and loading spikes. This is due to the extended aeration configuration of the aerobic zone of the oxidation ditch; however, the operator must still be careful of hydraulic overloading to the anaerobic and anoxic zones that might result in unfavorable conditions and decreased nutrient removal performance.

Both processes are capable of nutrient removal with EBPR. Due to the favorable carbon-to-nutrient influent loadings, biological nutrient removal is anticipated without continuous need for supplemental carbon addition or for phosphorus removal via chemical precipitation. Consideration for backup supplemental carbon and chemical phosphorus precipitation systems will be considered in final design.

5.5.3.4. Solids Processing

Stabilization of wastewater treatment plant sludge is required to meet the EPA 503 regulations if land application is used for disposal. The City of Nevada currently uses land application and intends to continue using land application as their disposal method at the new site. The land applied biosolids will be required to meet Class B criteria. Multiple aerobic digestion alternatives were elevated for each alternative as no primary treatment/sludge will be present. As stated previously, the City of Nevada placed a high value on ease of operation. Aerobic digestion typically has a lower capital cost and a simpler operation than anaerobic digestion. The two aerobic digestion alternatives evaluated are:

1. Aerobic Digestion with integral membrane thickening process
2. Aerobic Digestion system with post-thickening

Aerobic Digestion with Integral Membrane Thickening

In an effort to reduce the required digestion volume, the sludge can be thickened up to 3-percent solids. Thickening should be limited to 3-percent solids in order to maintain oxygen transfer and solids destruction processes.

Thickening can be performed ahead of or integral to the aerobic digester. Thickening performed ahead of digestion can be achieved using different equipment, including gravity belt thickeners and rotary drum thickeners. Thickened sludge is then transferred to the digester. There are systems that include integral thickening processes to the aerobic digestion process to achieve the same results. These systems use multi-stage membrane thickeners (MBT) to sequentially increase the percent solids throughout the digestion process. See **Appendix D** for more detailed process calculations and sizing for the aerobic digestion process with the MBT process. **See Appendix E: Figure 5** for the solids processing schematic for this alternative. A detailed cost analysis for this aerobic digestion process with solids storage is shown below.

Table 5-12: Integral Thickening Aerobic Digestion OPCC

Aerobic Digesters		
Item	Cost	
Earthwork	$	266,880
Concrete, Cast in Place	$	1,815,000
Metal	$	68,500
Painting	$	50,000
Equipment	$	1,878,000
Mechanical	$	308,200
Instrumentation	$	140,000
Electrical	$	450,000
Total Aerobic Digesters	$	4,977,000
Biosolids Storage and Loadout		
Item	Cost	
Earthwork	$	156,168
Concrete, Cast in Place	$	542,400

Glass Lined Bolted Steel Tank	$	810,000
Metal	$	30,000
Equipment	$	124,000
Mechanical	$	50,200
Instrumentation	$	30,000
Electrical	$	60,000
Total Storage and Loadout	$	1,803,000
Total Integral Thickening Aerobic Digestion with Storage	**$**	**6,780,000**
O&M Present Worth	$	3,522,000
Total Present Worth Integral Thickening Alternative	**$**	**10,302,000**

An advantage of the integral MBT process is the low nitrogen and phosphorus concentrations in the filtrate. This allows filtrate to be directly discharged with secondary effluent without the need to recycle this sidestream back to the secondary process for treatment. A disadvantage of the integral MBT process is that this process is proprietary with limited manufacturer selection options.

Aerobic Digestion with Post Thickening

In an effort to reduce the required sludge storage volume required, the sludge can be post thickened to a much higher solids concentration. For the post thickening alternative, a solids concentration of 5-percent was chosen for solids processing equipment selection and reducing the necessary storage volume. Higher degrees of biosolids volume reduction is possible via further dewatering and drying; however, these options were not desired nor evaluated.

Thickening performed after digestion can be achieved using different equipment, including gravity belt thickeners and rotary drum thickeners. Thickened biosolids is then transferred to sludge storage. See **Appendix D** for more detailed process calculations and sizing for the aerobic digestion process with a post thickening process. See **Appendix E: Figure 6** for the solids processing schematic for this alternative. A detailed cost analysis for this aerobic digestion process with solids storage is shown below.

Table 5-13: Post Thickening Aerobic Digestion OPCC

Aerobic Digesters		
Item	Cost	
Earthwork	$	380,445
Concrete, Cast in Place	$	3,561,000
Metal	$	68,500
Painting	$	50,000
Equipment	$	542,400
Mechanical	$	308,200
Total Aerobic Digesters	$	4,911,000
Solids Processing Building		

Earthwork	$	74,130
Concrete, Cast in Place	$	696,000
Superstructure	$	355,500
Metal	$	23,400
Painting	$	50,000
Equipment	$	1,176,000
Mechanical	$	363,000
Instrumentation	$	206,000
Electrical	$	660,000
Total Solids Processing	$	3,604,000

Biosolids Storage and Loadout Post Thickening

Item	Cost	
Earthwork	$	128,658
Concrete, Cast in Place	$	473,400
Glass Lined Bolted Steel Tank	$	371,000
Metal	$	30,000
Equipment	$	62,000
Mechanical	$	50,200
Instrumentation	$	30,000
Electrical	$	60,000
Total Storage and Loadout	$	1,205,000
Total Post Thickening Aerobic Digestion with Storage	**$**	**9,720,000**
O&M Present Worth	$	4,180,000
Total Present Worth Post Thickening Alternative	**$**	**13,900,000**

An advantage of the post-thickening process is the multiple process and manufacturer options as well as the widespread use of these processes compared to integral thickening. A disadvantage of the post-thickening process is the high nitrogen and phosphorus concentrations in the filtrate. This filtrate must be recycled back to the secondary process for treatment in lieu of direct discharge, and can increase the sizing of the secondary process.

Solids Processing Recommendation

The integral thickening with MBTs is more economical than the post thickening alternative. This solids processing alternative is used for the cost analysis in both alternatives P1 and P2.

The low nutrient concentrations filtrate (sidestream) from the integral thickening process is a major benefit in terms of reducing impact on the secondary treatment system. The post-thickening alternative's filtrate impacts will need further detailed evaluation during final design if chosen.

5.5.3.5. Biosolids Storage

The City of Nevada intends to continue using land application of liquid biosolids as discussed previously at the new site. Storage should be provided for a minimum of 180 days to avoid having to land apply during winter months on frozen ground. Storage tank options include cast-in-place concrete-wall tanks and glass-lined steel-wall tanks. Both options required concrete foundations and are relatively similar in cost. Final decision regarding tank type will be made during final design. The needed biosolids storage volume will vary depending on the solids processing alternative chosen from **Section 5.5.3.4.** Volume requirements for each alternative and proposed tank sizes are shown in **Table 5-14** below. Tank sizing is subject to change during final design. The cost estimate in Section 5.5.3.4 is based on the tank sizes shown below.

Table 5-14: Biosolids Storage Volume Requirements

Solids Processing Alternative	Required 180 Day Biosolids Storage Volume (MGal)	Proposed Number of Tanks	Tank Height[1] X Diameter (feet)	Actual Biosolids Storage Volume (MGal)
Integral Thickening	2.418	2	28’ x 90’	2.522
Post Thickening	1.448	1	19’ x 119’	1.456

[1]Hieght includes 1.5 feet freeboard

Mixing should also be included to provide homogeneous biosolids for land application. Options for mixing are diffused air or mechanical mixing systems. Mechanical systems can be configured to provide loadout capability. A mechanical system was used for costs development in this evaluation.

Storage tanks may be covered for heat and/or odor retention. Covers were not considered as part of the evaluation.

See **Appendix D** for more detailed process calculations and sizing for the biosolids storage.

5.5.3.6. Ultraviolet (UV) Disinfection

Both alternatives P1 and P2 were evaluated with the use of a UV disinfection system. During the design workshop, at the start of the planning process, disinfection options discussed included UV, chlorine, and Pera-acetic Acid (PAA) disinfection. Though UV disinfection tends to have a higher capital cost it has many added benefits such as:

- Simple operation,
- No chemical costs for operation,
- No chlorine residual, and
- No major safety concerns

From the design workshop, the City preferred UV disinfection. There are multiple types/arrangements and manufacturers of UV systems. UV equipment selection will be made during final design. Seasonal disinfection is anticipated with the water quality limits for bacteria that are set in the Waste Load Allocation. Full

redundancy is not anticipated for the disinfection system per IDNR design standards.

Two potential UV systems are provided in **Appendix D**. These proposals are provided only as guidance. The estimated disinfection system capital cost and operation and maintenance costs for both alternatives P1 and P2 are based on the Trojan UVSigna system. This proposal has a higher capital cost for planning purposes. Final systems and evaluations will be made during the final design phase.

5.6. SELECTED PROCESS AND SITE

5.6.1. Collection System

Alternative S2 is recommended for the interceptor sewer from the existing to new WWTF sites due to:

- Lower capital cost
- Better maintenance access
- Better constructability
- Minimizes environmental impacts along the alignment
- Minimizes easement needs

5.6.2. Wastewater Treatment Facility

Alternative P2 is recommended for the WWTF design because of the best relative ability for:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically EBPR

5.6.3. Summary of Selected Processes

After evaluations of two interceptor sewer alignments and two treatment facility alternatives, it is recommended to use alternatives S2 and P2. Alternative S2 proposes an interceptor sewer alignment that follows County Road S14 the majority of the way to the new site. This alternative will require a pump station and force main at the existing WWTF site. Alternative P2 proposes the new wastewater treatment facility to meet secondary effluent limits and includes nutrient removal capability.

These alternatives will be designed to allow for future expansion if the design flows are exceeded. Processes that are sized based on hydraulic flows may be oversized during final design to account for future flows past the design period. Other processes such as secondary treatment and solids processing will be designed to provide adequate space for future expansion. Space for additional trains to the oxidation ditch and clarifiers will be available in the secondary treatment process. Space for additional aerobic digesters and sludge storage tanks will be provided for expansion in the solids processing units.

There will be minimal environmental impact to the site outside of typical construction of the proposed facilities. The outfall will into West Indian Creek. **Figure 5-1** in Section 5.3 shows the proposed outfall location. The exact outfall location into West Indian Creek is subject to change during final design.

Due to the aggressive expansion schedule by SIU Burke, construction is anticipated to be bid and begin as soon as possible after design and permitting is completed.

Since the proposed treatment facility is at a new site, no additional methods of wastewater treatment will be necessary during project construction. The new interceptor sewer will tie into the existing sewer at the existing WWTF. Methods to keep the existing WWTF in operation during the connection of the new sewer will be determined during final design.

The combined Opinion of Probable Construction Cost is shown in **Table 5-15** on the next page. The total construction cost is estimated to be **$41,741,100.**

Table 5-15: Combined Alternatives OPCC

Item	Cost
General Requirements	$ 2,150,000
Interceptor Sewer	$ 9,746,100
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Oxidation Ditches	$ 4,756,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 4,885,000
Alternative S2 and P2 Total Construction Cost	$ 41,741,100

5.7. PROJECT FINANCING

Project financing is anticipated through a combination of the following sources:

- Clean Water State Revolving Fund (CWSRF) Loan Program,
- Cost-share allocation to industry,
- Potential EDA grant,
- Existing City funds.

In 2013 HR Green completed a sewer rate study for the City of Nevada with proposed increases in sewer rates through 2018. The City of Nevada has used this study to define rates. Currently the City has standard rates for basic monthly charges, quantity use charges, connection fees, and sewer construction fees. In addition to these standard fees, the City of Nevada has a treatment agreement with Significant Industrial User (SIU) Burke Corporation for pretreatment of its process wastewater to defined limits prior to discharge to the City's collection system with industry surcharge fees for cBOD, TSS, TKN, and Oil and Grease exceeding those defined limits. If Burke exceeds the loading agreements, additional penalty fees (surcharges) may be applied. Using 12-month service charges from March 2019 and prior, SIU Burke currently accounts for approximately 34-percent of all sewer charges. With no outstanding wastewater-related loans, the City of Nevada currently gains an annual net revenue of approximately $650,000 from sewer service charges. **Appendix B** provides the City of Nevada's existing ordinance for service charges.

This Facility Plan does not include a sewer rate analysis for the proposed wastewater treatment facility. New treatment agreements between the City and Burke and Verbio have yet to be completed. This Facility Plan will help the City negotiate a new treatment agreement with Burke and Verbio and establish SIU's cost share of the proposed WWTF. A sewer rate analysis can be completed by the City at a future date once those agreements are made.

5.8. LEGAL, AND OTHER CONSIDERATIONS

5.8.1. Right-of-Way (ROW)/Easement Acquisition

5.8.1.1. Schedule

ROW/easement acquisition will be required mostly for the interceptor sewer. Limited easement acquisition, if any, is anticipated for the WWTF as the planned site is already owned by the City. The anticipated schedule to complete ROW acquisition is a function of regulatory approvals schedule; development of the final design alignment; and completion of legal requirements to obtain ROW/easement acquisition. We anticipate that ROW acquisition can be completed in the year 2020 for this entire project.

5.8.2. Permitting Requirements

In addition to meeting IDNR Design Standards, the proposed gravity interceptor sewer and WWTF will need to adhere to the following permits:

- IDNR Construction Permit
- Joint Application Form (Alternative S1 and WWTF only)
    - Flood Plain Permit to Iowa DNR
    - US Army Corp of Engineers Section 404 Permit
- Iowa Sovereign Lands Approval
- Story County Conditional Use Permit for WWTF site

5.8.3. Method of Bidding

The proposed method of bidding for this project will be design/bid/build with sealed competitive bid process following the public bidding requirements as outlined in the Iowa Code.

5.8.4. Number of Construction Contracts

Two separate bidding process and contracts are anticipated:

1. One construction contract for the construction of the interceptor sewer project
2. One construction contract for the construction of the WWTF project

5.8.5. Estimated Project Schedule

The estimated project schedule is given below:

Table 5-16: Overall Estimated Project Schedule

Phase	Duration (months)	Anticipated Start Date
Design Period	8 – 10	October 2019
Obtain Permits	3 – 6	June 2020
ROW & Easement Acquisition	4 – 6	June 2020
Solicitation of Bids & Award of Contract	2 – 3	January 2021
Construction Period	12 – 18	April 2021

A. Appendix A – IDNR Planning Documents

IOWA DEPARTMENT OF NATURAL RESOURCES

NUTRIENT REDUCTION STRATEGY

FOR WASTEWATER TREATMENT PLANTS

The Iowa Nutrient Reduction Strategy is a science- and technology-based approach to assess and reduce nutrients delivered to Iowa waterways and the Gulf of Mexico. The strategy outlines efforts to reduce nutrients in surface water from point sources, such as municipal and industrial wastewater treatment plants, and nonpoint sources, including farm fields and urban areas, in a scientific, reasonable and cost-effective manner.

The Iowa strategy was developed in response to the 2008 Gulf Hypoxia Action Plan, which calls for the 12 states along the Mississippi River to craft strategies to reduce nutrients reaching the Gulf of Mexico. The Iowa strategy follows the recommended framework provided by the U.S. Environmental Protection Agency (EPA) in 2011. The DNR will work with wastewater facilities throughout the state to reduce nutrient discharges from point sources with a goal of reducing total phosphorus by 16 percent and total nitrogen by 4 percent. In addition to impacting the Gulf, nutrients also negatively affect local Iowa receiving streams. Nutrient reduction will help better protect those streams, especially during low flows.

WHAT FACILITIES ARE AFFECTED?

- 102 major municipal and 46 industrial wastewater facilities where biological nutrient removal is economically and technically feasible.
- Minor municipal wastewater facilities (less than 1 million gallons per day) will evaluate nutrient reduction alternatives when increasing design loads.
- Major industrial treatment plants that do not have biological treatment will assess nutrient removal possibilities during regularly scheduled permit renewals.

HOW WILL NUTRIENTS BE REMOVED?

- Biological nutrient removal, or BNR, was considered in this strategy. Other options for nutrient removal are available and can be evaluated.

HOW WILL THIS BE IMPLEMENTED?

- When a National Pollutant Discharge Elimination System (NPDES) permit is renewed, the permit will require that the facility conduct a two-year study to evaluate the costs and feasibility of installing biological nutrient removal and submit a proposed schedule for installation. After the study is completed, the schedule will be incorporated in the facility's NPDES.
- Timeframes for construction will be based on the negotiated schedules for major municipal and certain industrial facilities, case by case.

HOW ARE LIMITS SET?

- Technology-based limits will be implemented in a facility's NPDES permit. Many nutrient removal technologies are feasible, as they are already proven and well-established.
- Limits will be no more stringent than 10 mg/L for total nitrogen and 1 mg/L for total phosphorus.
- In general, these levels of nutrient reduction are technically and economically achievable for Iowa facilities.

HOW WILL COMPLIANCE BE DETERMINED?

- After BNR is installed and operational, the facility will have one year to conduct a process optimization evaluation prior to limits being established.
- Total nitrogen and phosphorus limits will be based on demonstrated plant performance, but no more than 10 mg/L (nitrogen) and 1 mg/L (phosphorus).
- Plants will be protected from stricter limits for 10 years if nutrient removal is installed.
- The facility will have monthly limits for nitrogen and phosphorus discharged. Compliance will be determined by the annual average, rather than by the monthly limits.

WWW.NUTRIENTSTRATEGY.IASTATE.EDU

GENERAL QUESTIONS
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B. Appendix B – City of Nevada Service Charges

APPENDIX TO
CODE OF ORDINANCES

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CHAPTER 500

MUNICIPAL CODE CARE AND MAINTENANCE

500.1	**Use and Maintenance of the Code of Ordinances**	**500.5**	**Supplement Record**
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500.1 USE AND MAINTENANCE OF THE CODE OF ORDINANCES. The following information is provided the Code Editor, Iowa Codification, Inc., to assist in the use and proper maintenance of this Code of Ordinances.

500.2 DISTRIBUTION OF COPIES.

1. Official Copy. The "OFFICIAL COPY" of the Code of Ordinances shall be kept by the City Clerk and shall be identified as the "OFFICIAL COPY."

2. Distribution. Other copies of the Code of Ordinances shall be made available to all persons having a relatively frequent and continuing need to have access to ordinances which are in effect in the City as well as reference centers such as the Nevada Public Library and the Nevada schools, if requested by the school. The City Clerk shall be responsible for furnishing a copy and all updates as they are issued, to the District Associate Judges' chambers located at the Justice Center in Nevada and Ames City Hall in Ames, Iowa.

3. Sale. The sale or distribution of copies in a general fashion is not recommended as experience indicates that indiscriminate distribution tends to result in outdated codes being used or misused.

4. Record of Distribution. The City Clerk shall be responsible for maintaining an accurate and current record of persons having a copy of the Code of Ordinance. Each official, elected or appointed, shall return to the City, upon leaving office, all documents, records and other materials pertaining to the office, including this Code of Ordinances.

(Code of Iowa, Sec. 372.13[4])

500.3 NUMBERING OF ORDINANCES AND AMENDING THE CODE OF ORDINANCES. The Code Editor recommends that a simple numerical sequence be used in assigning ordinance numbers to ordinances as they are passed. For example, if ordinance adopting the Code of Ordinances was No. 163, we would suggest that the first ordinance passed changing, adding to or deleting from the Code be assigned the number 164; the next ordinance is

assigned the number 165, and so on. We advise against using the Code of Ordinances numbering system for numbering of ordinances.

500.4 RETENTION OF AMENDING ORDINANCES. Two related Ordinance Books shall be maintained by the City Clerk: (1) the Code of Ordinances compiled in chronological order by sequential ordinance number, and (2) an ordinance book by Chapter and Section number. Iowa Codification will assist in the maintenance of the Code of Ordinances book, per the Supplement Agreement, by revising and returning appropriate pages for the Code of Ordinance book as required to accommodate ordinances amending the Code. The City Clerk is responsible for maintaining the ordinance book and must be sure that an original copy of each ordinance adopted, bearing the signatures of the Mayor and Clerk, is inserted in the ordinance book and preserved in a safe place.

500.5 SUPPLEMENT RECORD. A record of all supplements prepared for the Code of Ordinances is provided in the front of the Code. This record will indicate the number and date of the ordinances adopting the original Code and of each subsequently adopted ordinance which ahs been incorporated in the Code. For each supplemented ordinance, the Supplement Record will list the ordinance number, date, topic, and chapter number of the Code affected by the amending ordinance. A periodic review of the Supplement Record and ordinances passed will assure that all ordinances amending the Code have been incorporated therein.

500.6 DISTRIBUTION OF SUPPLEMENTS. Supplements containing revised pages for insertion in each Code will be sent to the Clerk. It is the responsibility of the Clerk to see that each person having a Code of Ordinances receives each supplement so that each Code may be properly updated to reflect action of the Council in amending the Code.

500.7 AMENDING THE CODE OF ORDINANCES. The Code of Ordinances contains most of the laws of the City as of the date of its adoption and is continually subject to amendment to reflect changing policies of the Council, mandates of the State, or decisions of the Courts. Amendment to the Code of Ordinances can only be accomplished by the adoption of an ordinance.

(Code of Iowa, Sec. 380.2)

500.8 ORDINANCES NOT CONTAINED IN THE CODE OF ORDINANCES. There are certain types of ordinances which the City will be adopting which are not required to be incorporated in the Code of Ordinances. These ordinances include ordinances (1) establishing grades of streets or sidewalks, (2) vacating streets or alleys, (3) authorizing the issuance of bonds and (4) zoning map ordinance.

(Code of Iowa, Sec. 380.8)

CHAPTER 510

SCHEDULE OF FEES AND CHARGES

510.1	**Water**	**510.8**	**Fire**
510.2	**Wastewater**	**510.9**	**Police**
510.3	**Solid Waste (Garbage)**	**510.10**	**Cemetery**
510.4	**Storm Sewer**	**510.11**	**Library**
510.5	**Building, Zoning and Subdivisions**	**510.12**	**Senior Community Center**
510.6	**Parks and Recreation**	**510.13**	**Miscellaneous**
510.7	**Streets**		

510.1 WATER.

1. Monthly Water Rates (See Code Section 92.02)

   A. Basic Monthly Flat Charge

(1) April, 2005 through March, 2006	$8.50 per month
(2) April, 2006 through March, 2007	$10.00 per month
(3) April, 2007 through October, 2011	$10.70 per month
(4) November, 2011 through July 2013	$11.02 per month
(5) July, 2013 through May 2014	$11.57 per month
(6) June 2014 through May 2015	$12.15 per month
(7) June 2015 through May 2016	$12.76 per month
(8) June 2016 through May 2017	$13.39 per month
(9) June 2017	$14.06 per month

And in addition thereto

B. Monthly Quantity Use Charge	Gallons or pro-rata portion
(1) April, 2005 through March, 2006	$3.90 per 1,000
(2) April, 2006 through March, 2007	$4.60 per 1,000
(3) April, 2007	$4.92 per 1,000
(4) November, 2011 through June 2013	$5.07 per 1,000
(5) June, 2013 through May 2014	$5.32 per 1,000
(6) June, 2014 through May 2015	$5.59 per 1,000
(7) June, 2015 through May 2016	$5.87 per 1,000
(8) June 2016 through May 2017	$6.16 per 1,000
(9) June 2017	$6.47 per 1,000

2. Rates for Non-Potable Raw Water (See Code Section 92.03)

   A. Basic Monthly Flat Charge

Meter Reading Date:	Monthly Service Fee:
April, 2007	$10.70 per month
November, 2011	$11.02 per month
June, 2013	$11.57 per month
June, 2014	$12.15 per month
June, 2015	$12.76 per month
June, 2016	$13.39 per month
June, 2017	$14.06 per month

B. Monthly Quantity Use Charge. In addition to the monthly flat charge set forth above, there shall be a use (consumption) charge per 1,000 gallons of water, or pro rata portion thereof, used or consumed by the customer as determined by meter readings in accordance with the following schedule:

Meter Reading Date:	Per 1,000 or pro-rata part thereof:
April, 2007	$0.70
November, 2011	$0.72
June, 2013	$0.76
June, 2014	$0.79
June, 2015	$0.83
June, 2016	$0.88
June, 2017	$0.92

3. Rates Outside City Limits. (See Code Section 92.04) — 200% of the rates provided above.

4. Miscellaneous

A. Equipment and Service Fees:

(1)	Replacement frost plate	$40.00
(2)	Replacement meter (used 5/8")	$150.00
(3)	Replacement meter (new 5/8")	$235.00
(4)	Neptune Meter Register	$150.00
(5)	Trip fee to replace meter	$20.00
(6)	Meter In	$25.00
(7)	Meter Out	$25.00
(8)	Check meter accuracy 5/8" or 1" (refundable if not accurate)	$235.00
(9)	Meters over 1" will be sent in at customers cost	
(10)	Reading Non-Neptune Meters	$35.00
(11)	Customer Requested 90-Day Meter Reading (1 free a year)	$25.00

B. Curb Box Service:

(1)	Locate curb box – 1st hour	$20.00
(2)	Locate curb box – After 1st hour	$25.00

(3)	Replace curb box	$300.00 plus labor and equipment fees
(4)	Purchase curb box (box only)	$55.00
(5)	Purchase curb stop (valve)	$70.00
(6)	Replacement curb box cap	$15.00

C. Delinquent Payment (bill, deposit, or NSF/Returned Payment), No application, and Requested Temporary Vacancy Shut-off Fees:

(1)	Blue Tag Notice Card	$20.00
(2)	Trip fee to Disconnect Service	$35.00
(3)	Disconnect Service Fee	$35.00
(4)	Trip fee to Reconnect between 7:30 a.m. and 4:00 p.m.	$35.00
(5)	Trip fee to Reconnect after 4:00 p.m. and before 7:30 a.m.	$50.00

Fees in the amounts shown in the Appendix to this Code of Ordinances shall be charged and paid before service is restored to a delinquent customer. No fee shall be charged for the usual or customary trips in the regular changes in occupancies of property.

5. Water Tapping Fees:

Tap Size	Tapping Fee
5/8” or 5/8” x 3/4"	$150.00
3/4"	$200.00
1”	$250.00
1-1/4”	$350.00
1-1/2”	$500.00
2”	$800.00
3”	$1,200.00
4”	$1,600.00
6”	$2,500.00
Larger than 6”	$3,000.00

An additional $600.00 will be charged for users located outside the corporate limits of the City.

6. Bulk Water Meters – Water Rates per 510.01.B.3. – current rate

A. Set/Installation Fee	$100.00
B. Monthly Fee for ¾” Meter	$18.00
C. Monthly Fee for 1” Meter	$32.00
D. Monthly Fee for 2” Meter	$130.00

510.2 WASTEWATER.

1. Basic Monthly Flat Charge (See Code Section 99.06)

March 1, 2004	$7.50 per month
June, 2013	$7.65 per month
June, 2014	$7.80 per month
June, 2015	$7.96 per month
June, 2016	$8.20 per month
June, 2017	$8.44 per month

And in addition thereto

2. Quantity Use Charge

March 1, 2004	$3.33 per 1,000 gallons or pro-rata
June 1, 2008	$3.43 per 1,000 gallons or pro-rata
July 1, 2009	$3.53 per 1,000 gallons or pro-rata
July 1, 2010	$3.64 per 1,000 gallons or pro-rata
July 1, 2011	$3.75 per 1,000 gallons or pro-rata
July 1, 2012	$3.86 per 1,000 gallons or pro-rata
July 1, 2013	$3.94 per 1000 gallons or pro-rata
July 1, 2014	$4.02 per 1000 gallons or pro-rata
July 1, 2015	$4.10 per 1000 gallons or pro-rata
July 1, 2016	$4.22 per 1000 gallons or pro-rata
July 1, 2017	$4.35 per 1000 gallons or pro-rata

3. Connection Fee

A. Residential	$200.00
B. Commercial/Industrial	$400.00

4. Sewer Construction

June, 2012	$1.50 per month
June, 2013	$1.53 per month
June, 2014	$1.56 per month
June, 2015	$1.59 per month
June, 2016	$1.64 per month
June, 2017	$1.69 per month

5. Surcharges (where applicable) (See Code Section 99.07):

A. Carbonaceous Biological Oxygen Demand (CBOD) per pound over 300mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.180/lb	$0.185/lb	$0.189/lb	$0.194/lb	$0.199/lb	$0.204/lb

B. Total Suspended Solids (TSS) in excess of 300 mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.450/lb	$0.450/lb	$0.461/lb	$0.473/lb	$0.485/lb	$0.497/lb

C. Total Kjeldahl Nitrogen (TKN) in excess of 35 mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.700/lb	$0.718/lb	$0.735/lb	$0.754/lb	$0.773/lb	$0.792/lb

A. Oil and Grease:
   (1) $0.10 per pound in excess of 300 mg/l and an additional
   (2) $0.20 per pound in excess of 600 mg/l

510.3 SOLID WASTE (GARBAGE).

This fee is reviewed annually and may be adjusted as required by Chapter 106 of the Nevada Municipal Code for the July billing cycle.

1. July 1, 2005	$1.80 per month
2. July 1, 2006	$1.70 per month
3. July 1, 2007	$1.75 per month
4. July 1, 2009	$1.70 per month
5. July 1, 2010	$1.70 per month
6. July 1, 2011	$1.75 per month
7. July 1, 2012	$1.55 per month
8. July 1, 2014	$1.45 per month
9. July 1, 2017	$1.30 per month

510.4 STORM WATER

This fee is reviewed annually and may be adjusted as required by the Nevada Municipal Code.

1. Basic Monthly Flat Charge (See Code Sec. 102.4)
   A. July 1, 2009 — $1.50 per month
   B. July 1, 2011 — $5.00 per month
   C. January 1, 2014 — $5.25 per month

2. Connection Fees (See Code Sec. 103.4)
   A. Residential — $20.00
   B. Commercial/Industrial — $50.00

510.5 BUILDING, ZONING AND SUBDIVISIONS. The Zoning Administrator and Building Official shall charge the following fees:

1. Zoning and Subdivisions

A. Major Subdivision Preliminary Plat*	$150.00 plus $10.00 per lot
B. Major Subdivision Final Plat*	$75.00
C. Minor Subdivision*	$75.00
D. Administrative Subdivision*	$75.00
E. Site Plan*	$100.00
F. Special Use Permit*	$100.00
G. Text Amendment to Code*	$50.00
H. Rezoning*	$100.00 plus $1.00 per mailing address
I. Board of Adjustment Appeal – Residential	$100.00
J. Board of Adjustment Appeal – Commercial/Industrial	$200.00
K. Construction Drawings	100% of costs for outside consulting
L. Regulations Disk (Comprehensive Plan, Zoning Ordinance, Subdivision Ordinance, Zoning Map, Application Forms, Etc.)	$20.00
M. Before and After Hours Inspections:	$50.00/hour

*In addition to the above fees, 100% of the costs incurred by the City during the review process shall be charged to the developer. These include, but are not limited to, costs and fees charged by the City Engineer and other professional consultants retained by the City in connection with the review process. No plat will be considered by the City Council until all fees are paid.

2. Building Permit Fees. A fee for each building permit shall be paid to the City as set forth herein.

PERMIT FOR	FEE
Residential (New, Remodel or Addition)	$50.00 plus $0.20 per square foot of useable space
Commercial (New, Remodel or Addition)	$100.00 plus $0.20 per square foot of useable space
Industrial (New, Remodel or Addition)	$200.00 plus $0.20 per square foot of useable space
Fence, Deck, or Utility Shed or Building (Tool, Storage, Playhouse and similar uses up to 250 square feet)	$20.00
Fireplace or Woodstove	$20.00
Sign	$20.00
Demolition	$20.00
Plumbing – Residential (New, Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)
Plumbing – Commercial (New)	$100.00 (see permit application)
Plumbing – Commercial (Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)

PERMIT FOR	FEE
Plumbing – Industrial (New)	$200.00 (see permit application)
Plumbing – Industrial (Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)
Electrical –Residential (New, Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Electrical – Commercial (New)	$100.00 (see permit application)
Electrical – Commercial (Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Electrical – Industrial (New)	$200.00 (see permit application)
Electrical – Industrial (Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Mechanical – Residential (New, Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)
Mechanical - Commercial (New)	$100.00 (see permit application)
Mechanical – Commercial (Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)
Mechanical – Industrial (New)	$200.00 (see permit application)
Mechanical – Industrial (Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)

3. Building Permit Plan Review Fee. A plan review fee shall be paid in an amount equal to one-half of the building permit and shall be paid at the time of submitting plans and specifications for review. Where plans are incomplete, or changed so as to require additional plan review, an additional fee may be charged at a rate commensurate with the additional review as required on a case-by-case basis and as established by the Building Official.

No plan review fee will be assessed for residential garages.

4. Right-of-Way License (See Code Sec. 135.10.2) $50.00 per year

5. Right-of-Way Excavation Permit (See Code Sec. 135.10.5) $20.00

6. Sidewalk Café Permit $50.00 per year

510.6 PARKS AND RECREATION.

1. Aquatic Center

A. General Admission (1 and under free)

1. Toddler Admission (2 & 3 year olds)	$2.50
2. General Admission (4-54 year olds)	$5.00
3. Senior Admission (55 and older)	$3.50

B. Season Passes:

• Individual Pass	$80.00
• 2 Person Family Pass (New Option)	$115.00
• 3 Person Family Pass (New Option)	$145.00
• 4 Person Family Pass (New Option)	$170.00
o Additional family members beyond 4 - $25.00 each	
• Senior Individual Pass (55 and older)	$63.00
• Babysitter/Grandparent Pass	$55.00

(This can be added to an individual or family pass and is limited to one (1) grandparent or babysitter not living in the same household. Babysitter must be at least 16 years of age and be providing child care/supervision.)

Family Pass– must be immediate family members living in the same house. Each additional member on the family pass beyond four will be charged at a rate of $25.00 per person.

C. Twilight Swim (after 4:00 p.m. – 1 and under free) $2.50

D. Lap Swim $2.50

E. Group Admission (20 or more) $3.50

F. Punch Pass (10 punches) $45.00

G. Senior Punch Pass (55 and older - 10 punches) $35.00

H. Pool Party (one and one-half hours)

1. Group Party during Open Swim Hours (5:30 p.m. – 7:00 p.m.)	$100.00
2. Private Party **(** 6:20 p.m. – 7:50 p.m. Saturday/Sunday only)	$225.00

I. Concession Stand Operations During Pool Parties: A fee of $25.00 if the individual or group renting the pool wants the concession stand to be open during the party.

K. Private Swim Lesson (per student/time - non-open hours)
Daily Admission Rate or Season Pass

L. Ten percent Discount on all season passes (individual, senior individual, and family) purchased during the months between December and March

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Taxes and fees are included in these prices.

2. Gates Hall

A.	Auditorium	$60.00 per hour
B	South Room	$25.00 per hour
C.	North Room	$20.00 per hour
D.	Kitchen	$30.00 per hour
E.	Entire Building – First 8 hours	$115.00 per hour
F.	Entire Building – After 8 hours on same day	$60.00 per hour
G.	Damage Deposit (Damage deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)	$200.00

3. Pavilion.

The Pavilion is not available for rentals on the following holidays: Thanksgiving, Friday after Thanksgiving, Christmas Eve (December 24), Christmas Day (December 25), New Year's Eve (December 31) and New Year's Day (January 1). All other city holidays (President's Day, Memorial Day, 4th of July, Labor Day and Veteran's Day) are charged at the weekend rate with a half day minimum regardless of the day of the week.

A. Monday – Thursday:
- $100.00 Initial, Non-refundable Fee
- $100.00 half day rate (6 consecutive hours)
- $150.00 whole day rate (8:30 a.m. – Midnight)

B. Friday – Sunday:
- $200.00 Initial, Non-refundable Fee
- $200.00 half day rate (6 consecutive hours)
- $300.00 whole day rate (8:30 a.m. – Midnight)

C. Damage Deposit $200.00
(Damage deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

4. 4-Plex Fields.

A.	One (1) day complex rental	$250.00
B.	Two (2) day complex rental	$450.00
C.	Three (3) day complex rental	$600.00

D. Lights are an additional $10.00/hour/field – 1 hour minimum

E. Rental includes dragging and chalking the fields one time, concession stand will be open, and a complex attendant/site supervisor will be on hand throughout the tournament.

F. Reservations may be made by paying a $50.00 hold fee at the time of booking to hold a date and does not count towards the complex rental fee. This fee is non-refundable unless the tournament is cancelled by the Nevada Parks and Recreation Department due to weather or poor field conditions.

G. Extra chalk and drying agent used throughout the tournament will be charged at cost.

H. Extra dragging and chalking of fields will be charged at the city's regular labor and equipment rates. Rakes and field chalker will be available for use at the diamonds.

I. 7% sales tax will be added to all fees.

5. Soccer Fields. Soccer field rent will be handled on a case by case basis based on season and field availability.

6. Equipment Rental. Fees charged by the Parks and Recreation Department for equipment used in its operation, or for rental of miscellaneous equipment, shall be those charged by the Streets Department in Section 510.7 or as follows:

A. Picnic Table — $5.00 per table per day
Damages will be assessed at cost plus labor to repair.

B. Bleacher — $25.00 per set per day
Damages will be assessed at cost plus labor to repair.

510.7 STREETS.

1. Non-Motorized Equipment Rental Rates:

A. Barricades*	$20.00 each plus $25.00 Deposit
B. Traffic Cones*	$15.00 each plus $25.00 Deposit
C. Flashers*	$10.00 each plus $25.00 Deposit
D. Plastic Snow Fence	$1.00 per foot plus $25.00 Deposit

* Deposit non-refundable if items are damaged or not returned.

2. Motorized Equipment Rental Rates (includes Parks and Recreation/Cemetery) – Machine or Vehicle Only (one hour minimum). The following rates represent the actual total cost of acquiring, operating and maintaining the listed equipment, except for fuel surcharges, if applicable. The rates are used to compute the "in-house" cost of actual work performed on municipal projects, utilizing city-owned equipment operated by city employees. These costs and charges are assessed against persons who are responsible for damages to City property and the costs of abating nuisances and repairing damage caused by vandalism, with the exception of sign replacement which is set forth in Section 510.7.4 below.

[Important Notice] The equipment rates set forth below do not include the additional labor costs of the driver or operator of each individual piece of equipment. All labor costs are in addition to the equipment rates listed below. Furthermore, in the event the local retail costs of gasoline exceeds $3.25 per gallon, or the local retail costs of diesel fuel exceeds $4.25 per gallon, the City Administrator shall have the option to assess a fuel tax surcharge in an amount deemed reasonable and appropriate by the Administrator.

A. Dump Truck	$50.00 per hour
B. Sewer Jet-Vac Truck	$125.00 per hour
C. Street Sweeper	$80.00 per hour
D. End loader	$75.00 per hour
E. Backhoe	$50.00 per hour
F. Motor Grader	$70.00 per hour
G. Skid Loader	$35.00 per hour
H. Snow Blower	$35.00 per hour
I. Concrete Saw	$30.00 per hour

J.	Air Compressor	$25.00 per hour
K.	Tractor	$35.00 per hour
L.	Weed Eater	$15.00 per hour
M.	Leaf Blower	$15.00 per hour
N.	Top Dresser	$30.00 per hour
O.	Aerifier	$30.00 per hour
P.	Walk-behind Mower	$20.00 per hour
Q.	Riding Mower with collection system	$40.00 per hour
R.	Zero Turn Mower	$35.00 per hour
S.	WAM Mower (wide area)	$50.00 per hour
T.	Pickup	$35.00 per hour
U.	Flatbed trailer (16' with ramps)	$15.00 per hour
V.	Line Painter	$20.00 per hour
W.	Utility Tractor Attachments (Tiller, Post hole auger, Snow blower, Broom, Blade, 3-point spreader, Loader, Field Groomer, Chemical Sprayer)	$20.00 per hour
X.	Power and Hand Tools	$10.00 per hour
Y.	Disposable items used during Incident, if purchased by City	Actual cost plus 15%
Z.	Charges for equipment repair, cleaning, parts and labor	Actual cost plus 15%
AA.	Charges for damaged equipment plus shipping, if applicable	Actual cost plus 15%
BB.	Gator	$25.00 per hour
CC.	Pickup/Snowplow	$55.00 per hour
DD.	Slit Seeder	$35.00 per hour
EE.	Sprayer with Gator	$45.00 per hour
FF.	Ride on Sprayer	$30.00 per hour

GG. Pickup with Dump Box $40.00 per hour

HH. Chain Saw $20.00 per hour

3. Driver, Operator and Labor Fees (includes Parks and Recreation/Cemetery):

A. Regular (Monday–Friday, 7:30 a.m.–4:00 p.m.) $35.70 per hour (1 hour minimum)

B. Overtime (Monday–Friday, 4:00 p.m.–7:30 a.m., weekends and holidays) $53.50 per hour (1 hour minimum)

4. Sign Replacement and Repair Charges due to Vandalism or Accidents

A. All signs, exclusive of posts $75.00 each

B. Wood Posts $25.00 each

C. Steel Posts $100.00 each

510.8 FIRE.

1. Equipment Rates, Exclusive of Labor Rates (One hour minimum):

A. Engine 210 and 310	$500.00 per hour
B. Truck 110	$600.00 per hour
C. Tanker 410 and 510	$300.00 per hour
D. Attack 610 and 710	$250.00 per hour
E. Heavy Rescue 1064	$400.00 per hour
F. Medical First Response Vehicle 810	$200.00 per hour
G. Command Vehicle	$200.00 per hour
H. Disposable items used during the incident, if purchase by City	Actual cost plus 15%
I. Charges for equipment repair, cleaning, parts and labor	Actual cost plus 15%
J. Charges for damaged equipment, plus shipping, if applicable	Actual cost plus 15%
K. Water used (non-emergency)	$1.00 per gallon

2. Labor Fees in addition to Equipment Rates for Fire Chief, Assistant Fire Chief, Firefighters, Emergency Medical Technicians and First Responders salaries (One hour minimum):

A. Regular (Monday-Friday, 8:00 a.m.-5:00 p.m.)	$40.00 per hour (One hour minimum)
B. Overtime (Mon-Fri 5 p.m.-8 a.m., weekends & holidays)	$60.00 per hour (Two hour minimum)

3. Non-Resident Response:

A. Vehicle Fire Response	$500.00
B. Extrication Response	$700.00 per hour

4. False Alarm Charges – Fees are based on calendar year beginning January 1, 2013

A. 1st, 2nd, 3rd False Alarm	No Charge
B. 4th False Alarm	$100.00
C. 5th False Alarm	$200.00
D. 6th and Subsequent False Alarms	$400.00
E. Late Fee for each False Alarm Invoice	$50.00

5. Inspection Fees

A. Occupancy Inspection (below 12,000 SF)	$50.00
B. Occupancy Inspection (12,000 SF and above)	$100.00
C. 1st Revisit Inspection	No charge
D. 2nd and 3rd Revisit Inspection	$50.00

6. Plan Review

A. Fire Alarm/Sprinkler and Building Plan Review (12,000 SF and above)	$200.00
B. Building Plan Review (all other plan reviews)	$100.00

7. Miscellaneous

A. Fire Report	$10.00

510.9 POLICE.

1. Parking Violation Fines:

A. Parking Ticket (General)	$25.00 each
B. Parking Ticket (Snow Ordinance)	$50.00 each
C. Overnight Downtown Parking Permit (One-time Administrative Fee)	$20.00 each
(1) Annual Parking Permit	$5.00 each

2. Copy and Redacting Fees:

A. Copies of Police Reports (Redacting Fees extra)	Minimum of $10.00 each plus $0.50 per page over - 4 pages
B. Copies of Crash or Accident Report (Redacting Fees extra)	Minimum of $10.00 each plus $0.50 per page over - 4 pages
C. Redacting Fees on Police, Crash or Accident Reports	Minimum of $10.00 each plus $0.50 per page over 4 pages
D. Copies of Audio and Video Tapes	$20.00 each
E. Copies of CD's and DVD's	$20.00 each
F. Duplicate Digital Photographs (accidents, nuisances, etc.)	$15.00 per CD-Rom
G. 35 mm photographs reprints	$3.00 each

3. Miscellaneous Fees:

A. Certified Mailings	Actual Postage Cost

B. Extensive Records Search $30.00 hour plus copy charges (2 hour minimum)
Extensive Redacting Fees $30.00 per hour plus copy charges (2 hour minimum)

(1) 8-1/2" x 11"	Black and White	$0.50 per page
(2) 8-1/2" x 11"	Color	$1.00 per page
(3) 8-1/2" x 14 or 11" x 17"	Black and White	$1.50 per page
(4) 8-1/2 x 14 or 11" x 17"	Color	$2.50 per page

C. Finger Printing	$25.00 each

D. Salvage Title Vehicle Inspection and other IDOT Inspections
(Fees based on established rate set by State of Iowa)

E. Service of Subpoena $35.00 each

4. Annual License Fees for Dogs and Cats

A. Four or fewer total dogs and/or cats.
(1) Each dog and cat that is spayed or neutered $5.00 each
(2) Each dog and cat that is NOT spayed or neutered $10.00 each

B. In Excess of four dogs and/or cats
(1) Each dog and cat that is spayed or neutered $20.00 each
(2) Each dog and cat that is NOT spayed or neutered $40.00 each

5. Fees Related to Animal Control. Impounding costs are established by the Council as necessary to recover all costs and charges incurred by the City in impounding and maintain the animal. In addition to all costs of impounding the animal, there is an administrative fee of $50.00 per incident per animal for each impoundment. All of the above fees and charges must be paid by the owner before the animal is released.

A. Daily Cat Impoundment Fee $9.40 /day
B. Daily Dog Impoundment Fee $13.40 /day
C. Rabies Observation Fee (in addition to daily impoundment) $6.50 /day
D. Euthanasia and Cremation $50.00
E. Cremation Only $39.50
F. Rabies Vaccination $16.90
G. After Hours Examination $55.00
H. Feral Cat –Special Handling Fee (one time fee) $24.50

6. Special License and Permit Fees:

A. Pawnbroker's License $100.00 each
B. Peddlers/Solicitors Permit
Application Fee (in addition to costs below) $25.00
(1) One Day (24 Hours) $25.00
(2) One Week (7 Calendar Days) $75.00
(3) One Month (Calendar Month) $100.00

7. Officer Labor Fees
A. Regular $40.00 per hour (2 hour minimum)
B. Overtime $60.00 per hour (2 hour minimum)
C. Out of Jurisdiction $80.00 per hour (2 hour minimum)

8. Community Service Officer Labor Fees
A. Regular $20.00 per hour (2 hour minimum)
B. Overtime $40.00 per hour (2 hour minimum)

9. Use of Police Vehicle
A. Within City Jurisdiction $25.00 per hour (2 hours minimum)
B. Out of Jurisdiction
$50.00 per hour (2 hours minimum) plus IRS Standard Mileage Rate

510.10 CEMETERY.

Payments for Lots and Niches. Payments for the purchase of lots and niches are required to be completed within one year from the date of down payment. If payment in full is not made within one year all payments will be forfeited. Monthly payments may be arranged at the time of purchase. There will be an additional cost of $5.00 per month added to scheduled payments to cover the additional record keeping. Twenty-five percent of the price of any space for in-ground burial will be entered into the Perpetual Care Fund. Twenty percent of the price of any niche space will be entered into the Perpetual Care Fund. Five percent of the price of any niche space will be entered into the Columbarium Maintenance Fund.

1. Standard Burial Space $600.00

One standard vault burial, two in-ground cremains burial urns or one two-niche columbarium may be placed in or on one standard burial space. Cremain burials on existing in-ground lots are allowed only with the permission of the Sexton.

2. Six-Foot Burial Space $775.00

Two cremation burials with one standard vault burial or three in-ground or above-ground cremation burials with no standard vault burial. Cremain burials on existing in-ground lots are allowed only with the permission of the Sexton.

3. Infant Package to be Used in Babyland $575.00

Marker, space, opening/closing included. All stones in the Babyland are one size, one color and furnished by the Cemetery. Burial containers cannot be larger than 36 inches long by 18 inches wide.

4. Columbarium Niche (above ground burial) $1,200.00

Opening and closing included; after normal business hours charge applies.

5. Columbarium Niche Plates (subject to change, actual vendor cost)
   A. As of January 2015
      (1) Single $300.00
      (2) Double $350.00
      (3) Scrolls for Previous Years $130.00

6. Cremation Garden Inurnment Lot (in ground burial) $400.00

8. Family Estate Lot (mausoleum) $4,000.00

All other costs including perpetual care of the mausoleum and opening and closing costs to be set by the Board of Trustees. A site plan must be submitted and approved by the Board of Trustees prior to the installation of all improvements, including the mausoleum, plantings, decorative ornaments, etc.

9. Grave Opening and Closing

Payment is expected and due prior to or at the time of burial. A late payment fee will be assessed for payment after burial of $25.00 for up to 30 days; of $50.00 for between 30 and 60 days; and of $75.00 for over 60 days.

	Monday through Friday*	Weekends and Holidays
Traditional Burials:		
April – November	$550.00	$850.00
December – March	$650.00	$950.00
For Infant	$225.00	$325.00
Cremation - Standard Urn Cremation in-ground burial (For standard size urn-burial hole no larger than 12” x 12”) *April-November *December-March	 $275.00 $325.00	 $475.00 $525.00
Cremation - Oversized Urn Cremation in-ground burial (For oversized urn-burial hole larger than 12” x 12” *April-November *December-March	 $350.00 $400.00	 $500.00 $550.00
Cremation in Private Monument/Stone	$100.00	
*All burials scheduled to begin after 3:00 p.m. will be subject to an additional charge of $100.00. All burials scheduled before noon on Monday will be charged the weekend rate.		

10. Trading of Spaces and New Deeds $50.00

All individuals completing a trade will be charged the fee for a new deed. With private party trades, each party will be subject to the fee for a new deed.

(Any individual desiring to trade a space(s) must have a valid deed showing proof of ownership for the space(s) they are wanting to trade.

The current prices of lots will be in effect. If the lot(s) being traded were purchased at a lower cost than the lot(s) being acquired in the trade, the purchaser must pay the cost difference. If the cost of the lot(s) being traded cost more than the lot(s) acquired in the trade, the Nevada Municipal Cemetery will not issue any refunds.

11. Disinterment fee for in-ground burial is double the amount of the grave opening and closing fee during Monday through Friday, Saturdays and Holidays

12. Disinterment fee for columbarium $100.00

510.11 LIBRARY.

1. Late Return Fines
   - A. Books — $0.15 per day (limit of $3.00 per item)
   - B. Movies — $0.50 per day (limit of $3.00 per movie)

2. Copying of Records
   - A. Black and White — $0.20 per page
   - B. Color — $0.30 per page

3. Fax
   - A. Outgoing — $2.00 per page for first ten; $1.00 per page after 10
   - B. Incoming — $1.00 for first page plus $0.25 for each additional page

4. Miscellaneous
   - A. Replacement Cases — $1.25 each
   - B. Storage Boxes — $5.00 each
   - C. Lost or Damaged Items — Retail cost plus $3.00 fee

5. Community Room Rental
   - A. Non-profit — No Charge
   - B. For profit and organizations — $10.00 per hour

510.12 SENIOR COMMUNITY CENTER

1. Sunday/Holiday – 9:00 a.m. – 9:00 p.m. $30.00 per hour or $150.00 per full day

2. Monday – Thursday – 5:00 p.m. – 9:00 p.m. $15.00 per hour (2-hour minimum)
   Full Evening Rental $45.00/evening

3. Friday – 5:00 p.m. – 11:00 p.m. $15.00 per hour (2-hour minimum)
   Full Evening Rental $50.00/evening

4. Saturday – 9:00 a.m. – 11:00 p.m. $30.00 hour or $150 per full day

5. Damage/Security Deposit $200.00
   (Damage/security deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

Senior Rates (for seniors over 60 on the day of the event) – effective January 1, 2012

1. Sunday/Holiday – 9:00 a.m. – 9:00 p.m. $24.00 per hour or $120.00 per full day

2. Monday – Thursday – 5:00 p.m. – 9:00 p.m. $12.00 per hour (2-hour minimum)
   Full Evening Rental $36.00/evening

3. Friday – 5:00 p.m. – 11:00 p.m. $12.00 per hour (2-hour minimum)
   Full Evening Rental $40.00/evening

4. Saturday – 9:00 a.m. – 11:00 p.m. $24.00 hour or $120 per full day

5. Damage/Security Deposit $200.00
   (Damage/security deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

Cleaning Fees $35.00/hour

510.13 MISCELLANEOUS

1. Copying customer provided materials (double if 2-sided)

A. 8-1/2" x 11"	Black and White	$0.25 per page
B. 8-1/2" x 11"	Color	$0.50 per page
C. 8-1/2" x 14 or 11" x 17"	Black and White	$1.00 per page
D. 8-1/2 x 14 or 11" x 17"	Color	$2.00 per page

2. Copying of Audio CDs — $20.00 each

3. Copies of Video DVDs — $20.00 each

4. Fax — $2.00 per 3 pages

Fee applies to both sending and receiving

5. City Records Search

A. 8-1/2" x 11"	Black and White	$0.50 per page
B. 8-1/2" x 11"	Color	$1.00 per page
C. 8-1/2" x 14 or 11" x 17"	Black and White	$1.50 per page
D. 8-1/2 x 14 or 11" x 17"	Color	$2.50 per page

6. Extensive City Records Search — $20.00 per hour plus copy charges (one hour minimum)

7. Non-Sufficient Funds/Returned Payment — $30.00

CHAPTER 520

CIVIL PENALITIES FOR MUNICIPAL INFRACTIONS

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
40.07(1)	Nudity-Licensed Premises	750.00	$1,000.00
40.07(2)	Nudity-Unlicensed Premises	500.00	800.00
40.07(3)(A)	Public Sex Act	750.00	1,000.00
40.07(3)(B)	Displaying Sex Acts	750.00	1,000.00
40.07(3)(C)	Advertising Sex Act	500.00	800.00
40.08	Invasion of Privacy	500.00	800.00
40.09	Prowling	500.00	800.00
40.10	Public Nudity	500.00	800.00
41.08	Antenna and Radio Wires	400.00	700.00
41.09	Barbed Wire and Electric Fence	400.00	700.00
41.10	Discharging Weapons	500.00	800.00
41.11	Throwing and Shooting	500.00	800.00
41.12	Urinating and Defecating	400.00	700.00
41.13	Fireworks	500.00	800.00
41.14	Drug Paraphernalia	750.00	1,000.00
41.16	Fire Code	250.00	400.00
42.05	Unauthorized Entry	400.00	700.00
45.02(1)	Possession of Alcohol Under Legal Age	400.00	700.00
45.02(2)	Misrepresentation of Age	400.00	700.00
45.03(1)	Consumption of Alcohol in a Public Place	400.00	700.00
45.03(1)	Public Intoxication	500.00	800.00
45.04 & 62.07	Open Container in Vehicle	400.00	700.00
46.02	Curfew Violation	300.00	500.00
46.03	Underage Use or Purchase of Tobacco	300.00	500.00
46.05	Underage Person in Tavern	300.00	500.00
47.04	Park Roadways and Use of Parks	300.00	500.00
47.05	Violation of Park Board Regulations	300.00	500.00
50.14	Failure to Abate Nuisance	500.00	800.00
51.04	Failure to Remove Refuse, Junk, Junk Cars, etc.	250.00	500.00
55.02	Standard of Care for Animals	400.00	700.00
55.03	Endangering, Neglect and Abandoning Animals	400.00	700.00
55.04	Failure to Dispose of Animal Waste	200.00	400.00
55.05	Failure to Supervise Animals (“At Large” Animals)	400.00	700.00
55.06	Prohibited Domestic Animal Nuisances	500.00	800.00

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
55.07	Keeping or Harboring Prohibited Animals	500.00	800.00
55.08	Keeping or Harboring Vicious Animals	750.00	1000.00
55.13	Failure to Report Animal Attacks or Suspected Rabies	500.00	800.00
55.14	Failure to Report Striking An Animal	300.00	500.00
55.15	Failure to Vaccinate For Rabies	300.00	500.00
55.16	Failure to Display Rabies Tags	300.00	500.00
55.17	Failure to Cooperate with Rabies Quarantine	400.00	700.00
55.18	Trapping Prohibited	300.00	500.00
55.19	Pet Awards Prohibited	400.00	700.00
55A	Urban Chickens	350.00	650.00
56	License Dog or Cat	350.00	650.00
60.07	Failure to Obey Peace Officer While Directing Traffic	400.00	700.00
61.03	Traffic Lanes	750.00	1,000.00
61.05	Failure to Obey Traffic Control Device	400.00	700.00
61.06	Tampering with or Striking Railroad Traffic Control Devices	750.00	1,000.00
61.07	Damage, Removal or Alteration to any Traffic Control Devises	100.00 or replacement	100.00 or replacement
62.01 et seq.	All State of Iowa Traffic Violations that are incorporated by reference in the City Code shall be prosecuted as criminal offenses and all State Code scheduled fines shall apply		
62.02 through 62.06	Miscellaneous Motor Vehicle Violations not included in 62.01 or otherwise incorporated by State Code	400.00	700.00
62.08	Obstructing View at Intersection	400.00	700.00
62.09	Reckless Driving	750.00	1,000.00
62.10	Careless Driving	400.00	700.00
62.11	Milling ("Scooping the Loop")	200.00	400.00
62.12	Excessive Motor Vehicle Noise	300.00	500.00
Chapter 63	Speed Regulations shall be prosecuted as simple misdemeanors with scheduled fines adopted from State Code		
Chapter 64	Turning Regulations [Same as Chapter 63 Above]		
Chapter 65	Stops [Same as Chapter 63 Above]		
66.01 - 66.04	Load Limits, Permits, etc.	750.00	1,000.00
66.05	Violation of Truck Route	300.00	500.00

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
Chapter 67	Pedestrian Violations	200.00	400.00
Chapter 68	One Way Traffic Violations	300.00	500.00
Chapter 69	Parking Violations shall be charged pursuant to Chapter 69 with fines assessed pursuant to Section 70.03 of the City Code		
Chapters 75.03, 75.04 and 75.05	Illegal Operation of ATV or Snowmobile	300.00	500.00
Chapter 76	Bicycle, Skateboard and Scooter Violations	200.00	400.00
Chapters 90 and 91	Water System Violations and Water Meter Violations	300.00	500.00
Chapter 95, 96, 97, and 103	Sanitary Sewer System, Sewer Connection and Storm Water Drainage System Violations	300.00	500.00
Chapter 98	On-Site Wastewater Systems	300.00	500.00
Chapter 105	Solid Waste Control Violations	300.00	500.00
Chapters 110, 111, 112 and 113	Violation of Franchise Ordinances by Franchisees	750.00	1,000.00
Chapters 120 and 121	Violations of Liquor Licenses and Cigarette Permits (except as set by Section 121.07)	750.00	1,000.00
Section 122.06	Peddling or Soliciting Without a Permit	300.00	600.00
Section 122.08	Permit Violations:		
	Outside Location of Permit	200.00	500.00
	Before or After Hours	200.00	500.00
	Operation on Public Street or ROW	200.00	500.00
	Operation on Expired Permit	300.00	600.00
Section 122.14	Failure to Carry or Show Permit	100.00	250.00
Section 122.17	Failure to Obey “No Solicitors” or “No Peddlers” Sign	250.00	500.00
Chapters 123, 124	Violations of House Movers and Pawnbrokers Ordinances	500.00	800.00
Chapters 135 and 136	Violations of Street and Sidewalk Ordinances	300.00	500.00
Chapters 145, 151, 155, 156, 157	Violations of Building and Property Regulation Ordinances	500.00	800.00
Chapters 165	Violations of Zoning and Subdivision	500.00	800.00

and 166	Ordinances		
	All other municipal infractions not mentioned above shall be subject to the following penalties:	500.00*	800.00*
***EXCEPTION:** those arising from noncompliance with a pretreatment standard or requirement by an industrial user, which shall not exceed $1,000 for each day. It is recommended that this specific type of penalty be set by resolution of the Council on a case-by-case basis.			
NOTE: The maximum penalties now allowed by both the State Code and City Code are $750 for first offense and $1,000 for each repeat offense, except for the pretreatment violations mentioned above.			

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C. Appendix C – WLA

City of Nevada

Proposed New Mechanical Facility

(Please do not microfiche this document.)

This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
CBOD5	Secondary Treatment Levels Will Not Violate WQS			
Total D.O.	Minimum Concentration (mg/l)			
January - December	5.0			
Ammonia – Nitrogen*				
January	3.5	15.2	87.6	382.8
February	4.1	14.2	101.6	357.8
March	3.5	14.7	87.5	370.1
April	1.6	15.7	39.2	395.7
May	1.8	15.2	44.7	382.7
June	1.4	**12.7**	33.7	**292.2**
July	1.0	**8.8**	25.8	**199.0**
August	1.0	**8.2**	24.5	**186.4**
September	1.1	**11.3**	27.2	**256.9**
October	1.6	15.7	40.0	395.7
November	2.4	14.7	59.7	370.1
December	2.6	16.0	63.6	402.2
Bacteria	Geometric Mean (#org./100 ml)		March 15th – November 15th	
E. coli	211			
Chloride	392	629	9,837	15,847
Sulfate	1,515	1,515	38,145	38,145
TRC**	0.008	0.019	0.199	0.479
pH	6.5 - 9.0 Standard Units			
Major Facility Acute WET Testing Ratio: Use 99.9% of effluent and 0.1% of dilution water for the testing				

Stream Network/Classification of Receiving Stream:
West Branch Indian Creek (A2, B(WW-2)) to Indian Creek (A1, B(WW-2)) to the South Skunk River (A1, B(WW-1) HH)

Annual critical low flows in West Branch Indian Creek at the outfall:
1Q10 flow 0.1 cfs, 7Q10 flow 0.1 cfs, 30Q10 flow 0.1 cfs

Annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek:
1Q10 flow 9.20 cfs, 7Q10 flow 12.3 cfs, 30Q10 flow 16.7 cfs, 30Q5 flow 26.3 cfs, harmonic mean flow 88.5 cfs

Excel spreadsheet calculations [X] Qual II E model [ ] Qual II E modeling date [ ]

Performed by: Ian Willard

* **Bold** values are governed by CBOD5/DO modeling; the others are based on ammonia nitrogen toxicity protection for aquatic life.
** Only required if chlorine is used for disinfection.

Antidegradation Review Requirement

A tier II antidegradation review is required. See Section 2 for details.

Please note that the antidegradation review conducted in this wasteload allocation is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

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Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
1,1,1-Trichloroethane	2.643E+01	2.643E+01	6.653E+02	6.653E+02
1,1-Dichloroethylene	5.405E+01	5.405E+01	1.026E+03	1.361E+03
1,2-Dichloroethane	3.597E+00	5.906E+01	5.345E+01	1.487E+03
1,2-Dichloropropane	1.458E+00	1.458E+00	2.167E+01	2.167E+01
2,3,7,8-TCDD (Dioxin)	4.958E-10	4.958E-10	7.368E-09	7.368E-09
3,3-Dichlorobenzidine	2.722E-03	2.722E-03	4.045E-02	4.045E-02
4,4' DDT	1.010E-06	1.101E-03	2.532E-05	2.772E-02
Aldrin	4.860E-06	3.003E-03	7.223E-05	7.560E-02
Aluminum	8.786E-02	7.507E-01	2.203E+00	1.890E+01
Antimony	2.299E+00	1.101E+01	3.881E+01	2.772E+02
Arsenic (III)	1.515E-01	3.403E-01	3.798E+00	8.568E+00
Barium	2.052E+02	2.052E+02	5.166E+03	5.166E+03
Benzene	4.958E+00	1.652E+01	7.368E+01	4.158E+02
Benzo(a)Pyrene	1.750E-03	1.750E-03	2.600E-02	2.600E-02
Beryllium	5.005E-01	5.005E-01	1.260E+01	1.260E+01
Bis(2-ethylhexyl)phthalate	2.139E-01	2.139E-01	3.178E+00	3.178E+00
Bromoform	1.361E+01	1.361E+01	2.023E+02	2.023E+02
Cadmium	4.567E-04	4.320E-03	1.145E-02	1.088E-01
Carbon Tetrachloride	1.555E-01	2.157E+01	2.311E+00	5.431E+02
Chlordane	4.342E-06	2.402E-03	1.089E-04	6.048E-02
Chloride	3.92E+02	6.29E+02	9.837E+03	1.5847E+04
Chlorobenzene	5.746E+00	1.612E+01	9.701E+01	4.057E+02
Chlorodibromomethane	1.264E+00	1.264E+00	1.878E+01	1.878E+01
Chloroform	4.569E+01	4.569E+01	6.790E+02	6.790E+02
Chloropyrifos	4.140E-05	8.308E-05	1.038E-03	2.092E-03
Chromium (VI)	1.111E-02	1.602E-02	2.785E-01	4.032E-01
Copper	1.703E-02	2.693E-02	4.271E-01	6.779E-01
Cyanide	5.251E-03	2.202E-02	1.317E-01	5.544E-01
Dichlorobromomethane	1.653E+00	1.653E+00	2.456E+01	2.456E+01
Dieldrin	5.249E-06	2.402E-04	7.801E-05	6.048E-03
Endosulfan	5.655E-05	2.202E-04	1.418E-03	5.544E-03
Endrin	3.635E-05	8.608E-05	9.116E-04	2.167E-03
Ethylbenzene	7.542E+00	2.267E+01	1.273E+02	5.708E+02
Fluoride	8.085E+00	8.085E+00	2.035E+02	2.035E+02
gamma-Hexachlorocyclohexane (Lindane)	9.509E-04	9.509E-04	2.394E-02	2.394E-02
Heptachlor	3.837E-06	5.205E-04	9.622E-05	1.310E-02

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Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
Heptachlor epoxide	3.791E-06	5.205E-04	5.634E-05	1.310E-02
Hexachlorobenzene	2.819E-05	2.819E-05	4.189E-04	4.189E-04
Hexachlorocyclopentadiene	3.951E+00	3.951E+00	6.670E+01	6.670E+01
Iron	1.001E+00	1.001E+00	2.520E+01	2.520E+01
Lead	7.769E-03	1.976E-01	1.948E-01	4.975E+00
Mercury (II)	5.387E-04	1.642E-03	9.095E-03	4.133E-02
Nickel	9.469E-02	8.442E-01	2.374E+00	2.125E+01
Nitrate as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
Nitrate+Nitrite as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
para-Dichlorobenzene	6.824E-01	2.002E+00	1.152E+01	5.040E+01
Parathion	1.313E-05	6.506E-05	3.292E-04	1.638E-03
Pentachlorophenol (PCP)	2.257E-02	2.917E-02	5.660E-01	7.343E-01
Phenols	5.049E-02	2.502E+00	1.266E+00	6.300E+01
Polychlorinated Biphenyls (PCBs)	6.221E-06	2.002E-03	9.246E-05	5.040E-02
Polynuclear Aromatic Hydrocarbons (PAHs)	6.636E-05	3.003E-02	1.253E-03	7.560E-01
Selenium	5.049E-03	1.932E-02	1.266E-01	4.864E-01
Silver	3.804E-03	3.804E-03	9.576E-02	9.576E-02
Sulfate	1.515E+03	1.515E+03	3.8145E+04	3.8145E+04
Tetrachloroethlyene	3.208E-01	3.208E-01	4.767E+00	4.767E+00
Thallium	1.688E-03	5.986E-01	2.850E-02	1.507E+01
Toluene	1.106E-01	2.727E+00	2.088E+00	6.607E+01
Total Residual Chlorine (TRC)**	8E-03	1.9E-02	1.99E-01	4.79E-01
Toxaphene	2.020E-06	7.307E-04	5.064E-05	1.840E-02
trans-1,2-Dichloroethylene	5.028E-01	5.028E-01	8.489E+00	8.489E+00
Trichloroethylene (TCE)	8.079E-02	4.004E+00	2.026E+00	1.008E+02
Vinyl Chloride	2.333E-01	2.333E-01	3.467E+00	3.467E+00
Zinc	2.158E-01	2.158E-01	5.432E+00	5.432E+00

WLAs/Permit Limits for the City of Nevada's Proposed New Mechanical Facility

These wasteload allocations and water quality based permit limitations are for the City of Nevada's wastewater discharge from a proposed new mechanical facility. The wasteload allocations/permit limits are based on the Water Quality Standards (IAC 567.61) and 'Iowa Wasteload Allocation (WLA) Procedure', February 21, 2018. The chloride allocation/permit limits are based on the criteria that became effective on November 11, 2009.

The water quality based limits in this WLA are calculated to meet the surface water quality criteria to protect downstream uses. There could be technology based limits applicable to this facility that are more stringent than the water quality based limits shown in this WLA. The technology based limits could be derived from either federal guidelines based on different industrial categories or permit writer's judgment.

1. BACKGROUND:
The City of Nevada currently discharges treated domestic wastewater from a mechanical (trickling filter) wastewater treatment facility into Unnamed Creek.

The City of Nevada is proposing to build a new mechanical (activated sludge) wastewater treatment facility at a new location. The design flows and design mass loadings used throughout this WLA are proposed values for the proposed new mechanical facility. The proposed new mechanical facility would discharge into West Branch Indian Creek (at 41° 57' 31.667" N, 93° 26' 50.871" W).

Route of flow and use designations:
At the outfall, West Branch Indian Creek is an A2, B(WW-2) designated use waterbody. Approximately 23,980 ft downstream of the outfall, West Branch Indian Creek flows into Indian Creek. Directly downstream of the mouth of West Branch Indian Creek, Indian Creek is an A1, B(WW-2) designated use waterbody. Approximately 128,710 ft downstream of the mouth of West Branch Indian Creek, Indian Creek flows into the South Skunk River. Directly downstream of the mouth of Indian Creek, the South Skunk River is an A1, B(WW-1) HH designated use waterbody.

The designations have been adopted in Iowa's state rule described in the rule referenced document of Surface Water Classification effective on June 17, 2015. Based on the pollutants of concern, the use designations of waterbodies further downstream will not impact the resulting limits for this facility.

Critical low flow determination:
The annual critical low flows in West Branch Indian Creek at the outfall are estimated based on the Regional Regression Equations (RRE) from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013).

The annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek are estimated based on the Weighted Drainage Area Ratio (WDAR) method from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013) and flow statistics obtained at USGS gage station 05471050, located on the South Skunk River at Colfax, Iowa.

Table 1a: Annual Critical Low Flows in West Branch Indian Creek

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)
West Branch Indian Creek at the outfall	44	0.1	0.1	0.1

Table 1b: Annual Critical Low Flows in the South Skunk River

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic Mean (cfs)
The South Skunk River at (or just upstream of) the mouth of Indian Creek	814	9.20	12.3	16.7	26.3	88.5

2. ANTIDEGRADATION REVIEW:

According to the Iowa Antidegradation Implementation Procedure, effective February 17, 2010 (IAC 567-61.2(2).e), all new or expanded regulated activities (with limited exceptions, such as unsewered communities) are subject to antidegradation review requirements.

Table 2: Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☒, No ☐, or Not Applicable ☐	1: Proposed design capacity shown on the request form.
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☒, No ☐, or Not Applicable ☐	1: Note that if chlorine is utilized for disinfection in the future an antidegradation review will be required.
4	Less Stringent Water Quality Based Limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Less stringent copper and ammonia nitrogen limits will trigger an antidegradation review.
5	Outfall Location Change	Yes ☒, No ☐, or Not Applicable ☐	
Conclusion and discussion: Due to Items 1, 3, 4, and 5, a tier II antidegradation review is required. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.			

3. TOTAL MAXIMUM DAILY LOAD (TMDL) LIMITATIONS:

The following waterbodies in the discharge route are on the 2016 impaired waters list:

- Indian Creek for bacteria (indicator bacteria, *E. coli*) and biological (low aquatic macroinvertebrate IBI)
- The South Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Mississippi River for metals (aluminum)

The City of Nevada STP has not been assigned allocations in any TMDLs at this time.

Please note that the results presented in this report are wasteload allocations based on meeting the State's current water quality standards in the receiving waterbody. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations. Information on impaired streams in Iowa and approved TMDLs can be found at the following website: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement/Impaired-Waters.

4. CALCULATIONS:
The WLAs/permit limits for this outfall are calculated based on the facility's proposed Average Dry Weather (ADW) design flow of 1.64 mgd and its proposed Average Wet Weather (AWW) design flow of 3.02 mgd.

Please note that only wasteload allocations/permit limits (water quality based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality based permit concentration limits are derived using the allowed stream flow and the proposed ADW design flow, while the loading limits are derived using the allowed stream flow and the proposed AWW design flow.

Toxics:
The toxics wasteload allocations will consider the procedures included in the 2000 revised WQS and the 2007 chemical criteria.

To protect the aquatic life use:
Important to toxics is the use of the 1Q10 stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the Mixing Zone (MZ) and the Zone of Initial Dilution (ZID), respectively.

To protect the human health (HH) use:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 30Q5 flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the harmonic mean flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

Final limits:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic life use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 5/week, based on a proposed design population equivalent (PE) of 36,365; the limits for other toxics are based on a sampling frequency of 1/week.

Ammonia Nitrogen:
Standard stream background pH, temperatures, and concentrations of NH3-N are mixed with the discharge from the facility's effluent pH and temperature values to calculate the applicable instream criteria for the protection of West Branch Indian Creek.

Based on the ratio of the stream flow to the discharge flow, 5% of the 1Q10 flow and 100% of the 30Q10 flow in West Branch Indian Creek at the outfall are used as the ZID and the MZ, respectively. At the outfall, West Branch Indian Creek is a B(WW-2) stream; therefore, early life protection will begin in April and run through September.

The monthly background pH, temperatures, and NH3-N concentrations shown in Table 3 are used for the wasteload allocation/permit limits calculations based on the Year 2000 ammonia nitrogen criteria. Table 4 shows the statewide monthly effluent pH and temperature values for mechanical facilities. Table 5a shows the calculated toxicity based ammonia nitrogen wasteload allocations for this facility. Additionally, Table 5b shows the final ammonia nitrogen wasteload allocations for this facility with reductions from the CBOD5/DO modeling (discussed below).

Table 3: Background pH, Temperatures, and NH3-N Concentrations
For Use with Year 2000 Ammonia Nitrogen Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
January	8.1	0.3	0.02
February	8.0	0.1	0.08
March	8.1	1.5	0.12
April	8.3	9.3	0.03
May	8.2	15.0	0.03
June	8.2	19.4	0.02
July	8.2	23.5	0.02
August	8.2	24.3	0.02
September	8.3	20.2	0.02
October	8.3	14.2	0.02
November	8.3	8.0	0.02
December	8.3	0.8	0.03

Table 4: Standard Effluent pH & Temperature Values for Mechanical Facilities

Months	pH	Temperature (°C)
January	7.67	12.4
February	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.70	22.1
July	7.58	24.1
August	7.63	24.4
September	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

Table 5a: Toxicity Based Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life

Months	ADW-Based*		AWW-Based**	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	14.5	1.4	14.4	1.3
July	17.6	1.0	17.6	1.0
August	16.2	1.0	16.2	1.0
September	16.5	1.1	16.5	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: bases for concentration limits; **: bases for mass loading limits

Table 5b: Final Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life after CBOD5/DO Modeling*

Months	ADW-Based**		AWW-Based***	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	**12.7**	1.4	**11.6**	1.3
July	**8.8**	1.0	**7.9**	1.0
August	**8.2**	1.0	**7.4**	1.0
September	**11.3**	1.1	**10.2**	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: **Bold** values are governed by CBOD5/DO modeling, while the other values are based on ammonia nitrogen toxicity protection for aquatic life
**: bases for concentration limits
***: bases for mass loading limits

CBOD5/Total Dissolved Oxygen:
Streeter-Phelps DO Sag Model is used to simulate the decay of CBOD and dispersion of total Dissolved Oxygen (DO) in the receiving water downstream from the outfall. The criterion is that the discharge cannot cause the DO level in the receiving stream (warm water) to be below 5.0 mg/l.

The parameter values used in the modeling are listed below:

Background:
The temperature and ammonia nitrogen levels are shown in Table 3. The ultimate CBOD and DO levels are assumed to be 6.0 mg/l and 6.0 mg/l, respectively.

Effluent:
The temperatures are shown in Table 4. The CBOD5 level used in the modeling is 40 mg/l, which is the technology based maximum limit for standard secondary treatment. The ammonia nitrogen values used in the modeling are the calculated toxicity based acute wasteload allocations shown in Table 5a. Both ADW and AWW flows and the ammonia nitrogen limits associated with them are used in the modeling.

Receiving stream parameters:
There is an average water channel slope of 0.00126 (the water channel elevation changes from 898 ft to 870 ft over a distance of approximately 22,310 ft, estimated based on the GIS LiDAR 2-ft contour coverage).

Field Use Attainability Assessment (UAA) had one site along West Branch Indian Creek that was downstream of the outfall. Two observations of stream width, depth, and velocity were made at the site. Based on these UAA data, the stream average width, depth, and velocity at 7Q10 + ADW and 7Q10 + AWW conditions are estimated and are shown in Table 6.

Table 6: Stream Width, Depth, and Velocity

Flow Condition	Flow (cfs)	Width (ft)	Depth (ft)	Velocity (fps)
7Q10 + ADW	2.64	23.0	0.28	0.42
7Q10 + AWW	4.77	24.7	0.36	0.54

Reaeration:
The UAA site on West Branch Indian Creek downstream of the outfall indicated that the stream contains both riffle and run features. Aerial imagery showed that the stream exhibits a moderate amount of meander downstream of the outfall. Therefore, the USGS pool-riffle model (Melching and Flores 1999) is used.

Discussion and conclusion:
The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of 40 mg/l (technology based limits for secondary treatment) and a minimum DO level of 5.0 mg/l, will not cause the DO level in the receiving stream to be below 5.0 mg/l at any time; however, some of the calculated water quality based ammonia nitrogen wasteload allocations, as shown in Table 5a, need to be reduced. The final ammonia nitrogen wasteload allocations are shown in Table 5b.

***E. coli*:**
To protect the Class A2 waterbody:
The water quality standard for *E. coli* in a Class A2 waterbody is a geometric mean of 630 org./100 ml and a sample maximum of 2,880 org./100 ml from March 15th through November 15th. The criteria apply at "end-of-pipe".

To protect the Class A1 waterbody:
The water quality standard for *E. coli* in a Class A1 waterbody is a geometric mean of 126 org./100 ml and a sample maximum of 235 org./100 ml from March 15th through November 15th. *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration. The decay is estimated by using a first order decay model with a length of 23,980 ft, a decay rate of 1.0/day, and a flow velocity of 0.54 fps for 7Q10 + AWW conditions. When *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration, the limits for the protection of the Class A1 waterbody are a geometric mean of 211 org./100 ml and a sample maximum of 393 org./100 ml from March 15th through November 15th.

Final limits:
The limits for the protection of the Class A1 waterbody are more stringent than those for the protection of the Class A2 waterbody; therefore, the limits for the protection of the Class A1 waterbody govern. However, 567 IAC 62.8(2) states that "the daily sample maximum criteria for *E. coli* set forth in Part E of the 'Supporting Document for Iowa Water Quality Management Plans' shall not be used as an end-of-pipe permit limitation." Therefore, only the geometric mean limit of 211 org./100 ml applies.

Chloride and Sulfate:
The chloride and sulfate criteria became effective on Nov. 11, 2009. The default hardness for background and effluent is 200 mg/l.

Chloride criteria are functions of hardness and sulfate concentration, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797} *(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797} *(\text{Sulfate})^{-0.07452}$$

The criteria apply to all Class B waters.

Sulfate criteria, shown in Table 7, are functions of hardness and chloride concentration.

Table 7: Sulfate Criteria

Hardness (mg/l as CaCO3)	Sulfate Criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The criteria defined in Table 7 serve as both acute and chronic criteria and apply to all Class B waters.

The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the MZ and the ZID, respectively.

The default chloride concentration for both background water and effluent is 34 mg/l, while the default sulfate concentration for both background water and effluent is 63 mg/l. The limits are calculated based on an assumed sampling frequency of 1/week.

Iron:
The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for both general use and designated use streams. In this case, the ZID is 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall.

pH:
Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the MZ, which is 25% of the 7Q10 flow in West Branch Indian Creek at the outfall. Therefore, the pH in the effluent at the outfall must be between 6.5 and 9.0 Standard Units.

TDS:
Effective Nov. 11, 2009, the site-specific TDS approach is no longer applicable; instead the new chloride and sulfate criteria became applicable. However, the TDS level should be controlled to a level such that the narrative criteria stated in IAC 567.61.3 are fulfilled.

Major Facility Acute WET Testing Ratio:
Use 99.9% of effluent and 0.1% of dilution water for the testing. The ratio is calculated using the ADW design flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall as the ZID.

5. PERMIT LIMITATIONS:
- *Based on the Year 2006 Water Quality Standards & 2002 Permit Derivation Procedure.*

The acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The water quality based limits are shown on Pages 1 – 3 of this report.

D. Appendix D – Process Facilities Evaluation

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P1

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Max 30-Day	Max Day
cBOD, lbs/day	6,692	10,554
TSS, lbs,day	4,300	6,899
TKN, lbs/day	869	1,148
Total Phosphorus, lbs/day	309	350
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Secondary Treatment System (Five-Stage Bardenpho)

No of units/process trains	2
Sidewater Depth, ft	15
Anaerobic Tank Volume, each, gallons	63,000
First Anoxic Tank Volume, each, gallons	78,300
Aerobic Tank volume, each, gallons	1,493,000
Second Anoxic Tank volume, each, gallons	25,000
Reaeration Tank volume, each, gallons	62,900
Hydraulic Detention Time @ AWW, hrs	27
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15.4
SRT, days	15
Equipment	Mixer/Aerator/Diffusers
Anaerobic Tank	2 Submersible mixers
First Anoxic Tank	4 Submersible mixers
Aerobic Tank	4 Aeration blowers (est., type TBD)
	Fine bubble Diffused aeration (type TBD)
	4 Submersible mixers
	6 Recycle Submersible Pumps (est.)
Second Anoxic Tank	2 Submersible mixers
Reaeration	Fine bubble diffused aeration (type TBD)
	Use Aerobic Tank blowers
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	14.9
Solids Loading Rate, max, lbs/sf/day	38.4

RAS Pumps

Type	Centrifugal
No of units	6
Rated Capacity each, gpm	~800
Rated head, ft	~12 (estimated)
RAS firm capacity, mgd	~5.75
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No of units	2
Rated Capacity each, gpm	200

Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel - Horizontal
No of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No of units	2
Tank dim, ft x ft	20 x 10 (tank 1); 15 x 10 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	350 (tank 1) 250 (tank 2)
No of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No of units	2
Capacity, MGal	2.42
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P2

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Avg. Day	Max Day
cBOD, lbs/day	6,692	10,554
TSS, lbs,day	4,300	6,899
TKN, lbs/day	869	1,148
Total Phosphorus, lbs/day	309	350
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Oxidation Ditches

No. of units	2
Sidewater Depth, ft	14.5
Aerobic Tank volume, each, gallons	1,670,000
Anoxic Tank volume, each, gallons	60,000
Anaerobic Tank volume, each, gallons	60,000
Hydraulic Detention Time @ AWW, hrs	28.4
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15
SRT, days	26
Aeration equipment type	Vertical shaft Mixer/Aerator
Size, Hp, each	100
No. of units	2 per train, 4 total
Anoxic/Anaerobic mixing	Submersible mixers
No. of units	1 per zone, 4 total
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97
Aeration Demand, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	18,900
Daily Maximum Loading, lbs O2/d	31,700
Denitrification Oxygen Credit, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	1,572
Daily Maximum Loading, lbs O2/d	3,530
Design Temperature,	
Winter, degrees-C	10
Summer, degrees-C	25
Sludge Recycle, % AWW	
RAS Rate, Max 30-day	80
RAS Rate, Max day	80
Sludge Wasting	
WAS Rate, lbs/d	4,271
Operational Mode	Continuous

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	14.9
Solids Loading Rate, max, lbs/sf/day	38.4

RAS Pumps

Type	Centrifugal
No. of units	6
Rated Capacity each, gpm	~800
Rated head, ft	~12 (estimated)

RAS firm capacity, mgd	~5.75
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No. of units	2
Rated Capacity each, gpm	200
Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel - Horizontal
No. of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No. of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No. of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No. of units	2
Tank dimensions, ft x ft	20 x 10 (tank 1); 15 x 10 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	350 (tank 1) 250 (tank 2)
No. of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No. of units	2
Capacity, MGal	2.42
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN SOLIDS PROCESSING POST THICKENING ALTERNATIVE

Item	Size/Capacity
Aerobic Digesters	
Operation Type	series flow
No. of trains	2
No. of units per train	2
Tank dimensions, ft x ft, each	63 x 63
Tank SWD, ft	20
SRT, days	42
Aeration Requirement, SCFM, total	1,630
Mechanical Mixing, HP, each	80
No. of mixers	4 (estimated, See Note)
Diffused Air Mixing, SCFM	9,525
No. of blowers	4 (estimated, See Note)
Type	Positive displacement
Digester Transfer pumps	2

Note:
Final mixing/aeration system will be determined during final design to meet IDNR requirements if this alternative is chosen. Cost estimate based on combined diffused aeration and mechanical mixing with 4 aeration blowers and 4 mechanical mixers.

Post Sludge Thickening	
Type	Mechanical (See Note)
No. of units	2 (estimated, See Note)
Thickened Sludge Concentration	5%
Thickened Sludge Transfer Pumps	2

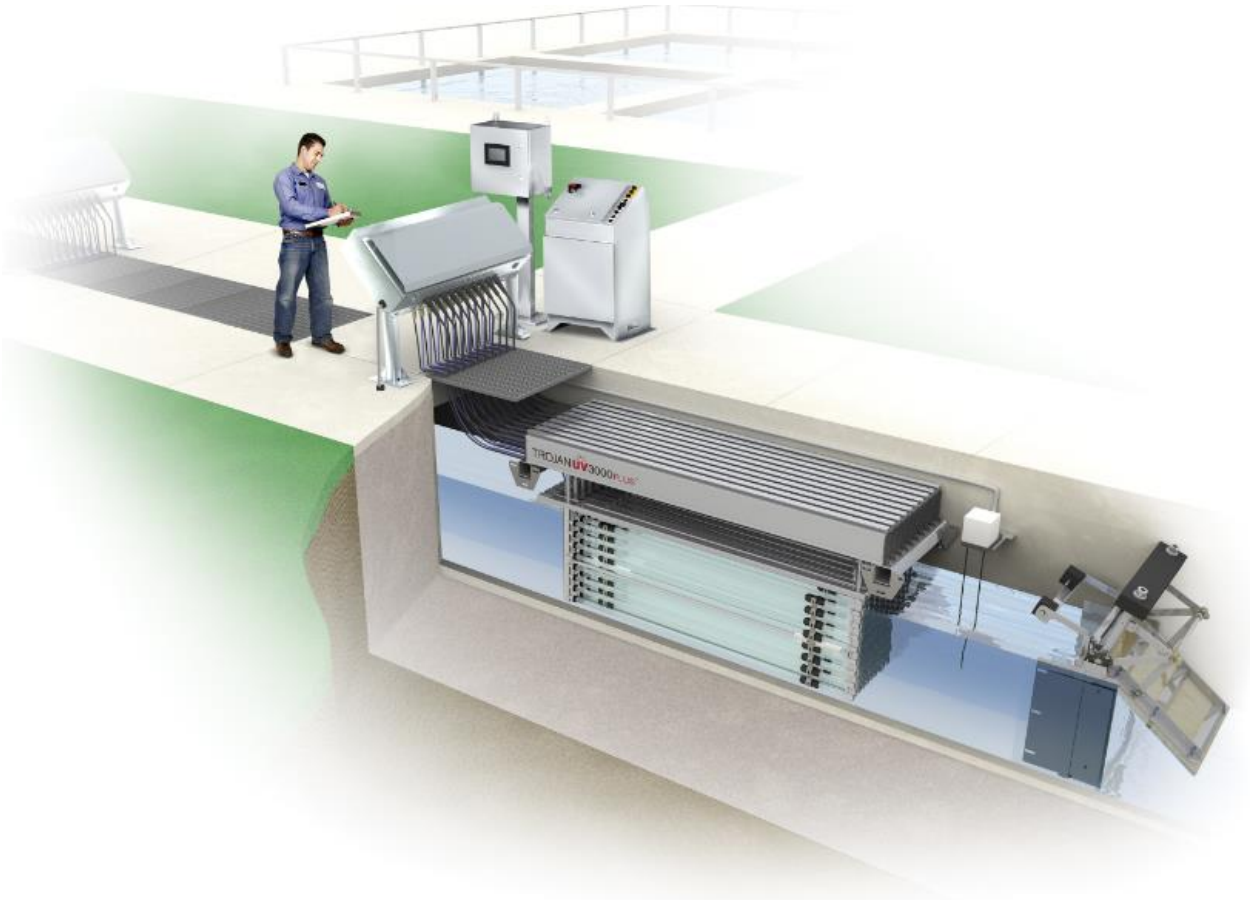
Note:
Alternatives for post sludge thickening include rotary drum thickeners and gravity belt thickeners. Final post thickening equipment will be chosen during final design if this alternative is chosen. Cost estimate based on 2 rotary drum thickeners and supporting equipment.

Biosolids Storage Tank	
Type	Above grade open top bolted steel
No of units	1
Capacity, MGal	1.45
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

UV Disinfection Proposals

TROJAN UV3000 PLUS™

PROPOSAL FOR THE CITY OF NEVADA, IA
QUOTE: 220576
06/17/2019



The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

August 19, 2019

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the NEVADA project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system. All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

Una Duncan
3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
4280 E 14th Street
Des Moines , IA
US
515-979-4648

DESIGN CRITERIA

NEVADA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65 %** (minimum)
Total Suspended Solids:	**15 mg/l** (30 Day Average, grab sample)
Disinfection Limit:	**126 E.coli per 100 ml,** based on a day 30 of consecutive daily grab samples

DESIGN SUMMARY

QUOTE: 220576

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

CHANNEL	
Number of Channels:	**1**
Approximate Channel Length Required:	**25 ft 4 in**
Channel Width Based on Number of UV Modules:	**24 in**
Channel Depth Recommended for UV Module Access:	**62 in**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**6**
Number of Lamps per Module:	**8**
Total Number of UV Lamps:	**96**
Maximum Power Draw:	**23.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**2**
System Control Center Quantity:	**1**
MISCELLANEOUS EQUIPMENT	
Level Controller Quantity:	**1**
Type of Level Controller:	**Weighted Gate (ALC)**
Automatic Chemical / Mechanical Cleaning:	**Trojan ActiClean-WW™**
UV Module Lifting Device:	**Davit Crane and Lifting Sling**
On-line UVT Monitor:	**Hach UVAS sc Sensor – Optionally Available**
Standard Spare Parts / Safety Equipment:	**(8) lamps, (8) sleeves, operator kit**
ELECTRICAL REQUIREMENTS	
1. Each Power Distribution Center requires an electrical supply of one (1) 480/277V 60Hz **2.** The Hydraulic System Center requires an electrical supply of one (1), 480V 60Hz, 2.5 kVA. **3.** The System Control Center requires an electrical supply of one (1) 120V 60Hz , 15 Amps.	

4.	Electrical disconnects required per local code are not included in this proposal.

COMMERCIAL INFORMATION

Total Capital Cost: $216,000 (USD)

This price excludes any taxes that may be applicable and is valid for 90 days from the date of this letter.

EQUIPMENT WARRANTEES

1. Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.

2. UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.

3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

PROPOSAL FOR NEVADA, IA
QUOTE: 220578
06/17/2019

TrojanUVSigna™ incorporates revolutionary innovations, including TrojanUV Solo Lamp™ technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
515-979-4648
marci@mc2h2o.com

DESIGN CRITERIA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65%** (minimum)
Total Suspended Solids:	**15 mg/l (30 Day Average,** grab sample)
Disinfection Limit:	**126 E.coli per 100 ml**, 30 day Geometric Mean of consecutive daily grab samples

DESIGN SUMMARY

CHANNEL	
Number of Channels:	**1**
Minimum Channel Length Required:	**~20' (not including level control area)**
Channel Width at UV Banks:	**2.9'**
Channel Depth Recommended:	**7.8'**
UV BANKS	
Number of Banks per Channel:	**2**
Number of Lamps per Bank:	**10**
Total Number of UV Lamps:	**20**
Maximum Duty Power Draw:	**21.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**1**
Hydraulic System Center Quantity:	**1**
System Control Center Quantity:	**1**
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	**1 Fixed Weir**
Integral Bank Walls:	**Included**
On-line UVT Monitoring:	**Hach UVAS sc Sensor – Optionally Available**
Other Equipment:	
ELECTRICAL REQUIREMENTS	

1. Each Power Distribution Center requires an electrical supply of one (1) 480V, 3 phase, 4 wire + GND, 50/60 Hz
2. Electrical supply for Hydraulic System Center will be (1) 480V, 3 phase, 3 wire + GND, 60 Hz, 2.5 kVA
3. Electrical supply for System Control Center will be (1) 120V, 1 phase, 2 wire + GND, 60 Hz, 1.8 kVA
4. Electrical disconnects are not included in this proposal. Refer to local electrical codes

COMMERCIAL INFORMATION

Total Capital Cost: $237,500 (USD)

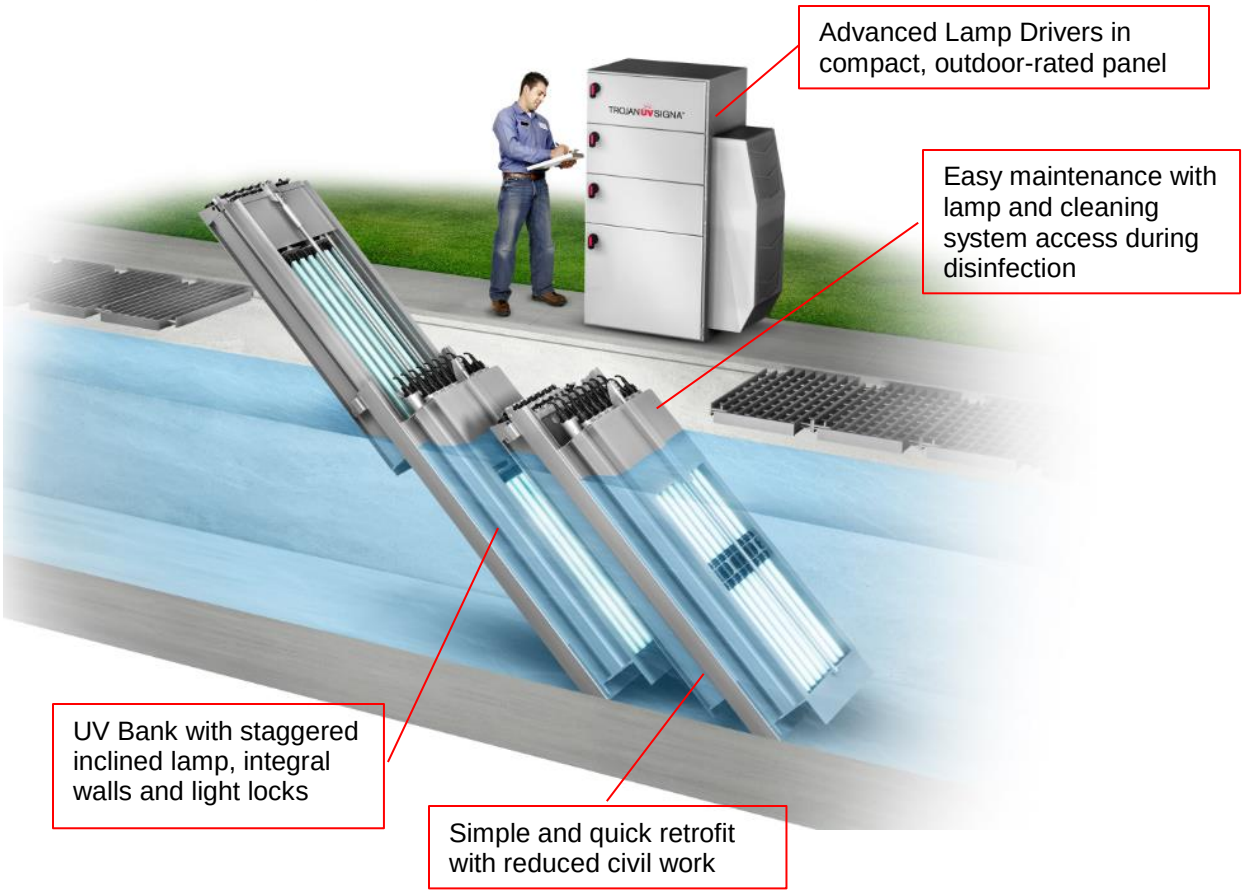
This price excludes any taxes or duties that may be applicable.

Standard equipment warrantees and start up by Trojan-certified technicians are included.

Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

SYSTEM OVERVIEW



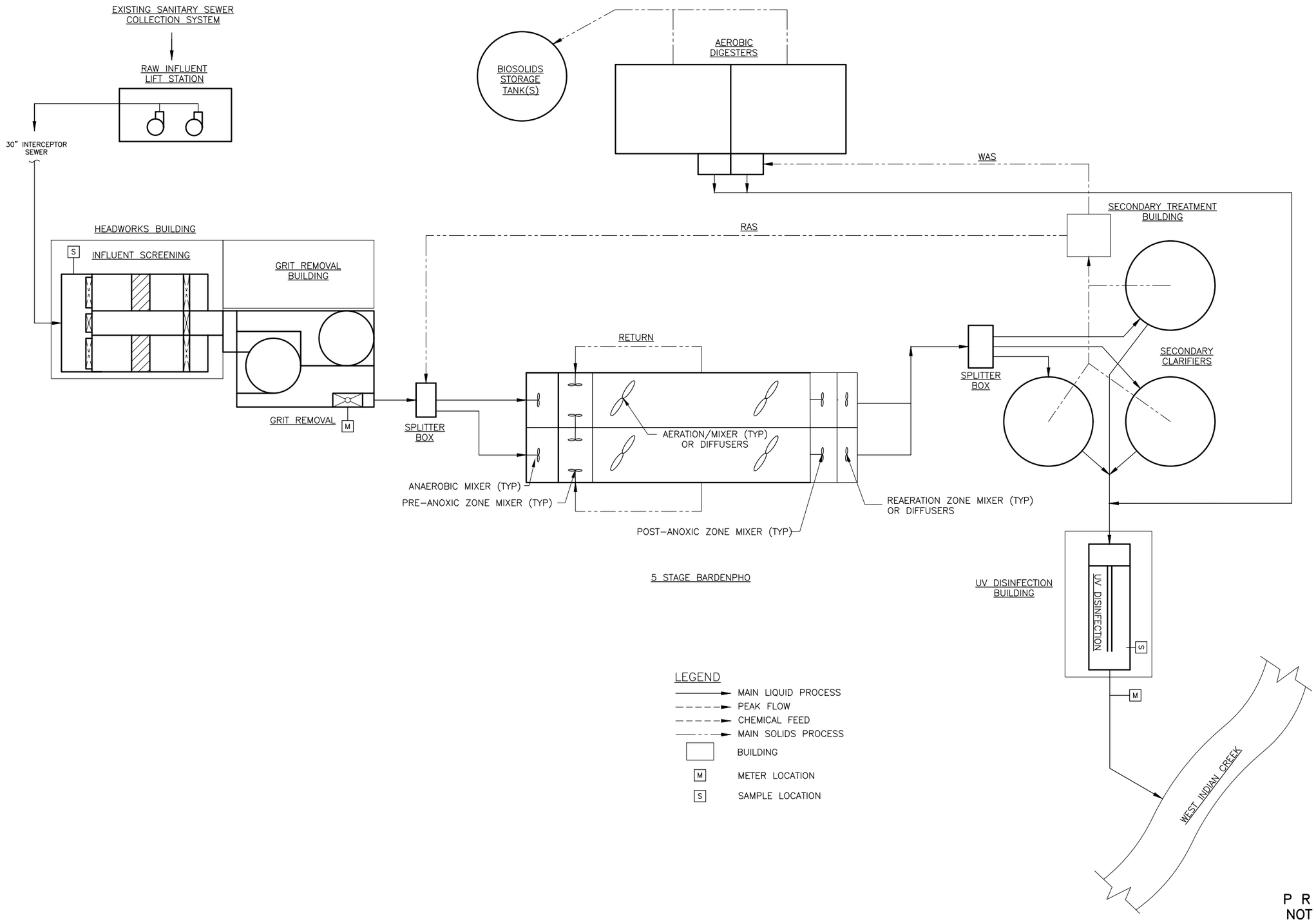
Simple to Design and Install

- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.

E. Appendix E – Process Diagrams



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NOT FOR CONSTRUCTION

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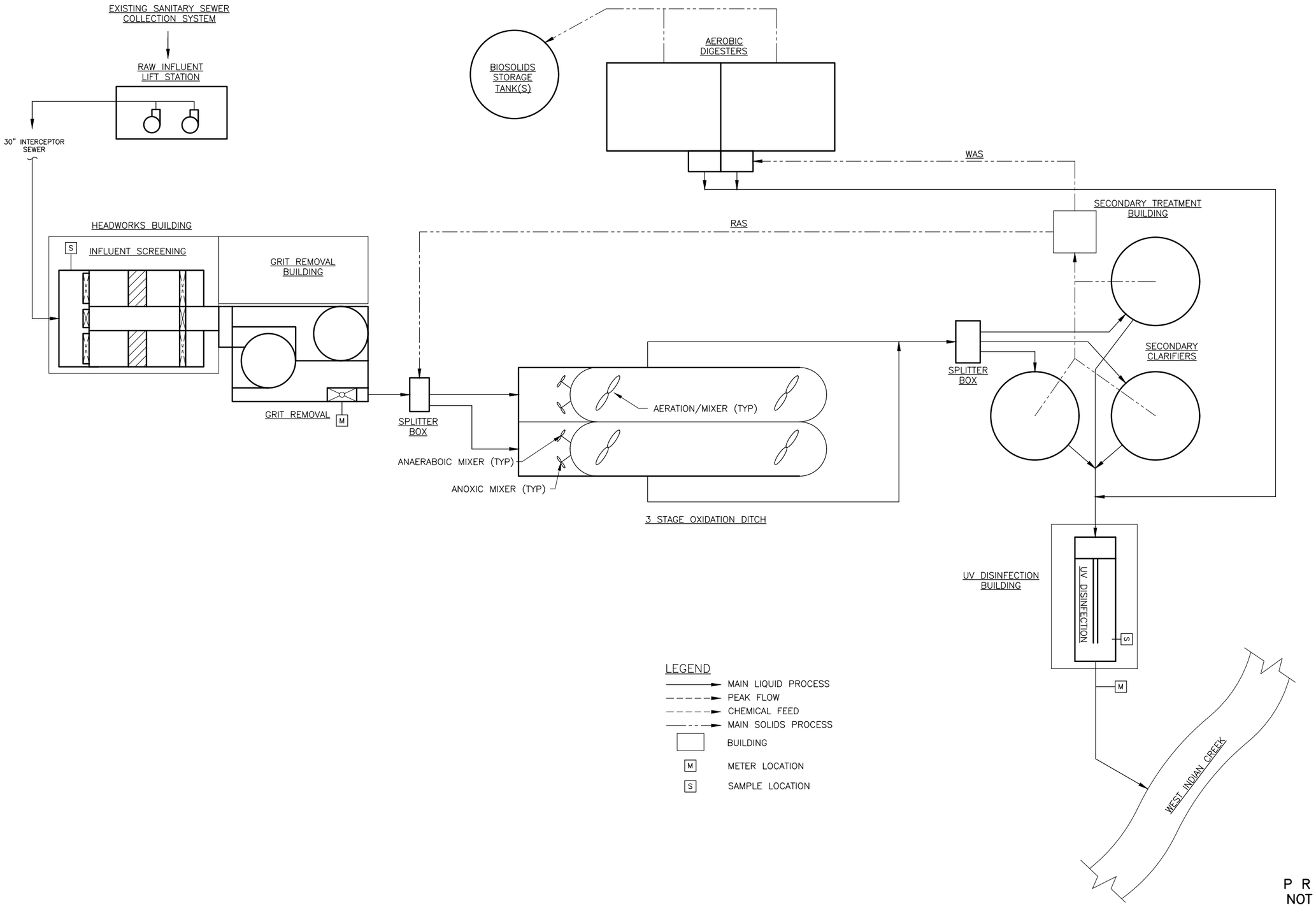
NEVADA – FACILITY PLAN
CITY OF NEVADA
NEVADA, IOWA 2019

NEVADA ANTIDEG
ALTERNATIVE 1 SCHEMATIC

SHEET NO.
FIG 1

Xrefs: xgt-1-dh01; XP-0-PID



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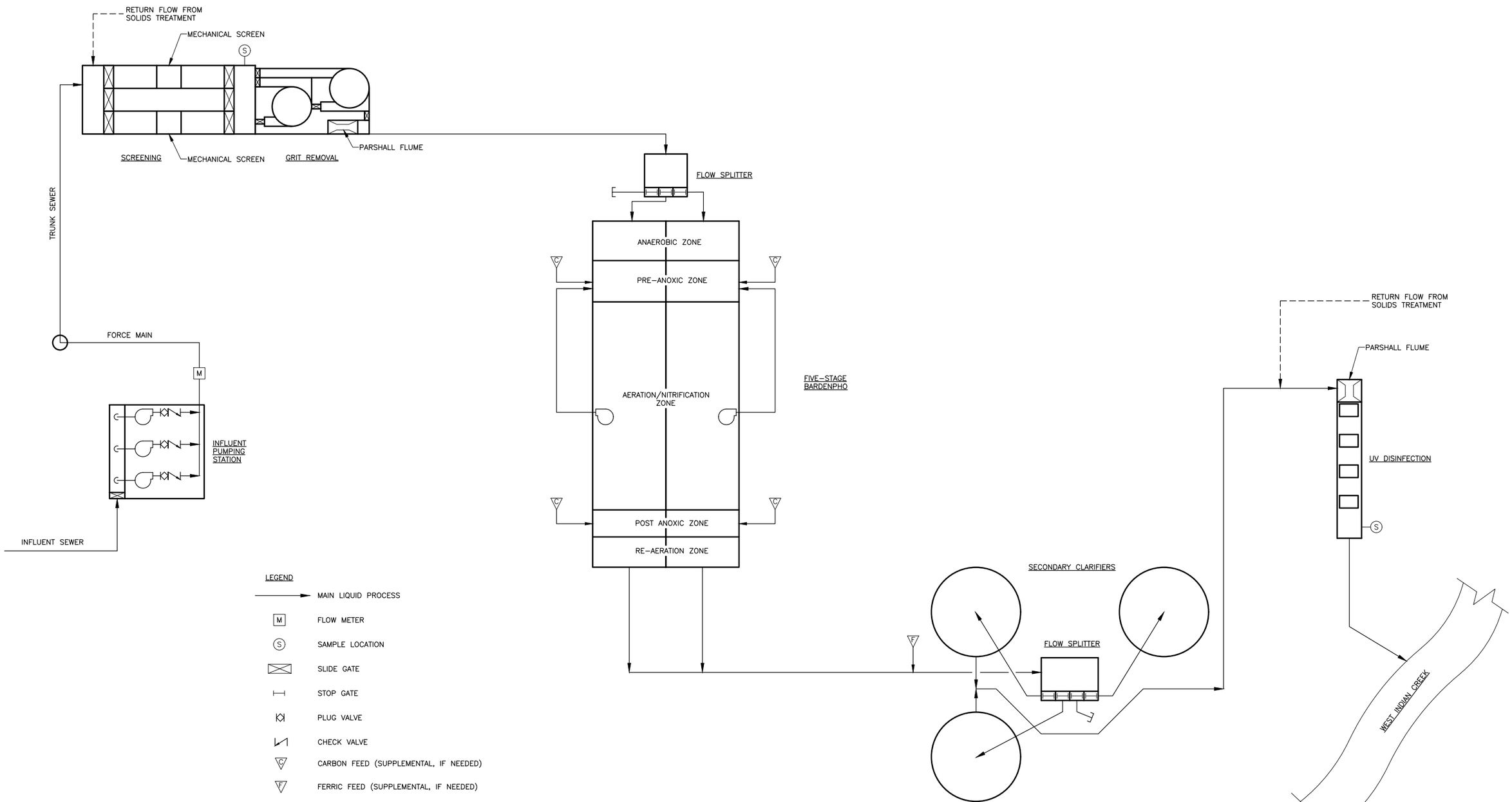
NEVADA – FACILITY PLAN
CITY OF NEVADA
NEVADA, IOWA 2019

NEVADA ANTIDEG
ALTERNATIVE 2 SCHEMATIC

SHEET NO.
FIG 2

Xrefs: xgt-1-dh01; XP-0-PID

Figures 3 and 4 on the following pages show the process diagrams for wastewater flow for both process alternatives (Alternative P1 and P2), assuming the integral thickening solids processing alternative. Figures 5 and 6 show the two proposed solids handling process flow diagrams (one process with aerobic digestion with integral thickening and one process with aerobic digestion with post thickening).



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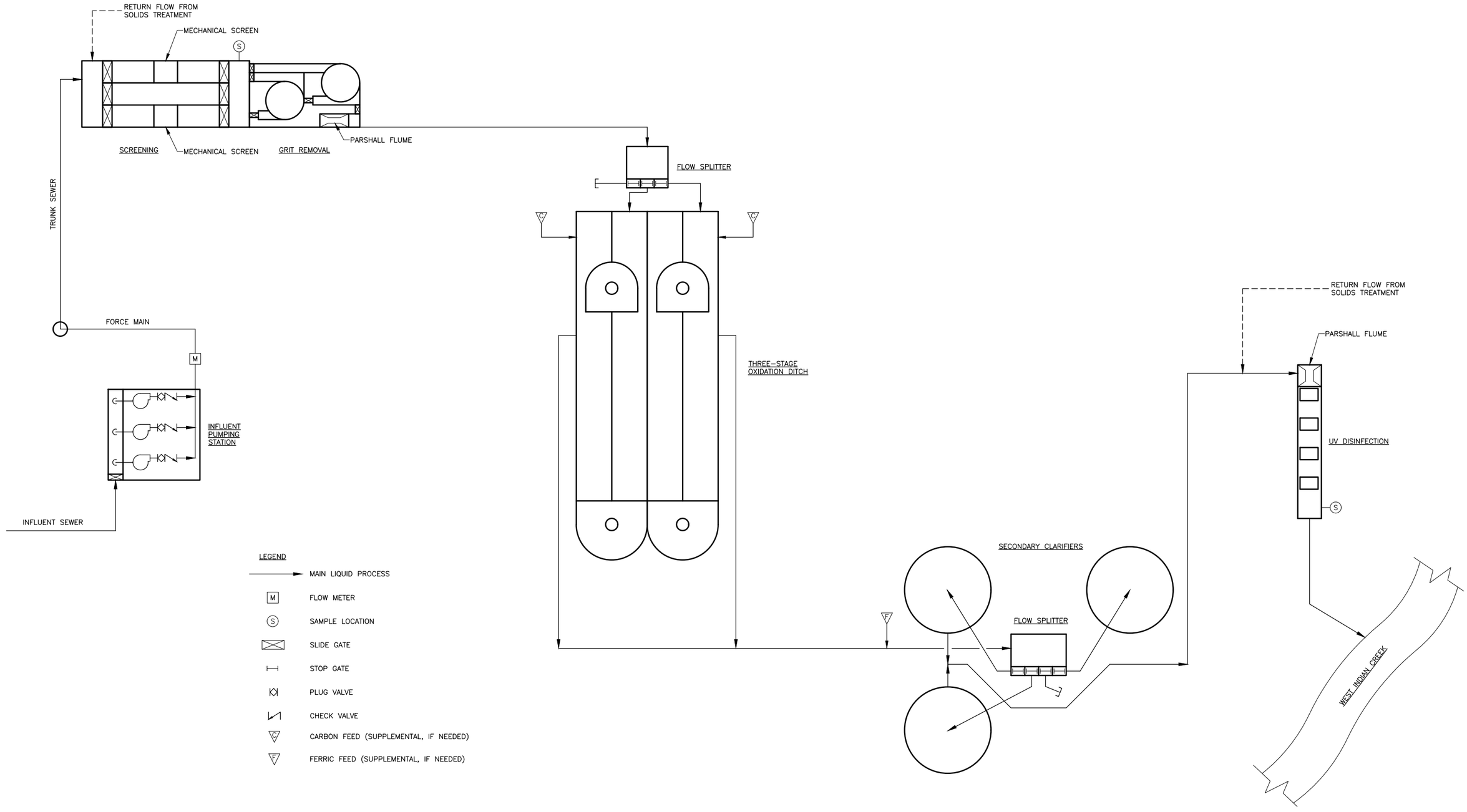
CITY OF NEVADA
NEVADA, IOWA – 2019

GENERAL
LIQUID PROCESS SCHEMATIC
ALTERNATIVE P1: FIVE-STAGE BARDENPHO

SHEET NO.
FIG 3

Xrefs: xgl-1-dh01; XP-0-PID



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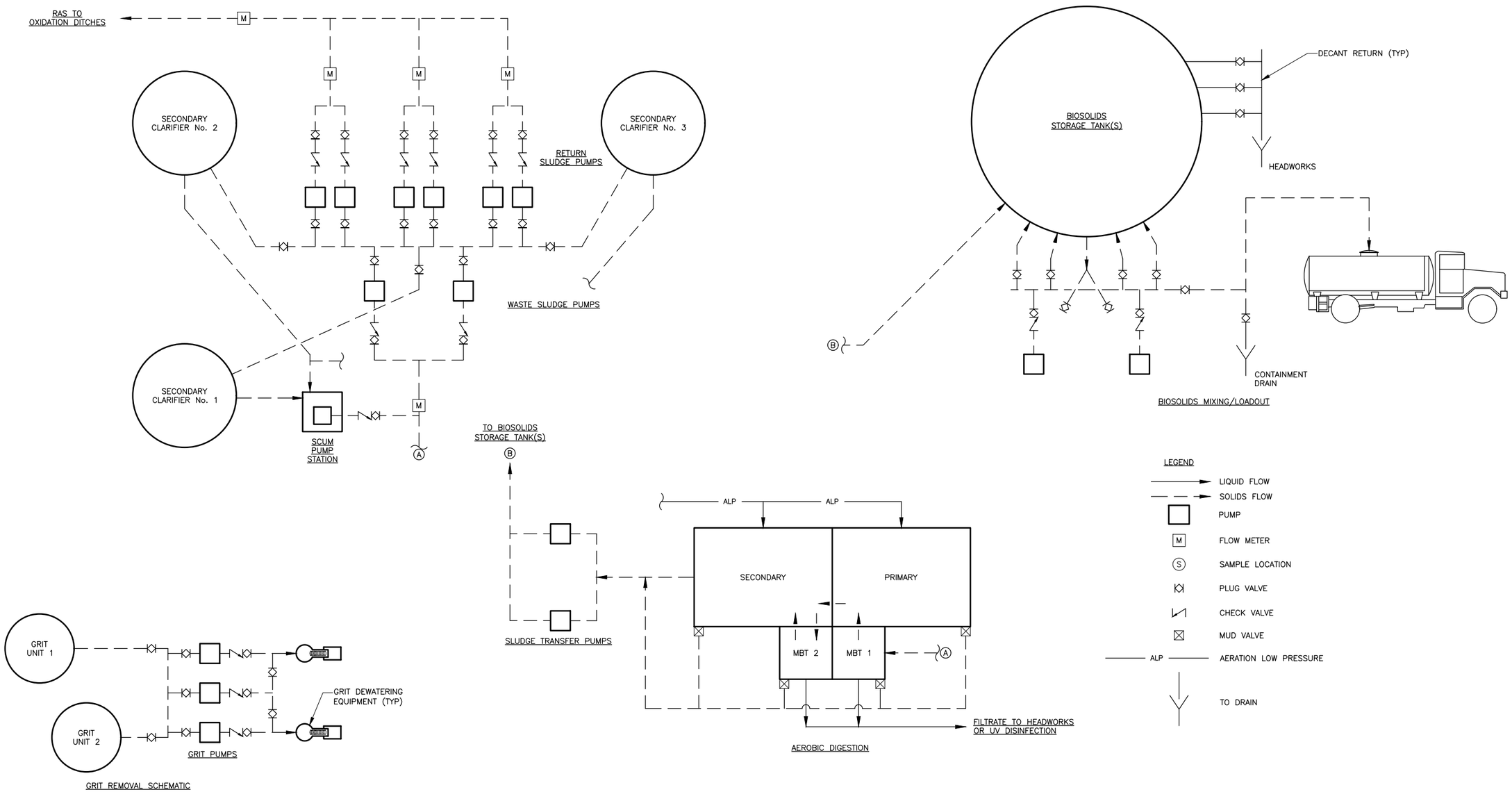
CITY OF NEVADA
NEVADA, IOWA – 2019

GENERAL
LIQUID PROCESS SCHEMATIC
ALTERNATIVE P2: 3-STAGE OXIDATION DITCH

SHEET NO.
FIG 4

Xrefs: xgl-1-dh01; XP-0-PID



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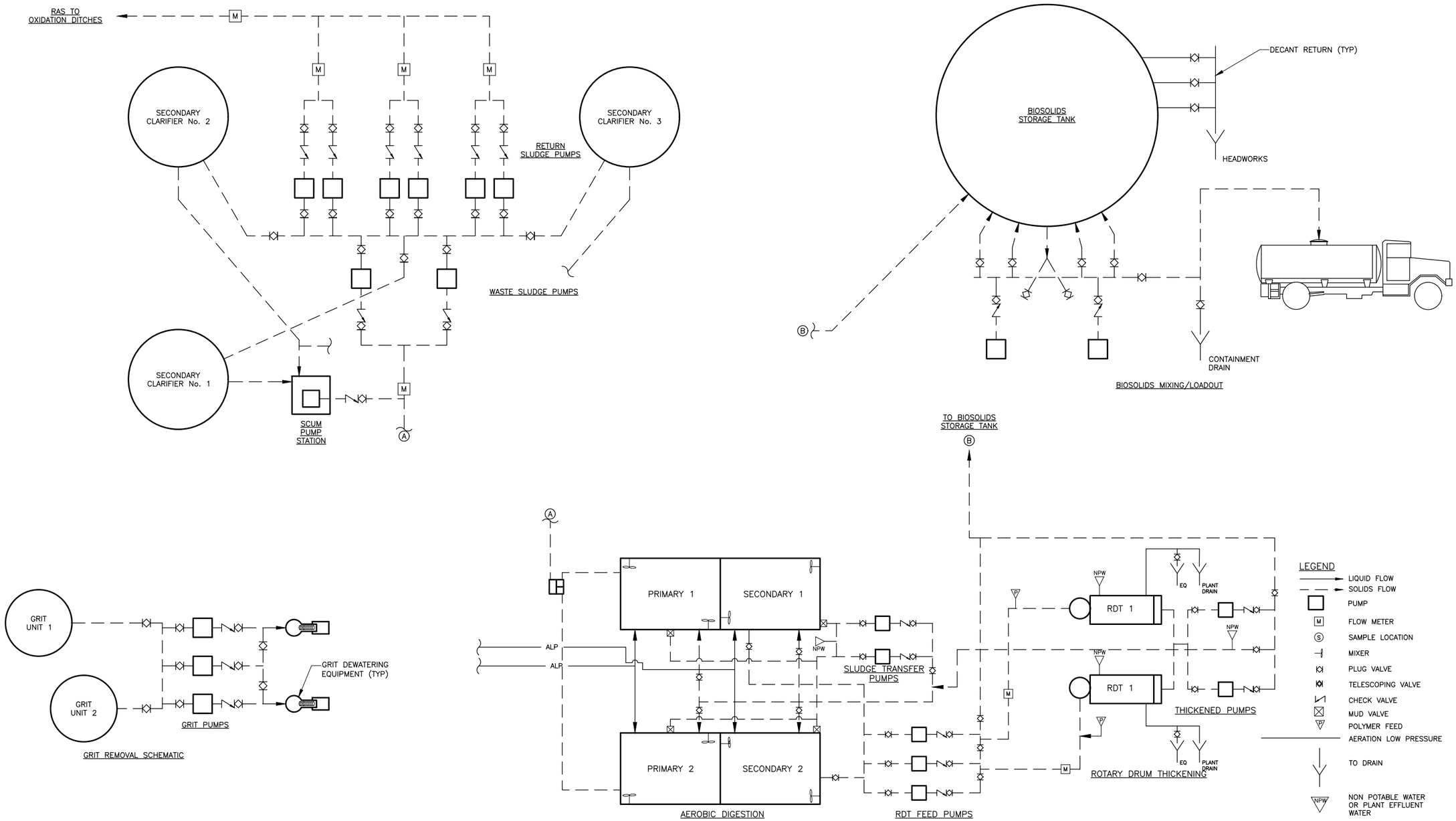
CITY OF NEVADA
NEVADA, IOWA – 2019

GENERAL
SOLIDS PROCESSING SCHEMATIC
AEROBIC DIGESTION WITH INTEGRAL THICKENING

SHEET NO.
FIG 5

Xrefs: xgl-1-dth01; XP-0-PID



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NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA – 2019

GENERAL
SOLIDS PROCESSING SCHEMATIC
AEROBIC DIGESTION WITH POST THICKENING

SHEET NO.
FIG 6

Xrefs: xgt-1-dh01; XP-0-PID

F. Appendix F – Process Facilities Operation and Maintenance

Basis of O&M Estimate

Present worth costs assume an interest rate of 3.5% and inflation rate of 2.2%. Interest rate based on 2019 value from the OMB Circular NO. A-94 and inflation rate is the average inflation rate from 2000 to present from the U.S. Department of Labor.

Power requirements assume power demand and usage costs provided by Consumers Electric. See the following page for Consumer's Electric service charge breakdown.

LARGE COMMERCIAL FLAT DEMAND RATE

SCHEDULE NUMBER: 40

SINGLE PHASE OR MULTI-PHASE: Single and Multi-Phase

FIRM OR INTERRUPTIBLE: Firm

SERVICE COMMITMENT: *High Reliability Firm* = we strive to have availability of power across our entire distribution grid from 99.96% to 99.98% of the time. Due to the possibility that severe storms occur from time-to-time, as well as our dependence on the transmission grid from which we receive power to distribute, these cannot be guaranteed.

SIZE PARAMETERS: 25 kVa through 300 kVa with load factor equal to or greater than 40% or services greater than 300 kVa with load factor less than 80%.

SERVICE AREA: All areas served by the Cooperative.

MEMBER CLASS: Large Commercial

AVAILABILITY: Large Commercial Demand Service is available to members with a load factor of 40 percent but less than 80 percent annually and are subject to the Cooperative's standard service as described in Section 4 of this tariff and within the limit of any incorporated area. All are subject to the terms of the service contract and membership application approved by the Board of Directors.

Consumers Energy may assist the member in choosing a rate schedule. However, it is the member's responsibility to select the rate schedule best adapted to the member's requirements. Consumers Energy will not be liable for any assistance given to the member in choosing a rate schedule.

LARGE COMMERCIAL FLAT DEMAND RATE

DELIVERY & SUPPLY RATE:

Access Charge: $100.00 per month

Distribution Delivery Demand Charge: $14.00 per kW
Per Non Coincident Peak kW Demand

Power Supply Rate:
Purchased Power Demand Charge $7.56 per kW
Per Non Coincident Peak kW Demand

Energy Charge (Based on Member's Preference):

100% Traditional (Coal & Nuclear)	3.60 cents per kWh
90% Traditional & 10% Renewable	3.85 cents per kWh
50% Traditional & 50% Renewable	4.85 cents per kWh
0% Traditional & 100% Renewable	6.10 cents per kWh

REQUISITE RIDERS:

Rider #1	Tax Clause
Rider #2	Purchased Power Adjustment Clause
Rider #3	Billing Option

RIDERS:

Rider #11	HomeGuard Over-Voltage Protection
Rider #12	HomeGuard Plus Over-Voltage Protection
Rider #13	Round-Up for Renewables
Rider #14	Neighbors Helping Neighbors Renewable Energy Blocks
Rider #15	Worry Free Meter Loop Protection
Rider #16	Operation Round-Up
Rider #17	Energy Information

PROMPT PAYMENT PROVISION:

The above rates are net, the gross rates being 1½% higher. In the event the current monthly bill for this service, plus its requisite riders, are not paid within 20 days after they are rendered, the gross rates shall apply, as described in Section 11 of this tariff.

LARGE COMMERCIAL FLAT DEMAND RATE

BILLING DEMAND: The billing demand shall be the maximum distribution non-coincident kilowatt demand established by the member for any period of fifteen consecutive minutes during the month for which the bill is rendered, as indicated or recorded by a demand meter and adjusted for power factor as provided hereafter.

The billing demand charges will be adjusted periodically in accordance to the Cooperative's Wholesale Power Supplier Rate Schedule.

POWER FACTOR ADJUSTMENT: The member agrees to maintain unity power factor as nearly as practicable. Demand charges will be adjusted to correct the average power factors lower than 95 percent. Such adjustments will be made by increasing the measured demand one percent by which the average power factor is less than 95 percent lagging.

MINIMUM CHARGE: The minimum charge shall be the highest one of the following charges:

1. The billing demand charge.
2. The minimum monthly charge specified in the contract.

SERVICE PROVISIONS:

1. Delivery Point. If service is furnished at secondary voltage the delivery point shall be the metering point unless otherwise specified in the contract for service. All wiring, pole lines and other electric equipment on the load side of the delivery point shall be owned and maintained by the member. If service is furnished at seller's primary line voltage the delivery point shall be the point of attachment of seller's primary line to member's transformer structure unless otherwise specified in the contract for service. All wiring, pole lines and other electric equipment (except metering equipment) on the load side of delivery point shall be owned, leased and maintained by the member.
2. Lighting. Both power and lighting shall be billed at the foregoing rate. If a separate meter is required for the lighting circuit, the registration of the two watt-hour meters shall be added to obtain total kilowatt hours used and the registrations of the two demand meters shall be added to obtain the total kilowatt demand for billing purposes.

LARGE COMMERCIAL FLAT DEMAND RATE

3. Primary Service. If service is furnished at primary distribution voltage, a discount of two percent shall apply to the demand and energy charges, and if the minimum charge is based on transformer capacity, a discount of two percent shall also apply to the minimum charge. However, the seller shall have the option of metering secondary voltage and adding the estimated transformer losses to the metered kilowatt hours and kilowatt demand.

Preliminary Treatment Treatment O&M

Replacement - Preliminary Treatment Only												
	Headworks Building Parts											
	Yearly Mechanical Screen Maintenance		Mechanical screen rebuild Every 15 years		Grit Pump Seals Once every 5 years		Grit Pump Wear Plate Once every 2 years		Grit Pump Oil Change			
Year	Present Cost 2 @ $500 ea.	Inflated Yearly Cost	2 @ $20,000 ea.	Inflated Yearly Cost	1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $500 ea.	Inflated Yearly Cost	Present Cost 2 @ $500 ea		Total Inflated Yearly Cost	Present Worth
0	$ 1,000.00	$ -	$ 40,000.00	$ -	$ 1,000.00	$ -	$ 500.00	$ -	$ 1,000.00	$ -	$ -	$ -
1		$ 1,022.00		$ -		$ -		$ -		$ 1,022.00	$ 2,044.00	$ 1,974.88
2		$ 1,044.48		$ -		$ -		$ 522.24		$ 1,044.48	$ 2,611.21	$ 2,437.59
3		$ 1,067.46		$ -		$ -		$ -		$ 1,067.46	$ 2,134.93	$ 1,925.58
4		$ 1,090.95		$ -		$ -		$ 545.47		$ 1,090.95	$ 2,727.37	$ 2,376.74
5		$ 1,114.95		$ -		$ 1,114.95		$ -		$ 1,114.95	$ 3,344.84	$ 2,816.27
6		$ 1,139.48		$ -		$ -		$ 569.74		$ 1,139.48	$ 2,848.69	$ 2,317.41
7		$ 1,164.54		$ -		$ -		$ -		$ 1,164.54	$ 2,329.09	$ 1,830.64
8		$ 1,190.16		$ -		$ -		$ 595.08		$ 1,190.16	$ 2,975.41	$ 2,259.56
9		$ 1,216.35		$ -		$ -		$ -		$ 1,216.35	$ 2,432.70	$ 1,784.95
10		$ 1,243.11		$ -		$ 1,243.11		$ 621.55		$ 1,243.11	$ 4,350.88	$ 3,084.42
11		$ 1,270.46		$ -		$ -		$ -		$ 1,270.46	$ 2,540.91	$ 1,740.39
12		$ 1,298.41		$ -		$ -		$ 649.20		$ 1,298.41	$ 3,246.02	$ 2,148.16
13		$ 1,326.97		$ -		$ -		$ -		$ 1,326.97	$ 2,653.94	$ 1,696.94
14		$ 1,356.17		$ -		$ -		$ 678.08		$ 1,356.17	$ 3,390.41	$ 2,094.54
15		$ 1,386.00		$ 55,440.03		$ 1,386.00		$ -		$ 1,386.00	$ 59,598.03	$ 35,573.50
16		$ 1,416.49		$ -		$ -		$ 708.25		$ 1,416.49	$ 3,541.23	$ 2,042.25
17		$ 1,447.66		$ -		$ -		$ -		$ 1,447.66	$ 2,895.31	$ 1,613.28
18		$ 1,479.50		$ -		$ -		$ 739.75		$ 1,479.50	$ 3,698.76	$ 1,991.27
19		$ 1,512.05		$ -		$ -		$ -		$ 1,512.05	$ 3,024.11	$ 1,573.01
20		$ 1,545.32		$ -		$ 1,545.32		$ 772.66		$ 1,545.32	$ 5,408.61	$ 2,718.18
											=	**$ 75,999.56**

Preliminary Treatment Process Power Requirements					
	Headworks Building				
	Fine Screen	Washing Press	Grit Unit/vortex	Grit Dewatering Screw	Grit Pump
Nameplate Horsepower	0.5	5	1	1	10
Hours of Operation	12	6	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	$21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.373	3.73	0.746	0.746	7.46
Electricity Cost	$ 155.32	$ 1,259.10	$ 235.26	$ 251.82	$ 2,518.20
Number of Units	2	2	2	2	2
Total Electricity Cost	$ 310.63	$ 2,518.20	$ 470.52	$ 503.64	$ 5,036.40
TOTAL	**$**				**8,839.38**

Preliminary Treatment-Alternatives 1 and 2 Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Fine Screen	$ 310.63	$ 5,337.55
Washing Press	$ 2,518.20	$ 43,269.57
Grit Unit/vortex	$ 470.52	$ 8,084.78
Grit Dewatering Screw	$ 503.64	$ 8,653.91
Grit Pump	$ 5,036.40	$ 86,539.14
Subtotal	$ 8,839.38	$ 151,884.96
Maintenance		
Labor[2]	$ -	$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 5,347.33	$ 75,999.56
Subtotal	$ 5,347.33	$ 75,999.56
TOTAL	**$ 14,186.71**	**$ 227,884.52**

Secondary Treatment O&M Alternative 1

Replacement - Secondary Treatment-Alternative 1

Final Clarifier and Sectondary Treatement Building Parts

	Once every year		Every 5 years		Every 5 years		Every 5 years		Every 5 years		Once per Year		Every 15 years		Once per Year		Return Pump Seals			
Year	Present Cost 3@ $1,000 ea	Inflated Yearly Cost	Present Cost 6 @ $1000 ea.	Inflated Yearly Cost	Present Cost 2 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1@ $2047	Inflated Yearly Cost	Present Cost 8@ $15000	Inflated Yearly Cost	Present Cost 8@ $150	Inflated Yearly Cost	Present Cost 6@ $1000	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 3,000.00	$ -	$ 6,000.00	$ -	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 2,047.00	$ -	$ 120,000.00	$ -	$ 1,200.00	$ -	$ 6,000.00	$ -	$ -	$ -
1		$ 3,066.00		$ -		$ -		$ -		$ -		$ 2,092.03		$ -		$ 1,226.40		$ -	$ 6,384.43	$ 6,168.54
2		$ 3,133.45		$ -		$ -		$ -		$ -		$ 2,138.06		$ -		$ 1,253.38		$ -	$ 6,524.89	$ 6,091.06
3		$ 3,202.39		$ -		$ -		$ -		$ -		$ 2,185.10		$ -		$ 1,280.96		$ -	$ 6,668.44	$ 6,014.55
4		$ 3,272.84		$ -		$ -		$ -		$ -		$ 2,233.17		$ -		$ 1,309.14		$ -	$ 6,815.14	$ 5,939.00
5		$ 3,344.84		$ 6,689.69		$ 2,229.90		$ 1,114.95		$ 1,114.95		$ 2,282.30		$ -		$ 1,337.94		$ 6,689.69	$ 24,804.24	$ 20,884.50
6		$ 3,418.43		$ -		$ -		$ -		$ -		$ 2,332.51		$ -		$ 1,367.37		$ -	$ 7,118.31	$ 5,790.75
7		$ 3,493.63		$ -		$ -		$ -		$ -		$ 2,383.82		$ -		$ 1,397.45		$ -	$ 7,274.91	$ 5,718.02
8		$ 3,570.49		$ -		$ -		$ -		$ -		$ 2,436.27		$ -		$ 1,428.20		$ -	$ 7,434.96	$ 5,646.20
9		$ 3,649.05		$ -		$ -		$ -		$ -		$ 2,489.87		$ -		$ 1,459.62		$ -	$ 7,598.53	$ 5,575.28
10		$ 3,729.32		$ 7,458.65		$ 2,486.22		$ 1,243.11		$ 1,243.11		$ 2,544.64		$ -		$ 1,491.73		$ 7,458.65	$ 27,655.43	$ 19,605.45
11		$ 3,811.37		$ -		$ -		$ -		$ -		$ 2,600.62		$ -		$ 1,524.55		$ -	$ 7,936.54	$ 5,436.10
12		$ 3,895.22		$ -		$ -		$ -		$ -		$ 2,657.84		$ -		$ 1,558.09		$ -	$ 8,111.15	$ 5,367.82
13		$ 3,980.91		$ -		$ -		$ -		$ -		$ 2,716.31		$ -		$ 1,592.37		$ -	$ 8,289.59	$ 5,300.40
14		$ 4,068.50		$ -		$ -		$ -		$ -		$ 2,776.07		$ -		$ 1,627.40		$ -	$ 8,471.96	$ 5,233.82
15		$ 4,158.00		$ 8,316.00		$ 2,772.00		$ 1,386.00		$ 1,386.00		$ 2,837.14		$ 166,320.08		$ 1,663.20		$ 8,316.00	$ 197,154.44	$ 117,679.63
16		$ 4,249.48		$ -		$ -		$ -		$ -		$ 2,899.56		$ -		$ 1,699.79		$ -	$ 8,848.83	$ 5,103.17
17		$ 4,342.97		$ -		$ -		$ -		$ -		$ 2,963.35		$ -		$ 1,737.19		$ -	$ 9,043.50	$ 5,039.07
18		$ 4,438.51		$ -		$ -		$ -		$ -		$ 3,028.54		$ -		$ 1,775.40		$ -	$ 9,242.46	$ 4,975.78
19		$ 4,536.16		$ -		$ -		$ -		$ -		$ 3,095.17		$ -		$ 1,814.46		$ -	$ 9,445.80	$ 4,913.28
20		$ 4,635.95		$ 9,271.91		$ 3,090.64		$ 1,545.32		$ 1,545.32		$ 3,163.27		$ -		$ 1,854.38		$ 9,271.91	$ 34,378.69	$ 17,277.56
										TOTAL PRESENT WORTH									**=**	**$ 263,759.99**

Bardenpho-Alt. 1 Power Req.

	Aerator	Submersible Mixers	Return Pumps
Nameplate Horsepower	100	10	40
Hours of Operation	24	24	24
Electricity Cost, $	0.036		
Electricity Demand cost, $	21.56		
1 hp = 0.746 KWH			
Max Electricity Draw, KWH	74.6	7.46	29.84
Electricity Cost	$ 42,826.37	$ 4,282.64	$ 17,130.55
Number of Units	2	8	6
Total Electricity Cost	$ 85,652.74	$ 34,261.09	$ 102,783.28
TOTAL			**$ 222,697.11**

Secondary Clarifiers-Alternatives 1 and 2 Power Requirements

	Final Clarifiers Drives	Ras Pumps	Was Pumps	Scum Pump	Sump Pump
Nameplate Horsepower	1	7.5	3	2.1	0.5
Hours of Operation	24	24	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.746	5.595	2.238	1.5666	0.373
Electricity Cost	$ 428.26	$ 3,211.98	$ 1,284.79	$ 528.82	$ 125.91
Number of Units	3	4	2	1	1
Total Electricity Cost	$ 1,284.79	$ 12,847.91	$ 2,569.58	$ 528.82	$ 125.91
TOTAL			**$**		**17,357.01**

Secondary Treatment-Alternative 1 Summary				
Capital Cost[3]:				
Item		Annual Cost		Present Worth
Operation				
Electricity[1]				
	Aerator	$ 85,652.74	$	1,471,749.87
	Submersible Mixers	$ 34,261.09	$	588,699.95
	Return Pumps	$ 102,783.28	$	1,766,099.84
	Final Clarifiers Drives	$ 1,284.79	$	22,076.25
	Ras Pumps	$ 12,847.91	$	220,762.48
	Was Pumps	$ 2,569.58	$	44,152.50
	Scum Pump	$ 528.82	$	9,086.61
	Sump Pump	$ 125.91	$	2,163.48
Subtotal		$ 240,054.13	$	4,124,790.97
Maintenance				
Labor[2]		$ -	$	-
Subtotal		$ -	$	-
Replacement				
Parts		$ 18,558.15	$	263,759.99
Subtotal		$ 18,558.15	$	263,759.99
TOTAL		**$ 258,612.28**	**$**	**4,388,550.96**

Secondary Treatment O&M Alternative 2

Replacement - Secondary Treatment-Alternative 2																				
	Final Clarifier and Sectondary Treatement Building Parts																			
	Final Clarifier Drives Oil Change Once every year		Ras Pump Seals Every 5 years		WAS Pump Seals Every 5 years		Scum Pump Seals Every 5 years		Sump Pump Seals Every 5 years		Oil Replacement Aerators Once per Year		Complete Replacement Mixers Every 15 years		Mixer Lubricant Change Once per Year			
Year	Present Cost 3@ $1,000 ea	Inflated Yearly Cost	Present Cost 6 @ $1000 ea.	Inflated Yearly Cost	Present Cost 2 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1@ $2047	Inflated Yearly Cost	Present Cost 4@ $15000	Inflated Yearly Cost	Present Cost 4@ $150	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 3,000.00	$ -	$ 6,000.00	$ -	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 2,047.00	$ -	$ 60,000.00	$ -	$ 600.00	$ -	$ -	$ -
1		$ 3,066.00		$ -		$ -		$ -		$ -		$ 2,092.03		$ -		$ 613.20	$ 5,771.23	$ 5,576.07
2		$ 3,133.45		$ -		$ -		$ -		$ -		$ 2,138.06		$ -		$ 626.69	$ 5,898.20	$ 5,506.03
3		$ 3,202.39		$ -		$ -		$ -		$ -		$ 2,185.10		$ -		$ 640.48	$ 6,027.96	$ 5,436.88
4		$ 3,272.84		$ -		$ -		$ -		$ -		$ 2,233.17		$ -		$ 654.57	$ 6,160.58	$ 5,368.59
5		$ 3,344.84		$ 6,689.69		$ 2,229.90		$ 1,114.95		$ 1,114.95		$ 2,282.30		$ -		$ 668.97	$ 17,445.59	$ 14,688.72
6		$ 3,418.43		$ -		$ -		$ -		$ -		$ 2,332.51		$ -		$ 683.69	$ 6,434.62	$ 5,234.57
7		$ 3,493.63		$ -		$ -		$ -		$ -		$ 2,383.82		$ -		$ 698.73	$ 6,576.19	$ 5,168.82
8		$ 3,570.49		$ -		$ -		$ -		$ -		$ 2,436.27		$ -		$ 714.10	$ 6,720.86	$ 5,103.90
9		$ 3,649.05		$ -		$ -		$ -		$ -		$ 2,489.87		$ -		$ 729.81	$ 6,868.72	$ 5,039.79
10		$ 3,729.32		$ 7,458.65		$ 2,486.22		$ 1,243.11		$ 1,243.11		$ 2,544.64		$ -		$ 745.86	$ 19,450.92	$ 13,789.12
11		$ 3,811.37		$ -		$ -		$ -		$ -		$ 2,600.62		$ -		$ 762.27	$ 7,174.27	$ 4,913.98
12		$ 3,895.22		$ -		$ -		$ -		$ -		$ 2,657.84		$ -		$ 779.04	$ 7,332.10	$ 4,852.26
13		$ 3,980.91		$ -		$ -		$ -		$ -		$ 2,716.31		$ -		$ 796.18	$ 7,493.41	$ 4,791.32
14		$ 4,068.50		$ -		$ -		$ -		$ -		$ 2,776.07		$ -		$ 813.70	$ 7,658.26	$ 4,731.14
15		$ 4,158.00		$ 8,316.00		$ 2,772.00		$ 1,386.00		$ 1,386.00		$ 2,837.14		$ 83,160.04		$ 831.60	$ 104,846.79	$ 62,582.07
16		$ 4,249.48		$ -		$ -		$ -		$ -		$ 2,899.56		$ -		$ 849.90	$ 7,998.93	$ 4,613.03
17		$ 4,342.97		$ -		$ -		$ -		$ -		$ 2,963.35		$ -		$ 868.59	$ 8,174.91	$ 4,555.09
18		$ 4,438.51		$ -		$ -		$ -		$ -		$ 3,028.54		$ -		$ 887.70	$ 8,354.76	$ 4,497.88
19		$ 4,536.16		$ -		$ -		$ -		$ -		$ 3,095.17		$ -		$ 907.23	$ 8,538.56	$ 4,441.38
20		$ 4,635.95		$ 9,271.91		$ 3,090.64		$ 1,545.32		$ 1,545.32		$ 3,163.27		$ -		$ 927.19	$ 24,179.59	$ 12,151.84
									TOTAL PRESENT WORTH								=	$ 183,042.48

Oxidation Ditches-Alt. 2 Power Requirements

	Anoxic Mixer	Aerator
Nameplate Horsepower	4.56	100
Hours of Operation	24	24
Electricity Cost, $	0.036	
Electricity Demand cost, $	21.56	
1 hp = 0.746 KWH		
Max Electricity Draw, KWH	3.40176	74.6
Electricity Cost	$ 1,952.88	$ 42,826.37
Number of Units	4	2
Total Electricity Cost	$ 7,811.53	$ 85,652.74
TOTAL	**$**	**93,464.27**

Secondary Clarifiers-Alternatives 1 and 2 Power Requirements

	Final Clarifiers Drives	Ras Pumps	Was Pumps	Scum Pump	Sump Pump
Nameplate Horsepower	1	7.5	3	2.1	0.5
Hours of Operation	24	24	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.746	5.595	2.238	1.5666	0.373
Electricity Cost	$ 428.26	$ 3,211.98	$ 1,284.79	$ 528.82	$ 125.91
Number of Units	3	4	2	1	1
Total Electricity Cost	$ 1,284.79	$ 12,847.91	$ 2,569.58	$ 528.82	$ 125.91
TOTAL			**$**		**17,357.01**

Secondary Treatment-Alternative 2 Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Anoxic Mixer	$ 7,811.53	$ 134,223.59
Aerator	$ 85,652.74	$ 1,471,749.87
Final Clarifiers Drives	$ 1,284.79	$ 22,076.25
Ras Pumps	$ 12,847.91	$ 220,762.48
Was Pumps	$ 2,569.58	$ 44,152.50
Scum Pump	$ 528.82	$ 9,086.61
Sump Pump	$ 125.91	$ 2,163.48
Subtotal	$ 110,821.28	$ 1,904,214.77
Maintenance		
Labor[2]	$ -	$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 12,878.87	$ 183,042.48
Subtotal	$ 12,878.87	$ 183,042.48
TOTAL	**$ 123,700.15**	**$ 2,087,257.25**

Solids Processing O&M - Integral Thickening Alternative

Replacement - Biosolids Treatment-Integral Thickening														
	Digerster Equipment										Biosolids Tank (storage)			
	Permeate Pump Seals Every 5 years		Sludge Transfer Pump Seals Every 5 years		Blower Belts Every 2 years		Blower Lubrication Every year		Blower Filters 6 times per year		Biosolids Mixing Pump Seals Every 5 years			
Year	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 4 @ $100 ea.	Inflated Yearly Cost	Present Cost 4 @ $1,000 ea.	Inflated Yearly Cost	Present Cost 24 @ $200 ea.	Inflated Yearly Cost	Present Cost 2@ $1000 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 400.00	$ -	$ 4,000.00	$ -	$ 4,800.00	$ -	$ 2,000.00	$ -	$ -	$ -
1		$ -		$ -		$ -		$ 4,088.00		$ 4,905.60		$ -	$ 8,993.60	$ 8,689.47
2		$ -		$ -		$ 417.79		$ 4,177.94		$ 5,013.52		$ -	$ 9,609.25	$ 8,970.34
3		$ -		$ -				$ 4,269.85		$ 5,123.82		$ -	$ 9,393.67	$ 8,472.55
4		$ -		$ -		$ 436.38		$ 4,363.79		$ 5,236.54		$ -	$ 10,036.71	$ 8,746.41
5		$ 4,459.79		$ 4,459.79				$ 4,459.79		$ 5,351.75		$ 2,229.90	$ 20,961.02	$ 17,648.61
6		$ -		$ -		$ 455.79		$ 4,557.91		$ 5,469.49		$ -	$ 10,483.18	$ 8,528.08
7		$ -		$ -				$ 4,658.18		$ 5,589.82		$ -	$ 10,248.00	$ 8,054.83
8		$ -		$ -		$ 476.07		$ 4,760.66		$ 5,712.79		$ -	$ 10,949.52	$ 8,315.19
9		$ -		$ -				$ 4,865.39		$ 5,838.47		$ -	$ 10,703.87	$ 7,853.76
10		$ 4,972.43		$ 4,972.43		$ 497.24		$ 4,972.43		$ 5,966.92		$ 2,486.22	$ 23,867.68	$ 16,920.25
11		$ -		$ -				$ 5,081.83		$ 6,098.19		$ -	$ 11,180.02	$ 7,657.71
12		$ -		$ -		$ 519.36		$ 5,193.63		$ 6,232.35		$ -	$ 11,945.34	$ 7,905.23
13		$ -		$ -				$ 5,307.89		$ 6,369.46		$ -	$ 11,677.35	$ 7,466.55
14		$ -		$ -		$ 542.47		$ 5,424.66		$ 6,509.59		$ -	$ 12,476.72	$ 7,707.89
15		$ 5,544.00		$ 5,544.00				$ 5,544.00		$ 6,652.80		$ 2,772.00	$ 26,056.81	$ 15,553.07
16		$ -		$ -		$ 566.60		$ 5,665.97		$ 6,799.16		$ -	$ 13,031.73	$ 7,515.48
17		$ -		$ -				$ 5,790.62		$ 6,948.75		$ -	$ 12,739.37	$ 7,098.42
18		$ -		$ -		$ 591.80		$ 5,918.02		$ 7,101.62		$ -	$ 13,611.44	$ 7,327.87
19		$ -		$ -				$ 6,048.21		$ 7,257.85		$ -	$ 13,306.07	$ 6,921.23
20		$ 6,181.27		$ 6,181.27		$ 618.13		$ 6,181.27		$ 7,417.53		$ 3,090.64	$ 29,670.11	$ 14,911.18
													=	**$ 192,264.11**

Solids Treatment & Disposal Integral Thickening Power Requirement								
	Aerobic Digester Equipment							Biosolids Tank
	Permeate Pump 1	Permeate Pump 2	MBT Blower 1	MBT Blower 2	Digester Blowers	Fine Screen	Sludge Transfer Pumps	Biosolids Mixer
Nameplate Horsepower	10	5	20	15	125	0.5	10	150
Hours of Operation	19.2	19.2	24	24	24	24	8	0.2
Electricity Cost, $	0.036							
Electricity Demand Cost, $	21.56							
	1 hp = 0.746 KWH							
Max Electricity Draw, KWH	7.46	3.73	14.92	11.19	93.25	0.373	7.46	111.9
Electricity Cost	$ 3,812.12	$ 1,906.06	$ 8,565.27	$ 6,423.96	$ 53,532.96	$ 214.13	$ 2,714.25	$ 29,244.84
Number of Units	1	1	1	1	2	1	2	2
Total Electricity Cost	$ 3,812.12	$ 1,906.06	$ 8,565.27	$ 6,423.96	$ 107,065.92	$ 214.13	$ 5,428.49	$ 58,489.68
TOTAL	**$**							**191,905.64**

Biosolids Treatment- Integral Thickening Summary				
Capital Cost[3]:				
Item		Annual Cost		Present Worth
Operation				
Electricity[1]				
	Permeate Pump 1	$ 3,812.12	$	65,502.71
	Permeate Pump 2	$ 1,906.06	$	32,751.36
	MBT Blower 1	$ 8,565.27	$	147,174.99
	MBT Blower 2	$ 6,423.96	$	110,381.24
	Digester Blowers	$ 107,065.92	$	1,839,687.34
	Fine Screen	$ 214.13	$	3,679.37
	Sludge Transfer Pumps	$ 5,428.49	$	93,276.45
	Biosolids Mixer	$ 58,489.68	$	1,005,013.81
	Subtotal	$ 191,905.64	$	3,297,467.27
Maintenance				
	MBT Chemical Usage (NaHCl)	$ 960.00	$	16,495.44
	Labor[2]	$ 900.00	$	15,464.48
	Subtotal	$ 1,860.00	$	31,959.92
Replacement				
	Parts	$ 13,527.70	$	192,264.11
	Subtotal	$ 13,527.70	$	192,264.11
TOTAL		**$ 207,293.34**	**$**	**3,521,691.30**

Solids Processing O&M Post Thickening Alternative O&M

Replacement - Biosolids Treatment-Post Thickening																		
	Digerster Equipment														Biosolids Tank (storage)			
	Mixer Seals Every 5 years		Digerster Transfer Pump Seals Every 5 years		Sludge Transfer Pump Seals Every 5 years		RDT Pump Seals Every 5 years		Blower Belts Every 2 years		Blower Lubrication Every year		Blower Filters 6 times per year		Biosolids Mixing Pump Seals Every 5 years			
Year	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 4 @ $100 ea.	Inflated Yearly Cost	4 @ $1,000 ea.	Inflated Yearly Cost	Present Cost 24 @ $200 ea.	Inflated Yearly Cost	Present Cost 1@ $1000 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 400.00	$ -	$ 4,000.00	$ -	$ 4,800.00	$ -	$ 1,000.00	$ -	$ -	$ -
1		$ -		$ -		$ -		$ -		$ -		$ 4,088.00		$ 4,905.60		$ -	$ 8,993.60	$ 8,689.47
2		$ -		$ -		$ -		$ -		$ 417.79		$ 4,177.94		$ 5,013.52		$ -	$ 9,609.25	$ 8,970.34
3		$ -		$ -		$ -		$ -				$ 4,269.85		$ 5,123.82		$ -	$ 9,393.67	$ 8,472.55
4		$ -		$ -		$ -		$ -		$ 436.38		$ 4,363.79		$ 5,236.54		$ -	$ 10,036.71	$ 8,746.41
5		$ 4,459.79		$ 4,459.79		$ 4,459.79		$ 4,459.79				$ 4,459.79		$ 5,351.75		$ 1,114.95	$ 28,765.65	$ 24,219.91
6		$ -		$ -		$ -		$ -		$ 455.79		$ 4,557.91		$ 5,469.49		$ -	$ 10,483.18	$ 8,528.08
7		$ -		$ -		$ -		$ -				$ 4,658.18		$ 5,589.82		$ -	$ 10,248.00	$ 8,054.83
8		$ -		$ -		$ -		$ -		$ 476.07		$ 4,760.66		$ 5,712.79		$ -	$ 10,949.52	$ 8,315.19
9		$ -		$ -		$ -		$ -				$ 4,865.39		$ 5,838.47		$ -	$ 10,703.87	$ 7,853.76
10		$ 4,972.43		$ 4,972.43		$ 4,972.43		$ 4,972.43		$ 497.24		$ 4,972.43		$ 5,966.92		$ 1,243.11	$ 32,569.44	$ 23,089.09
11		$ -		$ -		$ -		$ -				$ 5,081.83		$ 6,098.19		$ -	$ 11,180.02	$ 7,657.71
12		$ -		$ -		$ -		$ -		$ 519.36		$ 5,193.63		$ 6,232.35		$ -	$ 11,945.34	$ 7,905.23
13		$ -		$ -		$ -		$ -				$ 5,307.89		$ 6,369.46		$ -	$ 11,677.35	$ 7,466.55
14		$ -		$ -		$ -		$ -		$ 542.47		$ 5,424.66		$ 6,509.59		$ -	$ 12,476.72	$ 7,707.89
15		$ 5,544.00		$ 5,544.00		$ 5,544.00		$ 5,544.00				$ 5,544.00		$ 6,652.80		$ 1,386.00	$ 35,758.82	$ 21,344.10
16		$ -		$ -		$ -		$ -		$ 566.60		$ 5,665.97		$ 6,799.16		$ -	$ 13,031.73	$ 7,515.48
17		$ -		$ -		$ -		$ -				$ 5,790.62		$ 6,948.75		$ -	$ 12,739.37	$ 7,098.42
18		$ -		$ -		$ -		$ -		$ 591.80		$ 5,918.02		$ 7,101.62		$ -	$ 13,611.44	$ 7,327.87
19		$ -		$ -		$ -		$ -				$ 6,048.21		$ 7,257.85		$ -	$ 13,306.07	$ 6,921.23
20		$ 6,181.27		$ 6,181.27		$ 6,181.27		$ 6,181.27		$ 618.13		$ 6,181.27		$ 7,417.53		$ 1,545.32	$ 40,487.34	$ 20,347.55
																	=	**$ 216,231.65**

Solids Treatment & Disposal-Post Thickening Power Requirements									
	Aerobic Digester and Thickening Equipment								Biosolids Tank
	Digester Mixers	Digester Transfer Pump	Sludge Transfer Pump	RDT	RDT Floc Drive	RDT Booster Pump	RDT Feed Pump	Aeration Blower	Biosolids Mixers
Nameplate Horsepower	25	20	15	2	0.5	3	15	100	150
Hours of Operation	24	8	8	8	8	8	8	24	0.2
Electricity Cost, $	0.036								
Electricity Demand Cost, $	21.56								
	1 hp = 0.746 KWH								
Max Electricity Draw, KWH	18.65	14.92	11.19	1.492	0.373	2.238	11.19	74.6	111.9
Electricity Cost	$ 10,706.59	$ 5,428.49	$ 4,071.37	$ 542.85	$ 135.71	$ 814.27	$ 4,071.37	$ 42,826.37	$ 29,244.84
Number of Units	4	2	2	2	2	2	2	3	1
Total Electricity Cost	$ 42,826.37	$ 10,856.99	$ 8,142.74	$ 1,085.70	$ 271.42	$ 1,628.55	$ 8,142.74	$ 128,479.10	$ 29,244.84
TOTAL	**$**								**230,678.45**

Biosolids Treatment-Post Thickening Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Digester Mixers	$ 42,826.37	$ 735,874.93
Digester Transfer Pump	$ 10,856.99	$ 186,552.91
Sludge Transfer Pump	$ 8,142.74	$ 139,914.68
RDT	$ 1,085.70	$ 18,655.29
RDT Floc Drive	$ 271.42	$ 4,663.82
RDT Booster Pump	$ 1,628.55	$ 27,982.94
RDT Feed Pump	$ 8,142.74	$ 139,914.68
Aeration Blower	$ 128,479.10	$ 2,207,624.80
Biosolids Mixers	$ 29,244.84	$ 502,506.90
Subtotal	$ 230,678.45	$ 3,963,690.97
Maintenance		
		$ -
Labor[2]		$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 15,214.06	$ 216,231.65
Subtotal	$ 15,214.06	$ 216,231.65
TOTAL	**$ 245,892.51**	**$ 4,179,922.61**

Disinfection O&M Trojan UV Signa

Replacemet- Disinfection-Trojan UV3000 Plus				
	UV LAMP			
Year	Present Cost 8@$300 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 2,400.00	$ -	$ -	$ -
1		$ 2,452.80	$ 2,452.80	$ 2,369.86
2		$ 2,506.76	$ 2,506.76	$ 2,340.09
3		$ 2,561.91	$ 2,561.91	$ 2,310.70
4		$ 2,618.27	$ 2,618.27	$ 2,281.67
5		$ 2,675.87	$ 2,675.87	$ 2,253.01
6		$ 2,734.74	$ 2,734.74	$ 2,224.72
7		$ 2,794.91	$ 2,794.91	$ 2,196.77
8		$ 2,856.40	$ 2,856.40	$ 2,169.18
9		$ 2,919.24	$ 2,919.24	$ 2,141.93
10		$ 2,983.46	$ 2,983.46	$ 2,115.03
11		$ 3,049.10	$ 3,049.10	$ 2,088.47
12		$ 3,116.18	$ 3,116.18	$ 2,062.23
13		$ 3,184.73	$ 3,184.73	$ 2,036.33
14		$ 3,254.80	$ 3,254.80	$ 2,010.75
15		$ 3,326.40	$ 3,326.40	$ 1,985.50
16		$ 3,399.58	$ 3,399.58	$ 1,960.56
17		$ 3,474.37	$ 3,474.37	$ 1,935.93
18		$ 3,550.81	$ 3,550.81	$ 1,911.62
19		$ 3,628.93	$ 3,628.93	$ 1,887.61
20		$ 3,708.76	$ 3,708.76	$ 1,863.90
			=	**$ 42,145.86**

NOTE: Labor in disinfection category is estimate of 2 additional full time employees for the entire wastewater treatment plant necessary for both alternatives' operation.
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Trojan UV Signa Power Requirments	
	UV
Nameplate Horsepower	
Hours of Operation	16
Electricity Cost, $	0.036
Electricity Demand Cost, $	21.56
1 hp = 0.746 KWH	
Max Electricity Draw, KWH	21.1
Electricity Cost	$ 9,895.06
Number of Units	1
Total Electricity Cost	$ 9,895.06
TOTAL	**$ 9,895.06**

Disinfection Trojan UV Signa Summary		
Capital Cost[3]:	$237,500	
Item	Annual Cost	Present Worth
Operation		
Electricity		
UV	$ 9,895.06	$ 170,024.31
Subtotal	$ 9,895.06	$ 170,024.31
Maintenance		
Labor[1]	$ 141,470.00	$ 2,430,844.17
Subtotal	$ 141,470.00	$ 2,430,844.17
Replacement		
Parts	$ 2,965.38	$ 42,145.86
Subtotal	$ 2,965.38	$ 42,145.86
TOTAL	**$ 154,330.44**	**$ 2,643,014.34**

Alternative 1 O&M Summary

Alternative 1 O&M COSTS				
	Annual		**Present Worth**	
Total Electrical	$	450,694.20	$	7,744,167.51
Total Maintanance	$	143,330.00	$	2,462,804.09
Total Replacement	$	40,398.57	$	574,169.52
Rounded Total	**$**	**634,000.00**	**$**	**10,781,000.00**

Alternative 2 O&M Summary

Alternative 2 O&M COSTS				
	Annual		**Present Worth**	
Total Electrical	$	321,461.36	$	5,523,591.31
Total Maintanance	$	143,330.00	$	2,462,804.09
Total Replacement	$	34,719.28	$	493,452.01
Rounded Total	**$**	**500,000.00**	**$**	**8,480,000.00**

G. Appendix G – Flows and Loads Memo

HRGreen

MEMO

To: City of Nevada, Iowa

From: HR Green, Inc.

Subject: Flow & Loading Summary

Date: February 4, 2019 (Revised 2/12/19)

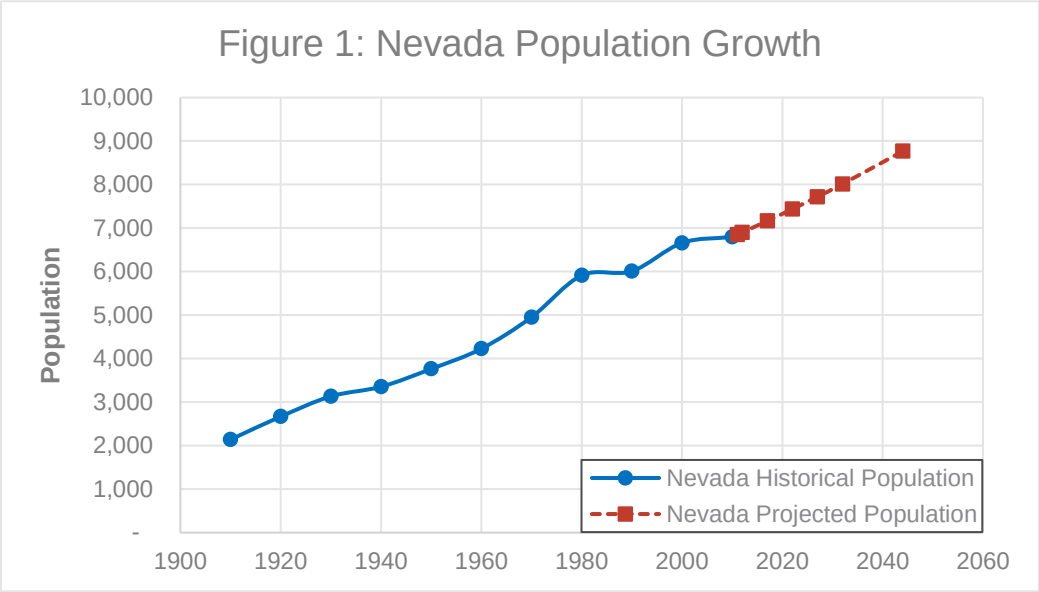
Introduction

Influent hydraulic and organic loadings into the City's WWTF derive from domestic, commercial, and significant industrial users (SIU). Non-industrial flow consists of residential and commercial flows. Nevada's WWTF has two significant industrial users (SIU): Burke Corporation (SIU-1) and Du Pont (SIU-2). The Du Pont facility has recently been acquired by VERBIO North American Corporation, with continued discharge to City sewers is anticipated.

HR Green has completed the wastewater flow and loading evaluation using monthly operating report (MOR) data provided by the City. Historical data from October 31, 2015 to October 31, 2018 has been analyzed for design purposes. Per the Iowa DNR (IDNR) Wastewater Facilities Design Standards, the design flows and loads for the treatment facility shall be established for the design period, which shall be 20 years beyond the date of completion of construction. Therefore, the design year for this project will be 2044.

Population Projection

According to the U.S. Bureau of the Census, in 2010 the total population of Nevada was 6,798. Since 1920, Nevada has experienced an annual average population growth of 1.25%, with growth slowing from 2000 – 2010. In the 2013 Facility Plan submitted by HR Green, an average annual growth rate of 0.75% was determined to be a reasonable estimation of 20-year growth for design purposes. City staff have recently reaffirmed the validity of this assumption. Therefore, this report will also assume a 0.75% annual average growth rate. Applying this growth rate will result in a 2044 population of 8,764 which is used as the reference population for flow and loading projections. Census population data for the past 100 years as well as projections to 2044 are shown in Figure 1, below.



Historical Hydraulic Loading

The City's historical wastewater flows are summarized in Table 1. Average Dry Weather (ADW) flow is defined as the daily flow when there is no runoff and the groundwater table is low. For existing facilities, this period of measurement should extend for as long as possible, up to 30 days. The Average Wet Weather (AWW) flow is based on the wettest 30 consecutive days. Maximum Wet Weather (MWW) flow is calculated based on the total maximum flow received in a 24-hour period. Therefore, we have assumed the historical ADW, AWW, and MWW flows are represented by the lowest running 30-day average value, highest running 30-day average value, and maximum day value within the review period, respectively. Table 1 indicates that the City's 3-year average historical flows are within the NPDES permit limits.

Table 1: Historical Influent Total Flow Summary

	2015–2016	2016–2017	2017–2018	Average	Current NPDES Permit Limit
ADW, mgd	1.164	0.963	0.862	0.996	1.658
AWW, mgd	2.389(1)	1.973	2.785	2.382	3.710
MWW, mgd	4.776(1)	3.720	5.219	4.572	6.218

(1) Flow meter was submerged on 12/14/15. Data point excluded.

Table 2 summarizes the historical and current permitted SIU hydraulic loadings. SIUs flows are a function of operations/production, and are not subject to wet weather conditions. Therefore, AWW, MWW, and PHWW conditions do not apply. Historical SIU flows are analyzed for 30-day running average (representative of ADW condition) and maximum day (representative of MWW condition) values.

Table 2: Historical SIU Hydraulic Loadings

Parameter	SIU-1 (Burke)		SIU-2 (DuPont)	
	Permitted	Actual	Permitted	Actual[(1)]
30-d Avg (ADW), mgd	0.35	0.119	0.072	0.016
AWW, mgd	NA	NA	NA	NA
Max Day (MWW), mgd	0.50	0.283	0.144	0.106
PHWW, mgd	NA	NA	NA	NA
(1) Period of 11/1/16 to 10/30/18.				

Historical flows and current WWTF NPDES permit limits are plotted in Figure 2 (12/14/15 data point excluded). Industrial flow in Figure 2 is the combined daily total of Du Pont and Burke Corporation.

Precipitation data for Nevada, Iowa from the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service databases and is also shown in Figure 2 to determine correlation of influent flow peaks. Figure 2 shows that Nevada's sanitary collection system is subject to significant inflow and infiltration (I&I) loading as the major peaks in influent flow to the WWTF are highly correlated with heavy precipitation events. This facility plan will not address any collection system improvements to reduce I&I loading. However, future collection system improvements may reduce the peaking experienced by the WWTF for MWW and PHWW conditions.

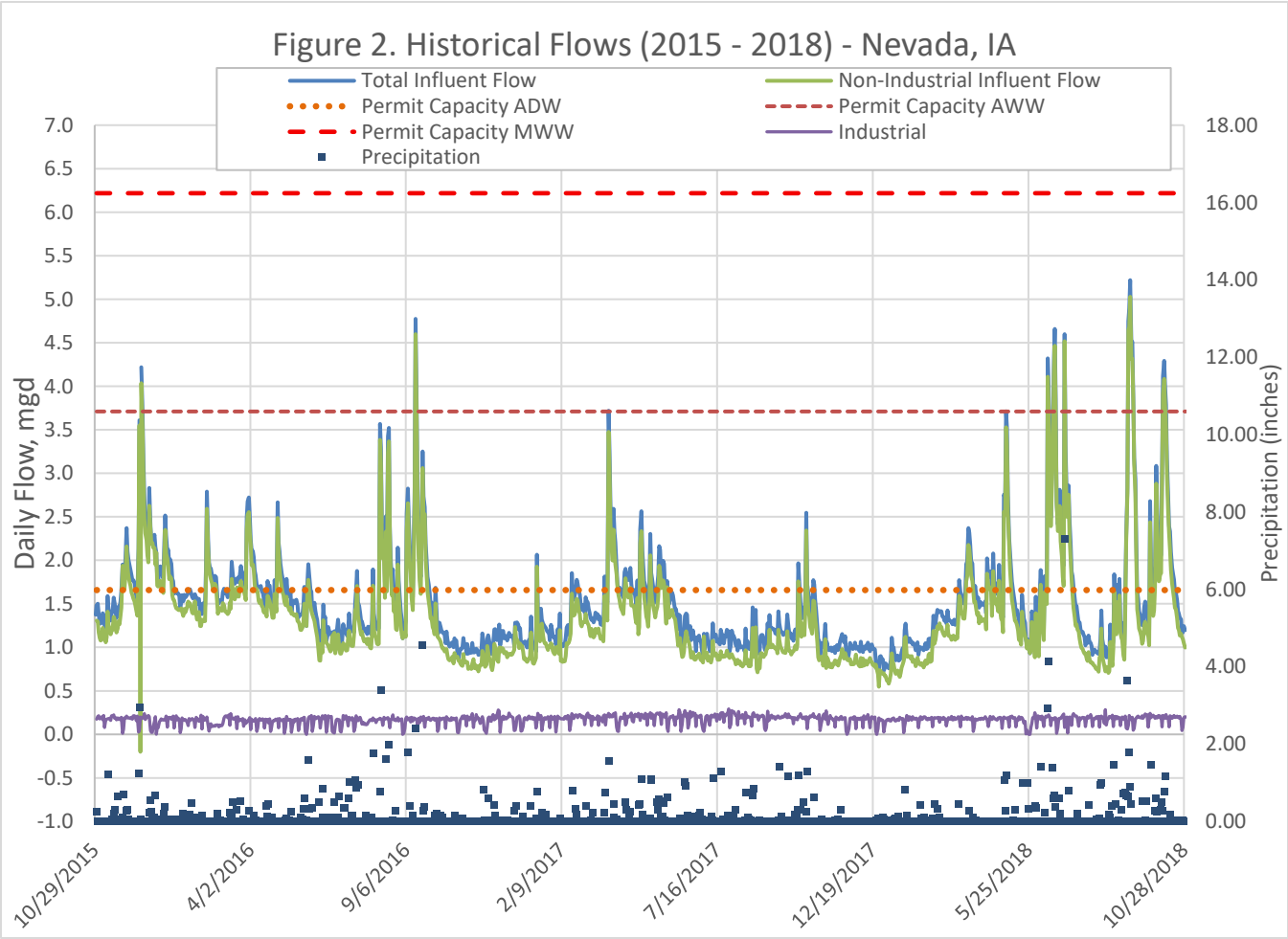


Figure 2 also indicates that the total historical daily average industrial flow is approximately 0.17 mgd, or approximately 17% of the average ADW reported in Table 1. The current NPDES permit issued for the Nevada WWTF on November 1, 2016 and amended September 1, 2018, contains permitted 30-day average flow and daily maximum flow limits for both SIUs.

Historical Organic Loadings

Loading from any input to the WWTF cannot exceed total influent loading measured at the WWTF; however the reviewed data shows dates where loadings from Burke exceeded the total influent organic load for a given constituent at the WWTF. Reasons for these inconsistencies could be:

(1) WWTF sample not collected on the same day as SIU sample (e.g. WWTF samples on Monday and Wednesday; SIU sample on Tuesday)
(2) Delay of SIU load reaching the WWTF due to collection system residence time
(3) Unrepresentative sample event/sampling error

In an effort to eliminate these anomalies, an outlier analysis was performed on Burke's historical data. Data points found to be outside of 1.5 times the interquartile range (middle 2 parts of the data distribution, Q1-Q3) were eliminated from the data set and analysis.

Influent organic loadings into the City's WWTF are derived from domestic, commercial, and the two SIUs. Historical total influent loading measured at the WWTF is shown in Table 3, below.

Historical per capita loadings for the non-industrial component of influent loading was calculated using the subtracting the historical total industrial maximum 30-day average load (SIU-1 maximum 30-day average + SIU-2 maximum 30-day average) from the historical total influent maximum 30-day average load, divided by the most recent (2010) census population estimate for Nevada. Equation 1 is the generic equation for the per capita non-industrial load calculation.

$$Non - Industrial\ Load, lb/cap \cdot d = \frac{(Total\ Infl\ Load) - (SIU{-}1\ Infl\ Load + SIU{-}2\ Infl\ Load), lb/d}{2010\ population}$$ (Equation 1)

Table 3: Historical Total Influent Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
cBOD, mg/L(1)	227	320		-	-
cBOD, lb/d(1)	2388	3366		0.09	0.09
BOD, mg/L(2)	327	440		-	-
BOD, lb/d(2)	3114	5287	4871	0.18	0.27
TSS, mg/L	210	320		-	-
TSS, lb/d	2822	5976		0.37	0.79
TKN, mg/L	47	61		-	-
TKN, lb/d	467	762	1004	0.039	0.064
TN, mg/L(3)	61	72		-	-
TN, lb/d(3)	515	719		0.040	0.061
TP, mg/L(4)	17	21		-	-
TP, lb/d(4)	160	205		0.012	0.013

(1) Measured from 10/1/2015 - 10/31/2016
(2) Measured from 11/1/2016 - 10/30/2018
(3) Measured from 11/29/2016 - 5/30/2018
(4) Measured from 11/8/2016 - 10/30/2018

Historic maximum 30-day average non-industrial per capita loading for BOD is within typical values for municipal wastewater(1). Historic maximum 30-day average non-industrial per capita loadings for TSS, TKN, TN, and TP are at the upper end of typical range for municipal wastewater(1).

Burke Corporation contributes a significant fraction of the total cBOD/BOD and nutrient loading to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's BOD input accounted for an average 57% of the total BOD, 40% of the total nitrogen, and 49% of the total phosphorus loads to the WWTF. Burke Corporation has recently notified the City of plans to expand production and increase loading of organics and nutrients which will exceed the design capacity of the existing WWTF.

Projected loads from VERBIO following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable loading to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Historical industrial loading to the Nevada WWTF is shown in Table 4, below.

(1) Table 3-12, *Wastewater Engineering Treatment and Reuse,* Metcalf & Eddy, 4th Ed.

Table 4: Historical Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
cBOD, mg/L	1323	1900	-	-
cBOD, lb/d	1762	2694	3073	3750
BOD, mg/L	1284	1900	-	-
BOD, lb/d	1877	3439	-	-
TSS, mg/L	205	330	-	-
TSS, lb/d	293	548	646	750
TKN, mg/L	137	200		
TKN, lb/d	194	292	570	750
TN, mg/L	154	182	-	-
TN, lb/d	241	304	-	-
TP, mg/L	51	77	-	-
TP, lb/d	75	113	-	-
Du Pont de Nemour Corp (SIU-2)				
BOD, mg/L(1)	116	170	-	-
BOD, lb/d(1)	15	41	76	114
TSS, mg/L(1)	119	180	-	-
TSS, lb/d(1)	31	77	129	194
TKN, mg/L(1)	111	140	-	-
TKN, lb/d(1)	7	37	26	38

(1) MOR data from 11/1/16 - 10/30/18

Trends of the 30-day average loading of BOD, cBOD, TSS, TKN, TN, and TP at the WWTF over the period of review are shown Figures 3 – 8, respectively.

The trends indicate that BOD, cBOD, TKN, TN, and TP loadings from Burke has a significant effect on the overall loadings for these parameters observed at the WWTF. There is negligible effect of TSS loading from Burke on the overall TSS loading observed at the WWTF. The trends also indicate that Du Pont loadings have a negligible effect on the overall loadings for all parameters observed at the WWTF. Also note there was no historical cBOD, TN, or TP data from Du Pont for review.

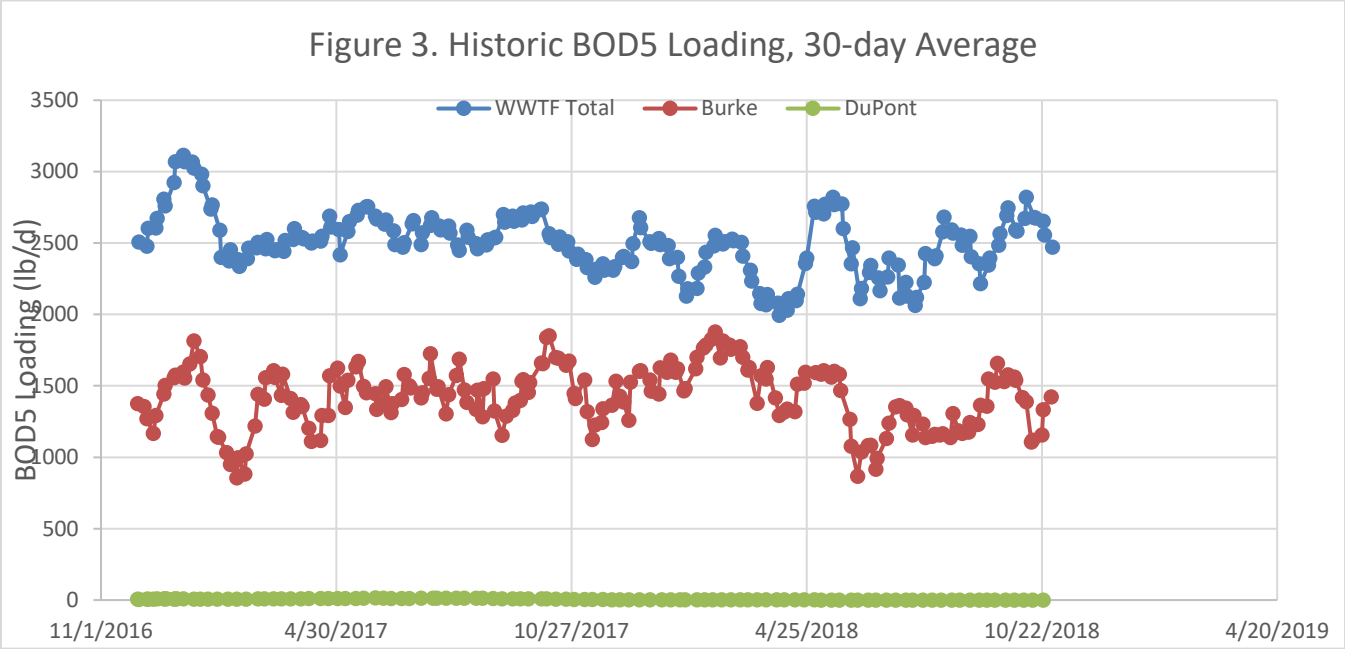


Figure 3. Historic BOD5 Loading, 30-day Average
WWTF Total
Burke
DuPont
BOD5 Loading (lb/d)
3500
3000
2500
2000
1500
1000
500
0
11/1/2016
4/30/2017
10/27/2017
4/25/2018
10/22/2018
4/20/2019

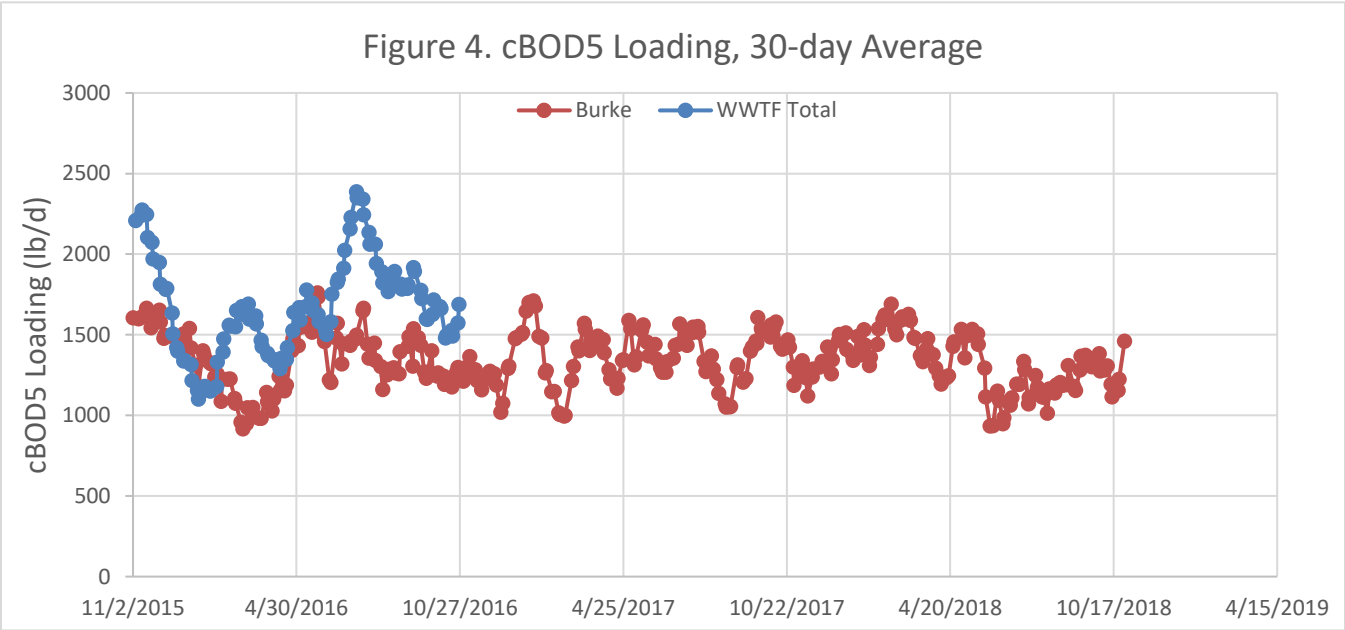


Figure 4. cBOD5 Loading, 30-day Average
Burke
WWTF Total
cBOD5 Loading (lb/d)
3000
2500
2000
1500
1000
500
0
11/2/2015
4/30/2016
10/27/2016
4/25/2017
10/22/2017
4/20/2018
10/17/2018
4/15/2019

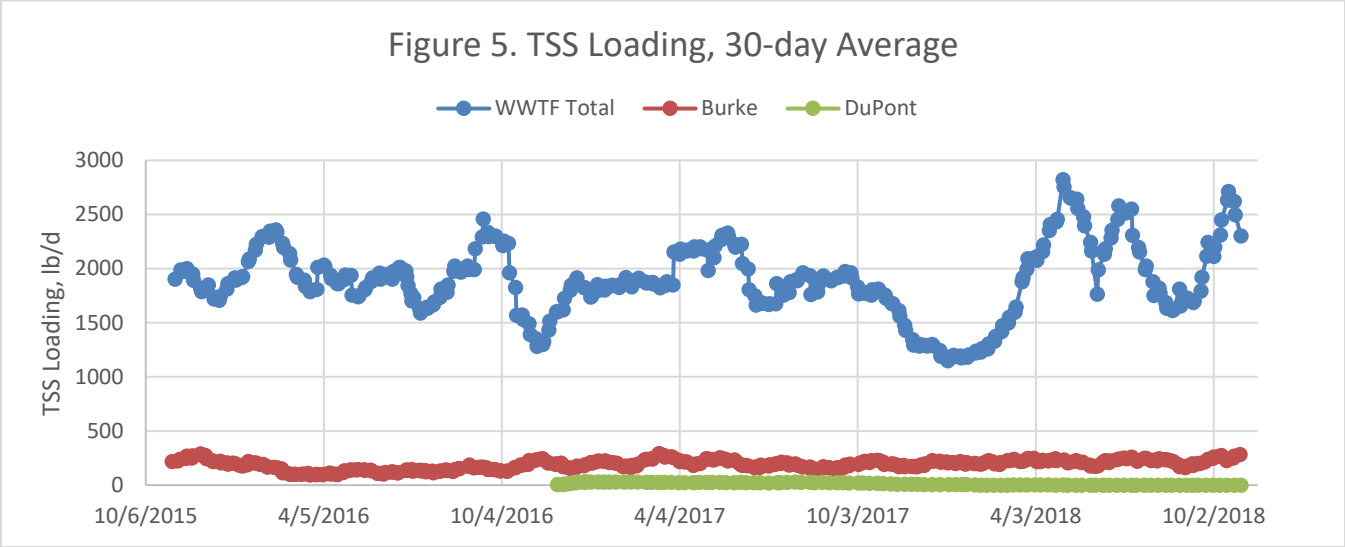


Figure 5. TSS Loading, 30-day Average
WWTF Total
Burke
DuPont
TSS Loading, lb/d
3000
2500
2000
1500
1000
500
0
10/6/2015
4/5/2016
10/4/2016
4/4/2017
10/3/2017
4/3/2018
10/2/2018

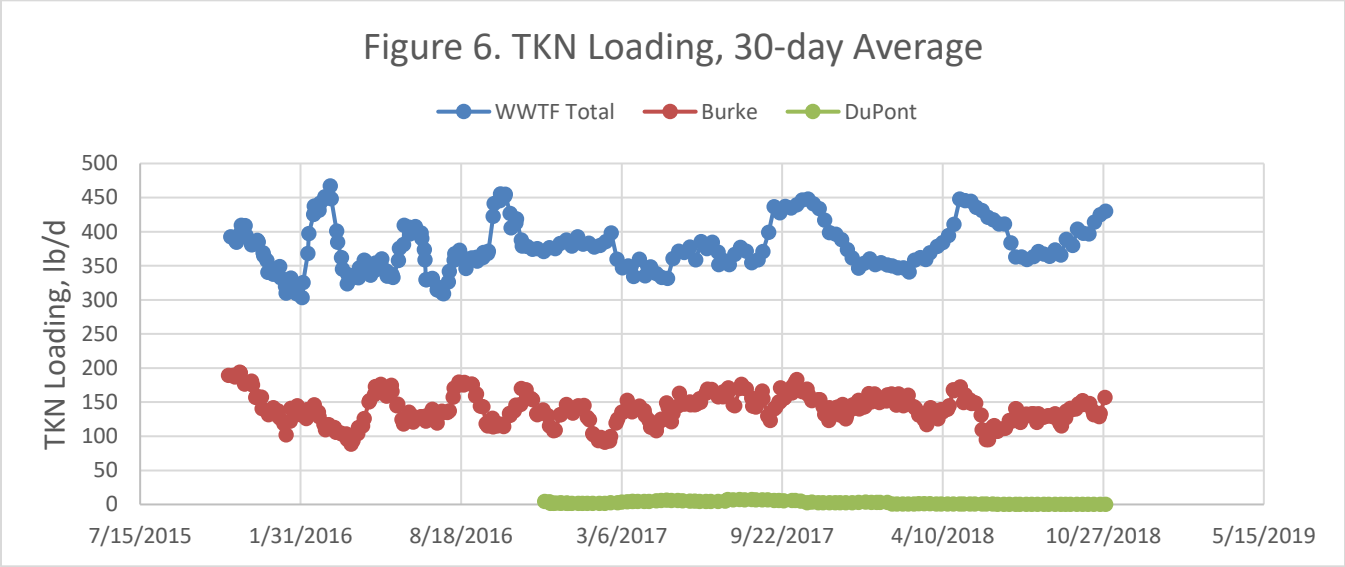


Figure 6. TKN Loading, 30-day Average
WWTF Total
Burke
DuPont
TKN Loading, lb/d
500
450
400
350
300
250
200
150
100
50
0
7/15/2015
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019

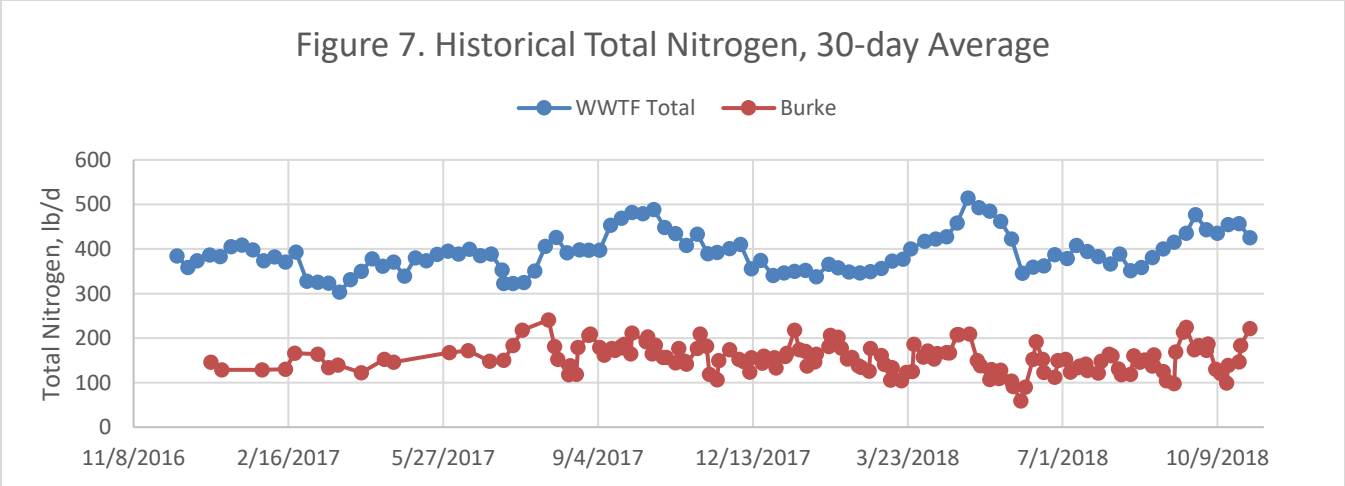
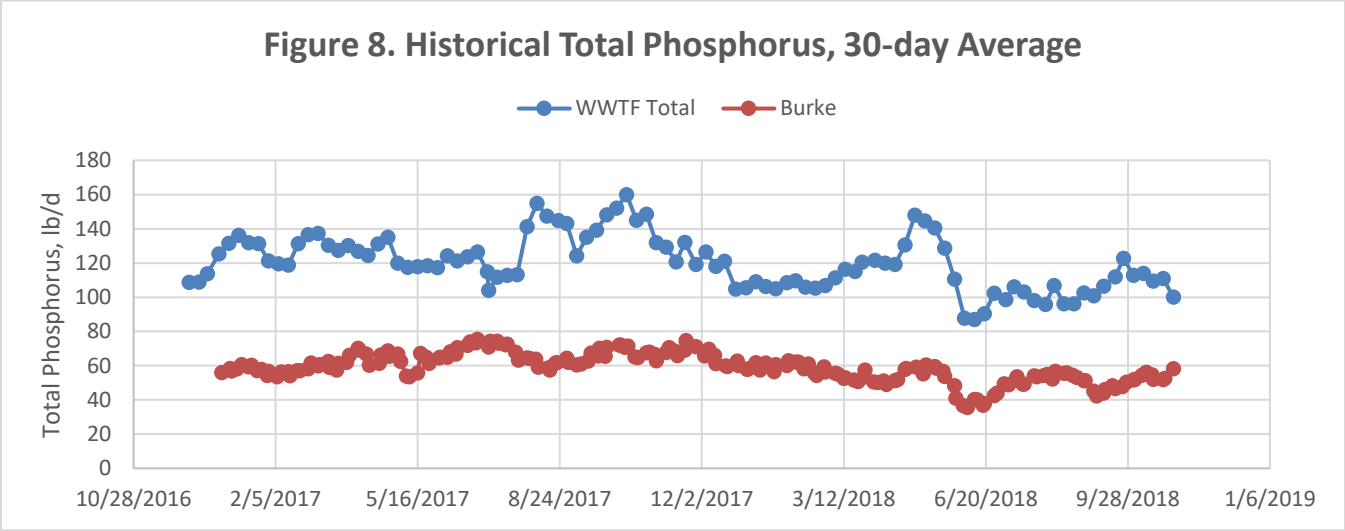


Figure 7. Historical Total Nitrogen, 30-day Average
WWTF Total
Burke
Total Nitrogen, lb/d
600
500
400
300
200
100
0
11/8/2016
2/16/2017
5/27/2017
9/4/2017
12/13/2017
3/23/2018
7/1/2018
10/9/2018



Design Hydraulic Loading

Flow projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by calculating the average per capita hydraulic loading rate and the projected 2044 population. Per capita flow was assumed to be stable over the design period. Historical per capita flow for the non-industrial component of ADW flow was calculated using the 2015-2018 ADW divided by the most recent (2010) census population estimate for Nevada. This is calculated to be 121.7 gallons per capita per day (gpcd).

Future AWW and MWW flows to the WWTF were projected by calculating historical AWW Infiltration & Inflow (I&I) and MWW I&I values and adding them to the design ADW flow. These historical I&I values were calculated as the difference between the AWW and ADW flows and MWW and ADW flows, respectively. Given the City's efforts to rehabilitate the existing sanitary sewer collection system in conjunction with street projects, the I&I fractions are anticipated to remain constant over the design period. The design peak hourly wet weather (PHWW) flow was estimated using the IDNR peaking factor formula and the 2044 population of Nevada of 8,764**.**

Future industrial flows are based on the two existing SIUs. No new SIUs are anticipated during the planning period. An expansion of the WWTF would be required to accommodate any new SIUs in the future. Industrial flows are based on information from or assumptions about each major industrial contributor. Projected flows and loads from Burke Corporation were provided on December 31, 2018 by their engineering consultant (Bolton & Menk). Projected Burke Corporation flows are given in Table 5.

Projected flows from VERBIO following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable flow to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Table 5: 2044 Design Flow Values

Parameter	Non-Industrial(2)	SIU-1 (Burke)	SIU-2 (VERBIO)	Total
ADW, mgd	1.07	0.5	0.072	1.64
AWW, mgd	2.45	0.5	0.072	3.02
MWW, mgd	5.29	0.7	0.144	6.13
PHWW(1), mgd	7.38	0.7	0.144	8.23

(1) The ratio of PHWW:AWW non-industrial flow is calculated by using the equation found in Appendix I, Chapter 12 of the Iowa Wastewater Facility Design Standards Peak:Average=(18+ √P)/(4+ √P), where P is population in thousands.
(2) Includes I&I component of total flow for AWW and MWW conditions

Design Organic Loadings

The maximum 30-day average organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic maximum 30-day average per capita organic loading rate and the projected 2044 population. The maximum day organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic daily maximum per capita organic loading rate and the projected 2044 population. Per capita loading was assumed to be stable over the design period.

The design industrial loading for Burke Corporation is based on the planned expansion and related loadings outlined by Burke's design engineer (Bolton & Menk) in the letter dated December 31, 2018. Loading from VERBIO North American Corporation are assumed to remain within the permit limits established for Du Pont in the NPDES permit issued November 1, 2016 and amended September 1, 2018. Design industrial loadings are summarized in Table 6.

Maximum 30-day design loading at the WWTF were estimated by combining industrial loading projections with non-industrial (residential/commercial) projections. Maximum day design loadings at the WWTF for process sizing, except for the aeration system sizing, were estimated by combining industrial maximum 30-day loading projections with non-industrial (residential/commercial) maximum day loading projections. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously. Review of the historical data support this assumption as well. The secondary treatment process aeration system sizing is based on the industrial maximum day loading projection only. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously; however, the aeration capacity must match the demand for the largest of the two maximum day loadings. Design loadings are summarized in Table 7.

HRGreen

Table 6: Design Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum
Burke Corporation (SIU)-1)[1]		
cBOD, lbs/d	4200	8700
TSS, lb/d	950	2500
TKN, lbs/d	500	1110
TP, lb/d	200	350
VERBIO (SIU-2)[2]		
BOD, lb/d	76	114
TSS, lb/d	129	194
TKN, lb/d	26	38

(1) From Bolton & Menk December 31, 2018 projected loading letter

(2) From the Nevada STP NPDES Permit Issued 11/1/2016 and amended 9/1/2018

Table 7: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day[1]					
BOD, lb/d[3]	1,576	4,421	76	6,073	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d[4]	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum[2]					
BOD, lb/d	2,329	9,158	114	NA	9,272
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d[4][5]	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.95 (Burke MOR data from 11/1/16 - 10/29/18)

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Updated Table 7: Design Loading (New BOD values per Burke cBOD:BOD Ratio Update)

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day(1)					
BOD, lb/d(3)	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d(4)	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum(2)					
BOD, lb/d	2,329	10,440	114	NA	10,554
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d(4)(5)	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833 (updated ratio from Burke)

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Note: The Updated Table 7 above shows updated BOD values from the approved report shown previously. BOD values have been updated due to Burke Corporation updating their cBOD/BOD ratio after the initial flows and loads memo was issued. All process design and calculations are based on the updated BOD values shown in the Updated Table 7 above.

H. Appendix H – Ancillary Improvements

ADMINISTRATION BUILDING

An administration building will be constructed at the new wastewater treatment facility. This building will also serve as a vehicle storage building and maintenance shop. It will include a minimum of the following spaces:

- Non-certified laboratory for process testing
- Office space
- Men's and women's rest room/locker room
- Reception area
- Breakroom/Lunchroom
- Office Storage
- Electrical Room
- Mechanical Room
- Vehicle/Equipment bays
- Maintenance tools and parts storage

VACTOR RECEIVING STATION

A vactor receiving station will be provided near the Headworks Building to allow for dumping of the City's vactor truck. The vactor receiving station will be provided with flushing water to help clean the area and push the dumped debris into the mechanical screens for removal. The vactor receiving station is not planned to receive hauled waste from other sources.

EMERGENCY ENGINE GENERATOR

An emergency engine generator will be provided for the stand-by-power service for the Nevada wastewater treatment facility. The stand-by generator will be a self-enclosed generator with base fuel tank. An automatic transfer switch will transfer the critical treatment process plant load and life-safety systems to the stand-by generator on loss of utility power. The emergency generator will not be used for peak load shaving.

PERSONELL REQUIREMENTS

The City of Nevada's WWTF currently has a staff of three employees to manage, operate, and maintain the wastewater treatment plant. The operations staff completes the laboratory analysis needed for operations as well as doing routine and minor maintenance on equipment. The City of Nevada supports this staff with administration and clerical employees as well as assistance with sanitary sewer maintenance within other departments.

The recommended WWTF staffing levels for the proposed new wastewater treatment plant and collection system maintenance is shown below:

Position	No of Full-Time Employees
Superintendent	1
Operations Staff (includes collection)	4
Total	5

The proposed increase over the current level is two (2) full-time employees. This staffing level was determined based on the increased labor required to operate and maintain the proposed

treatment facilities and expanded collection system (interceptor sewer and lift station). The increased staffing level from the current WWTF is due to increased operations and maintenance labor needs for secondary treatment process with nutrient removal; increased biosolids production due to increased loadings; addition of effluent disinfection treatment process. The increased operations and maintenance costs of these employees are included in the present worth costs provided in the report. See the UV Disinfection O&M evaluation in Appendix F for the additional costs associated with these employees.

There is no recommended increase in administrative and clerical staffing levels with the proposed improvements. The City can also continue to augment sewer staff with other City departments staff when needed for any increased sewer maintenance needs.

I. Appendix I – Nutrient Reduction Strategy

1.0 NUTRIENT REDUCTION FEASIBILITY

As outlined in the November 17, 2017 letter to the Department requesting an amendment to the compliance schedule for nutrient reduction (approved by September 1, 2018 Amended NPDES Permit), nutrient reduction in support of the Iowa Nutrient Reduction Strategy (INRS) will be addressed during facility planning and included within the Facility Plan report. The Antidegradation Alternatives Analysis, as submitted separately from this report, found the alternative for nutrient removal (less degrading alternative) to be reasonable, practical, and economical. Therefore, the facility planning effort addressed two alternatives for secondary treatment with nutrient removal (Total Nitrogen (TN) and Total Phosphorus (TP) ability. Targeted TN and TP effluent nutrient limits 10 mg/L and 1 mg/L, respectively. The INRS goals are to reduce TN and TP in the effluent by 66-percent and 75-percent, respectively.

1.1 Existing Facility Removal Capability & Operational Changes

The existing WWTF has limited ability to remove nutrients with the current fixed-film secondary treatment processes. Given that the existing WWTF will be replaced due to insufficient capacity for the design loadings, no further evaluation for nutrient removal capabilities of or operational changes to the existing WWTF was completed.

1.2 Nutrient Source Reduction

Historical influent nutrient loadings are generally at the upper range or higher than typical “domestic waste” ranges recognized by Iowa Department of Natural Resources (IDNR). Existing significant industrial contributor, Burke Corporation, is a significant source of nutrient loads. Burke Corporation currently pretreats their wastewater prior to discharge to the City; however, the current pretreatment agreement does not include requirements for reduction of or limits on TN or TP. The overall strategy for nutrient reduction based on discussions during the facility planning effort with Burke is to design the new WWTF with capacity to accept and treat Burke’s design TN and TP loadings, without requiring pretreatment of Burke’s wastewater for nutrient removal prior to discharge to the City. Nutrient source reduction from Burke is possible, but would require extensive expansion of Burke’s pretreatment process which may not be feasible on their site. The City and Burke are proceeding based on no nutrient source reduction beyond pretreatment system capabilities.

1.3 Evaluation of Nutrient Removal Treatment Technologies

Evaluation of treatment processes for nutrient removal is covered in the Alternative P2 section of the report. The economic feasibility of nutrient removal is covered by the Affordability Analysis section of the related Antidegradation Alternatives Analysis as submitted separately from this report.

1.4 Preferred Method for Nutrient Reduction

The preferred method to address nutrient removal is covered in the Selected Process section of the report.

1.5 Schedule

The schedule to address nutrient removal will coincide with the new WWTF construction schedule. The new WWTF construction is anticipated to be completed by late Fall 2023. Six months of WWTF operational optimization will follow startup, followed by one year of weekly influent and effluent TN and TP data collection to establish effluent nutrient limits.

J. Appendix J – Exhibit 9B

Iowa Department of Natural Resources
Wastewater Engineering Section

Exhibit 9B - Preliminary Review of Facility Plan Checklist

"Facility Plan" means a report certified by a professional engineer licensed to practice in Iowa and prepared in conformance with Chapter 11 of the Iowa Wastewater Facilities Design Standards (IWWFDS). A Facility Plan will not be required for non-funded minor sewer extensions, minor trunk and interceptor sewers, and minor pump stations where comprehensive planning is not completed, necessary or required. Facility planning submittals may be returned if they are deemed incomplete by the Department.

The transmittal letter referenced in Section 11.2.2 of the IWWFDS and a completed Exhibit 9B checklist by the engineer shall be bound with the engineering report. The transmittal letter must:

- Describe fully the scope of the project identified in Design Schedule A.
- Provide a statement on the feasibility of the project.
- Include a statement that this report has been accepted by the client.
- Indicate that the proposed project is in conformance with the long range planning of the area.
- Reference all information and approved planning reports necessary for a review.
- Clearly indicate the purpose of the submittal.

Exhibit 9B is divided into four sections as follows:

- Section 1 – All Projects
- Section 2 – New or Expanded Wastewater Treatment Facility Projects
- Section 3 – Earthen Basin Projects
- Section 4 – SRF Funded Projects

Section 1 must be completed for all projects. Sections 1 and 2 must be completed for projects involving new or expanded wastewater treatment facilities. Sections 1, 2, and 3 must be completed for projects that consist of new or expanded wastewater treatment lagoon facilities. Sections 1 and 3 must be completed for projects involving new or expanded equalization with earthen basins. In addition, complete Section 4 if the project is SRF funded.

Responses of **"Yes", "No", "?", or Not Applicable ("N/A")** may be used by DNR in completing Exhibit 9B Preliminary Review with explanations given, as appropriate. A "?" mark may be used by DNR staff where additional follow-up, or the consideration of additional information may be warranted before a comment is offered. Every attempt should be made to complete the Exhibit 9B preliminary review checklist using good engineering judgment and as accurately as possible for the benefit of decision makers. If the response is "No" by the engineer for location maps and/or geotechnical report, the transmittal letter must acknowledge that the Facility Plan is incomplete and provide adequate need and justification for the Department to initiate a concept review.

Section 1 – All Projects

1. Yes A work initiation meeting determination has been made. If the meeting was determined to be necessary, the meeting has been held. The scope and milestones for the project have been clearly established.
2. Yes A project location and a recommended alternative have been proposed by the A/E and the conclusion accepted by the Owner in accordance with Step 17, Section 11.2 of the Iowa Wastewater Facilities Design Standards and Design Schedule A.
3. Yes A completed and signed Design Schedule A has been submitted in accordance with Section 11.1 of the Iowa Wastewater Facilities Design Standards.
4. NA Any proposed variation from the design standards contained in Chapter 567 IAC 64 is identified by the Engineer in accordance with Design Schedule A with justification provided in accordance with DNR rules.
5. Yes A complete and achievable project implementation schedule has been provided identifying all project milestones in accordance with Section 11.2.5.3(k) of the Design Standards.
6. Yes The Appendix (Technical Information and Design Criteria) is provided per Design Standard 11.2.11.
7. Yes The facility plan is signed and certified by a professional engineer licensed in the State of Iowa.

Section 1 – Comment Box:

Regarding item 2: Owner accepted facility plan at city council meeting on August 26, 2019.
Regarding item 5: Project implementation schedule is located in section 5.8.5 of the report, rather than the executive summary.

Section 2 – New or Expanded Wastewater Treatment Plant Projects

8. No The Owner has filed an application for a new or amended NPDES permit as needed for the improvements described in the Facility Plan and has notified the review engineer of this submission.
9. Yes Completed Design Schedules F and G have been submitted in accordance with Section 11.1 of the Iowa Wastewater Facilities Design Standards.
10. Yes The location maps are prepared by the Engineer in accordance with Design Schedule F to the recommended scale and provide all requested detail to conduct a site survey investigation for the proposed new or expanded wastewater treatment facilities.
11. Yes All hydraulic and organic design loadings in Design Schedule G and the Facility Plan are consistent with the preliminary design loadings concurred by the Department.
12. Yes The project has conformed to the Waste Load Allocation (WLA) determination and the effluent limits which have been established by the DNR through Steps 9, 11, 12, 13, and 14 of the wastewater construction permitting procedures.
13. Yes Where anti-degradation requirements apply, the recommended alternative is consistent with the anti-degradation alternatives analysis approved by the Department.
14. NA New Process Evaluation - all required engineering data and design basis formulated from the data for New Process Evaluation has been approved by the Department under Section 14.4.3 and was prepared by a licensed professional engineer other than the one employed by the manufacturer or patent holder.

Section 2 – Comment Box:

Regarding Item 14: No new innovative technologies are proposed.

Section 3 – Projects with Earthen Basins (Lagoon and Equalization Basins)

15. NA A completed geotechnical investigation engineering report is provided as a supplement to the engineer's report.

Section 3 – Comment Box:

Section 4 – State Revolving Fund (SRF) Loan Projects

16. Yes The proposed project is a fundable category (Refer to Subrule 567 IAC 90.2) for receipt of a CWSRF loan.
17. Yes The Intended Use Plan application (Exhibit 8) is enclosed with the Facility Plan and the "Assurance with Respect to Real Property Acquisition" form.
18. Yes The Property/Easement Acquisition Schedule is included.
19. ---- The Owner has submitted all required Exhibit 5 information to the Environmental Review Services Coordinator in order to initiate the SRF environmental review.

Section 4 – Comment Box:

Regarding Item 18: See section 5.8.1 of the Facility Plan.
Regarding Item 19: Exhibit 5 included with facility plan submission.

This page for DNR Use Only

DNR Decisions:

---- 9B Complete

---- Concept Review Request

Conclusions by DNR:

FACILITY PLAN AMMENDMENT 1

FACILITY PLAN AMENDMENT 1

WASTEWATER TREATMENT FACILITY IMPROVEMENTS

CITY OF NEVADA, IOWA

DECEMBER 2019

The items contained in this amendment shall replace their respective pages, appendices, and/or tables from the City of Nevada's WWTF Improvements Facility Plan. The amended items are highlighted in RED for reference.

- **Page 52: Includes a revised max day loading reference.**
- **Page 53: Includes a revised max day loading reference and updated design oxygen requirement for oxygen/lb. BOD_5.**
- **Table 5-3, Page 30: Includes a revised Table 5-3 with the updated max day loads.**
- **Table 5-14, Page 57: Includes a revised Table 5-14 with updated biosolids storage volume requirements.**
- **Appendix D: Includes updated max day loading values, and sizing to the secondary treatment process and biosolids processing. Note: The changes in process sizes due to the updated max day loading values are minimal. As such, the cost opinions provided in the original submittal remains accurate within the 30% contingency and no updates to the cost opinions are necessary.**
- **Table 7, Appendix G: Includes a revised Table 7 with the updated max day loads.**

This amendment resolves updated Daily Maximum loading values as agreed by HR Green and the DNR on October 17, 2019. There is no change to the recommended alternative proposed in the Facility Plan.

OWNERSHIP OF DOCUMENT

This document, and the ideas and designs incorporated herein, as an instrument of professional service, is the property of HR. Green, Inc. and is not to be used, in whole or in part, for any other project without the written authorization of HR Green, Inc.

CERTIFICATION

LICENSED PROFESSIONAL ENGINEER MICHAEL J. ROTH 18424 IOWA	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. Date: 12/13/19 **MICHAEL J. ROTH, P.E.** License No. **18424** My renewal date is **December 31, 2020** Pages or sheets covered by this seal: **Entire Document**

Alternative P1: Five-Stage Bardenpho Process with Final Clarifiers

Alternative P1 proposes an activated sludge system with the use of a five-stage Bardenpho process for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The five-stage oxidation ditch consists of five zones: anaerobic, first-stage anoxic, first-stage aerobic, second-stage anoxic, and second-stage aerobic. Within these zones phosphorus release, denitrification (TN removal), BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The Bardenpho zones were sized according textbook design guidance and examples. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 12,130 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed five-stage Bardenpho process.

Three final clarifiers will follow the Bardenpho process. Clarifiers were designed in accordance with IDNR standards to account for the PHWW flow of 8.23 mgd. Three 70-feet diameter clarifies with a 14.5-feet SWD are proposed. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed final clarifiers.

The five-stage Bardenpho and final clarifier process are designed to meet Facility Reliability Class I.

Alternative P2: Three-Stage Oxidation Ditch with Final Clarifiers

Alternative P2 proposes an activated sludge system with the use of a three-stage oxidation ditch for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The three-stage oxidation ditch consists of three zones: anaerobic, anoxic, and aerobic. Within these zones phosphorus release, denitrification (TN removal), and BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The aerobic volume for extended aeration activated sludge system is based on a maximum organic loading of 15 ppd BOD/1,000 cft of aerobic reactor volume. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.27 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 12,130 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed three-stage Oxidation Ditch.

Three final clarifiers following the same design standards as in Alternative P1 will be required for this alternative as well.

The Three-Stage Oxidation Ditch and final clarifier process are designed to meet Facility Reliability Class I.

Secondary Treatment Comparison

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process is relatively more simple in terms of operational control. The “return/recycle” streams are integrated into the overall design of the oxidation ditch layout with minimal pumping required. There are fewer zones to maintain with the oxidation ditch as well.

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process has a relatively better ability to accommodate flow and loading spikes. This is due to the extended aeration configuration of the aerobic zone of the oxidation ditch; however, the operator must still be careful of hydraulic overloading to the anaerobic and anoxic zones that might result in unfavorable conditions and decreased nutrient removal performance.

Both processes are capable of nutrient removal with EBPR. Due to the favorable carbon-to-nutrient influent loadings, biological nutrient removal is anticipated without continuous need for supplemental carbon addition or for phosphorus removal via chemical precipitation. Consideration for backup supplemental carbon and chemical phosphorus precipitation systems will be considered in final design.

Table 5-3: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day[1]					
BOD, lb/d[3]	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d[4]	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum[2]					
BOD, lb/d	2,329	10,440	114	NA	12,130
TSS, lb/d	6,899	2,500	194	NA	7,978
TKN, lb/d	558	1,110	38	NA	1,491
TN, lb/d[4][5]	558	1,110	38	NA	1,501
TP, lb/d	118	350	NA	NA	459

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Scenario 1 or Scenario 2

Scenario 1 = Non-industrial daily max + SIU-1 Maximum 30 day + SIU-2 Maximum 30 day

Scenario 2 = Non-industrial Maximum 30 day + SIU-1 Daily Max + SIU-2 Daily Max

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Table 5-14: Biosolids Storage Volume Requirements

Solids Processing Alternative	Required 180 Day Biosolids Storage Volume (MGal)	Proposed Number of Tanks	Tank Height[1] X Diameter (feet)	Actual Biosolids Storage Volume (MGal)
Integral Thickening	2.541	2	28.5' x 90'	2.570
Post Thickening	1.517	1	19.5' x 120'	1.523

[1]Hieght includes 1.5 feet freeboard

D. Appendix D – Process Facilities Evaluation

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P1

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Max 30-Day	Max Day
cBOD, lbs/day	6,692	12,130
TSS, lbs,day	4,300	7,978
TKN, lbs/day	869	1,491
Total Phosphorus, lbs/day	309	459
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Secondary Treatment System (Five-Stage Bardenpho)

No of units/process trains	2
Sidewater Depth, ft	15
Anaerobic Tank Volume, each, gallons	63,000
First Anoxic Tank Volume, each, gallons	78,300
Aerobic Tank volume, each, gallons	1,493,000
Second Anoxic Tank volume, each, gallons	25,000
Reaeration Tank volume, each, gallons	62,900
Hydraulic Detention Time @ AWW, hrs	27
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15.4
SRT, days	15
Equipment	Mixer/Aerator/Diffusers
Anaerobic Tank	2 Submersible mixers
First Anoxic Tank	4 Submersible mixers
Aerobic Tank	4 Aeration blowers (est., type TBD)
	Fine bubble Diffused aeration (type TBD)
	4 Submersible mixers
	6 Recycle Submersible Pumps (est.)
Second Anoxic Tank	2 Submersible mixers
Reaeration	Fine bubble diffused aeration (type TBD)
	Use Aerobic Tank blowers
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	12.4
Solids Loading Rate, max, lbs/sf/day	35.0

RAS Pumps

Type	Centrifugal
No of units	6
Rated Capacity each, gpm	~650
Rated head, ft	~12 (estimated)
RAS firm capacity, mgd	~4.53
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No of units	2
Rated Capacity each, gpm	200

Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel – Horizontal or Inclined bulb orientation
No of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No of units	2
Tank dim, ft x ft	15 x 12 (tank 1); 15 x 12 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	300 (tank 1); 250 (tank 2)
No of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No of units	2
Capacity, MGal	2.54
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P2

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Avg. Day	Max Day
cBOD, lbs/day	6,692	12,130
TSS, lbs,day	4,300	7,978
TKN, lbs/day	869	1,491
Total Phosphorus, lbs/day	309	459
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Oxidation Ditches (Based on Preliminary Ovivo Proposal)

No. of units	2
Sidewater Depth, ft	14.5
Aerobic Tank volume, each, gallons	1,668,000
Anoxic Tank volume, each, gallons	125,000
Anaerobic Tank volume, each, gallons	125,000
Hydraulic Detention Time @ AWW, hrs	26.5
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15
SRT, days	19.8
Aeration equipment type	Vertical shaft Mixer/Aerator
Size, Hp, each	100
No. of units	2 per train, 4 total
Anoxic/Anaerobic mixing	Submersible mixers
No. of units	1 per zone, 4 total
Lbs. O2/lbs. BOD5, Applied	1.27
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97
Aeration Demand, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	16,196
Daily Maximum Loading, lbs O2/d	29,137
Denitrification Oxygen Credit, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	1,515
Daily Maximum Loading, lbs O2/d	3,087
Design Temperature,	
Winter, degrees-C	10
Summer, degrees-C	25
Sludge Recycle, % AWW	
RAS Rate, Max 30-day	50
RAS Rate, Max day	75
Sludge Wasting	
WAS Rate, lbs/d	5,340
Operational Mode	Continuous

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	12.4
Solids Loading Rate, max, lbs/sf/day	35.0

RAS Pumps

Type	Centrifugal
No. of units	6
Rated Capacity each, gpm	~650
Rated head, ft	~12 (estimated)

RAS firm capacity, mgd	~4.53
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No. of units	2
Rated Capacity each, gpm	200
Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel – Horizontal or Inclined bulb orientation
No. of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No. of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
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Aeration Demand, SCFM	300 (tank 1); 250 (tank 2)
No. of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No. of units	2
Capacity, MGal	2.54
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles

Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN SOLIDS PROCESSING POST THICKENING ALTERNATIVE

Item	Size/Capacity
Aerobic Digesters	
Operation Type	series flow
No. of trains	2
No. of units per train	2
Tank dimensions, ft x ft, each	64 x 64
Tank SWD, ft	20
SRT, days	42
Aeration Requirement, SCFM, total	1,707
Mechanical Mixing, HP, each	82
No. of mixers	4 (estimated, See Note)
Diffused Air Mixing, SCFM	9,830
No. of blowers	4 (estimated, See Note)
Type	Positive displacement
Digester Transfer pumps	2

Note:
Final mixing/aeration system will be determined during final design to meet IDNR requirements if this alternative is chosen. Cost estimate based on combined diffused aeration and mechanical mixing with 4 aeration blowers and 4 mechanical mixers.

Post Sludge Thickening	
Type	Mechanical (See Note)
No. of units	2 (estimated, See Note)
Thickened Sludge Concentration	5%
Thickened Sludge Transfer Pumps	2

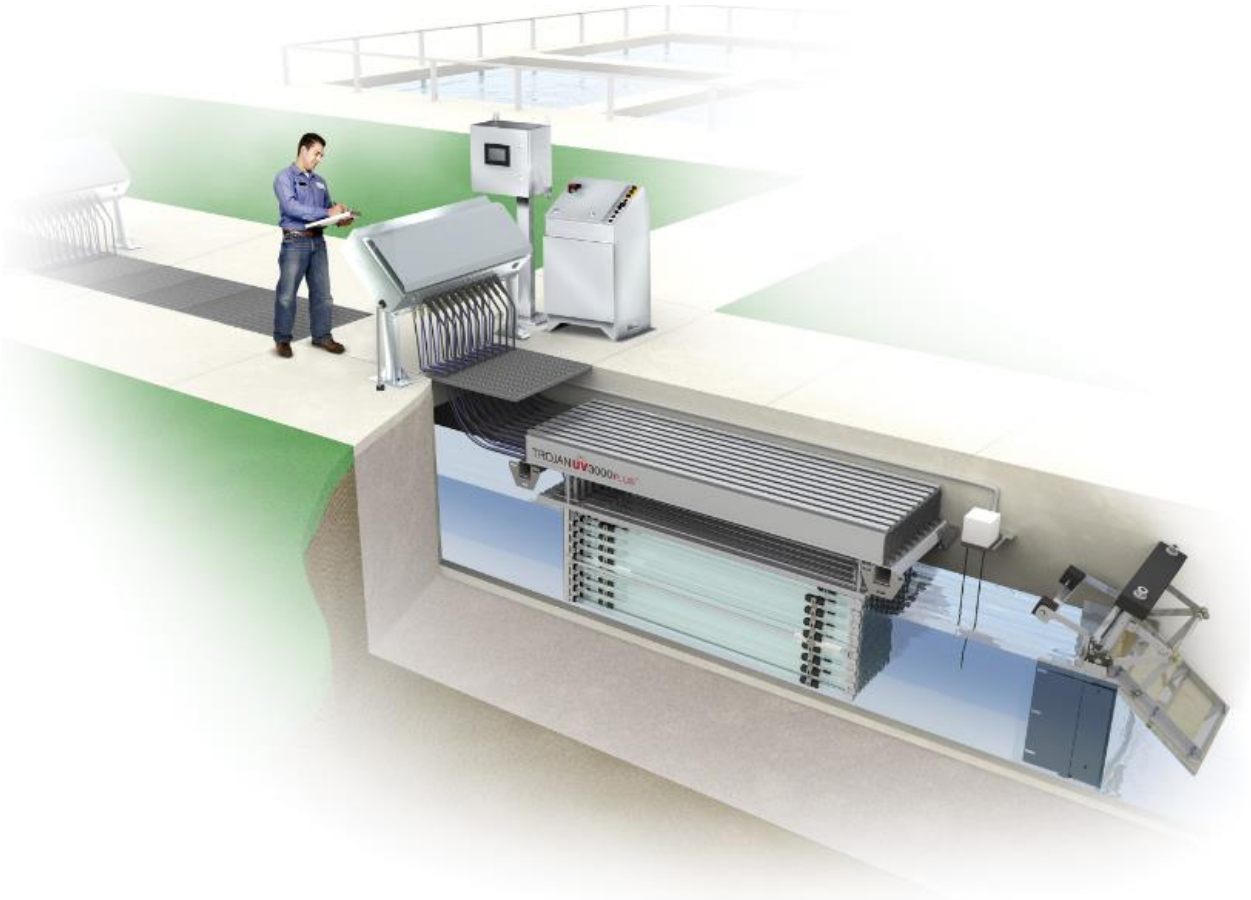
Note:
Alternatives for post sludge thickening include rotary drum thickeners and gravity belt thickeners. Final post thickening equipment will be chosen during final design if this alternative is chosen. Cost estimate based on 2 rotary drum thickeners and supporting equipment.

Biosolids Storage Tank	
Type	Above grade open top bolted steel
No of units	1
Capacity, MGal	1.52
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

UV Disinfection Proposals

TROJAN UV3000 PLUS™

PROPOSAL FOR THE CITY OF NEVADA, IA
QUOTE: 220576
06/17/2019



The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

August 19, 2019

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the NEVADA project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system. All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

Una Duncan
3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
4280 E 14th Street
Des Moines , IA
US
515-979-4648

DESIGN CRITERIA

NEVADA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65 %** (minimum)
Total Suspended Solids:	**15 mg/l** (30 Day Average, grab sample)
Disinfection Limit:	**126 E.coli per 100 ml,** based on a day 30 of consecutive daily grab samples

DESIGN SUMMARY

QUOTE: 220576

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

CHANNEL	
Number of Channels:	**1**
Approximate Channel Length Required:	**25 ft 4 in**
Channel Width Based on Number of UV Modules:	**24 in**
Channel Depth Recommended for UV Module Access:	**62 in**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**6**
Number of Lamps per Module:	**8**
Total Number of UV Lamps:	**96**
Maximum Power Draw:	**23.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**2**
System Control Center Quantity:	**1**
MISCELLANEOUS EQUIPMENT	
Level Controller Quantity:	**1**
Type of Level Controller:	**Weighted Gate (ALC)**
Automatic Chemical / Mechanical Cleaning:	**Trojan ActiClean-WW™**
UV Module Lifting Device:	**Davit Crane and Lifting Sling**
On-line UVT Monitor:	**Hach UVAS sc Sensor – Optionally Available**
Standard Spare Parts / Safety Equipment:	**(8) lamps, (8) sleeves, operator kit**
ELECTRICAL REQUIREMENTS	
1. Each Power Distribution Center requires an electrical supply of one (1) 480/277V 60Hz **2.** The Hydraulic System Center requires an electrical supply of one (1), 480V 60Hz, 2.5 kVA. **3.** The System Control Center requires an electrical supply of one (1) 120V 60Hz , 15 Amps.	

4.	Electrical disconnects required per local code are not included in this proposal.

COMMERCIAL INFORMATION

Total Capital Cost: $216,000 (USD)

This price excludes any taxes that may be applicable and is valid for 90 days from the date of this letter.

EQUIPMENT WARRANTEES

1. Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.

2. UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.

3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

PROPOSAL FOR NEVADA, IA
QUOTE: 220578
06/17/2019

TrojanUVSigna™ incorporates revolutionary innovations, including TrojanUV Solo Lamp™ technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
515-979-4648
marci@mc2h2o.com

DESIGN CRITERIA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65%** (minimum)
Total Suspended Solids:	**15 mg/l (30 Day Average,** grab sample)
Disinfection Limit:	**126 E.coli per 100 ml**, 30 day Geometric Mean of consecutive daily grab samples

DESIGN SUMMARY

CHANNEL	
Number of Channels:	**1**
Minimum Channel Length Required:	**~20' (not including level control area)**
Channel Width at UV Banks:	**2.9'**
Channel Depth Recommended:	**7.8'**
UV BANKS	
Number of Banks per Channel:	**2**
Number of Lamps per Bank:	**10**
Total Number of UV Lamps:	**20**
Maximum Duty Power Draw:	**21.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**1**
Hydraulic System Center Quantity:	**1**
System Control Center Quantity:	**1**
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	**1 Fixed Weir**
Integral Bank Walls:	**Included**
On-line UVT Monitoring:	**Hach UVAS sc Sensor – Optionally Available**
Other Equipment:	
ELECTRICAL REQUIREMENTS	

1. Each Power Distribution Center requires an electrical supply of one (1) 480V, 3 phase, 4 wire + GND, 50/60 Hz
2. Electrical supply for Hydraulic System Center will be (1) 480V, 3 phase, 3 wire + GND, 60 Hz, 2.5 kVA
3. Electrical supply for System Control Center will be (1) 120V, 1 phase, 2 wire + GND, 60 Hz, 1.8 kVA
4. Electrical disconnects are not included in this proposal. Refer to local electrical codes

COMMERCIAL INFORMATION

Total Capital Cost: $237,500 (USD)

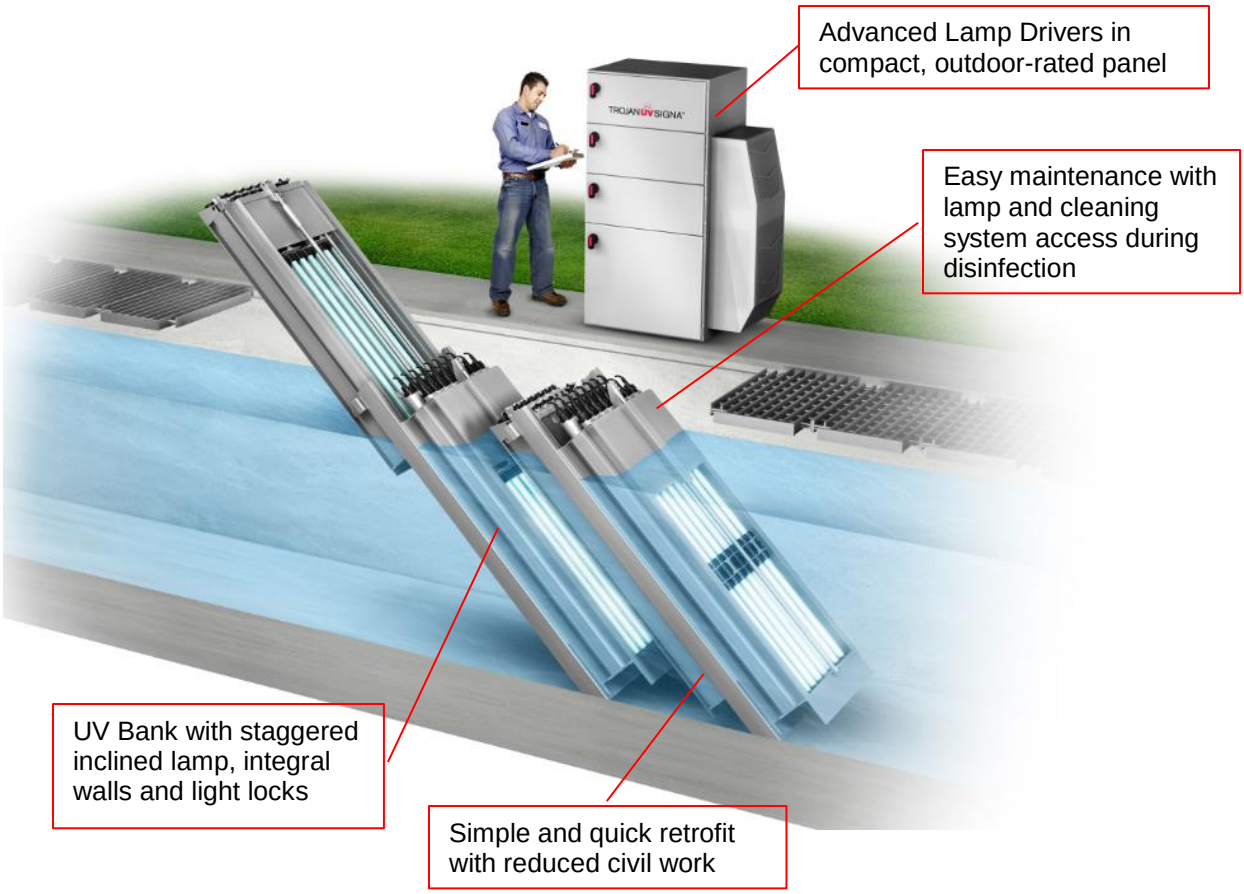
This price excludes any taxes or duties that may be applicable.

Standard equipment warrantees and start up by Trojan-certified technicians are included.

Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

SYSTEM OVERVIEW



Simple to Design and Install

- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.

Updated Table 7: Design Loading (Revised Max Day Loading)

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day(1)					
BOD, lb/d(3)	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d(4)	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum(2)					
BOD, lb/d	2,329	10,440	114	NA	12,130
TSS, lb/d	6,899	2,500	194	NA	7,978
TKN, lb/d	558	1,110	38	NA	1,491
TN, lb/d(4)(5)	558	1,110	38	NA	1,501
TP, lb/d	118	350	NA	NA	459

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Scenario 1 or Scenario 2

Scenario 1 = Non-industrial daily max + SIU-1 Maximum 30 day + SIU-2 Maximum 30 day

Scenario 2 = Non-industrial Maximum 30 day + SIU-1 Daily Max + SIU-2 Daily Max

Per agreement with IDNR that non-industrial and SIU daily maximum loads are very unlikely to occur on the same day. Daily Max used for aeration/mixing system sizing.

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

PHASE 1 NEVADA WASTEWATER TREATMENT FACILITY IMPROVEMENTS

CITY OF NEVADA

NEVADA, IOWA

2020

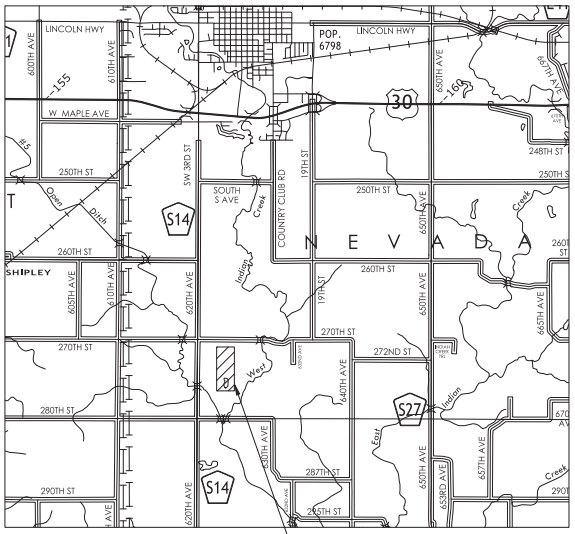
CERTIFICATION

MICHAEL J. ROTH 18424 — IOWA

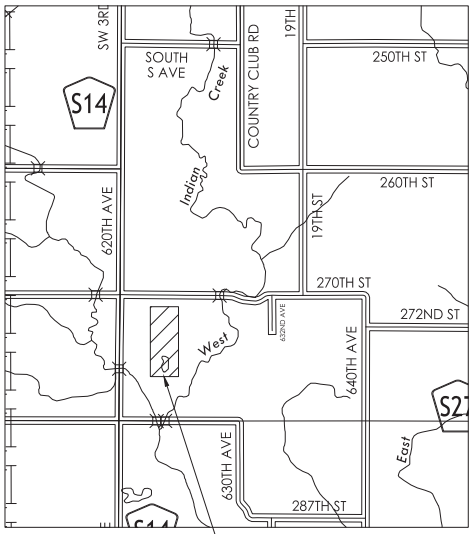
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

MICHAEL J. ROTH, P.E. DATE
License Number: 18424
My license renewal date is December 31, 2020.
Pages or sheets covered by this seal:
G SHEETS.

VICINITY MAP



LOCATION MAP



Sheet Number	Sheet Title
GENERAL	
G.01	COVER SHEET
G.02	ABBREVIATIONS, LEGEND, AND SHEET INDEX
G.03	GENERAL NOTES, ALIGNMENTS, AND CONTROL
G.04	QUANTITIES AND ERI
CIVIL SITEWORK	
C.01	OVERALL SITE PLAN
C.02	EROSION CONTROL PLAN
C.03	EROSION CONTROL NOTES
C.04	GRADING PLAN
C.05	INFLUENT TRUNK SEWER PLAN AND PROFILE
C.06	INFLUENT TRUNK SEWER PLAN AND PROFILE
C.07	INFLUENT TRUNK SEWER PLAN AND PROFILE
C.08	EFFLUENT OUTFALL PLAN AND PROFILE
C.09	ENTRANCE DRIVE GRADING PLAN AND PROFILE
C.10	DRAINAGE CULVERTS PLAN AND PROFILE
C.11	SECTIONS AND DETAILS

HRGreen

5525 MERLE HAY ROAD, SUITE 200 | JOHNSTON, IOWA 50131
Phone: 515.278.2913 | Toll Free: 800.728.7805 | Fax: 515.278.1846 | HRGreen.com

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: MJR	JOB NUMBER: 160473		
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NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com

NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

GENERAL
COVER SHEET

SHEET NO. G.01

Xrefs: xgl-1-dh01; story-co

ABBREVIATIONS

@	AT
A	AMPS, AMPERES
AAV	AUTOMATIC AIR VENT
AB	ANCHOR BOLT
AC	ALTERNATING CURRENT
ACC	ASPHALTIC CEMENT CONCRETE
ACT	ACOUSTIC CEILING TILE
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR, AIR DRYER
ADP	AUTO DIALER PNL
ADH	ADHESIVE
A/E	ARCHITECTURAL / ENGINEERING FIRM
AF	AMPERE FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY
AFG	ABOVE FINISHED GRADE
AH	ACCESS HATCH
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
ALT	ALTERNATE
ALUM, AL	ALUMINUM
AMB	AMBIENT
ANCH	ANCHOR
ANOD	ANODIZED
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH	ARCHITECT, ARCHITECTURAL
AS	AIR SEPARATOR
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
B/	BOTTOM OF, BACK OF
B/B	BACK TO BACK (OF CURBS)
BBH	BASEBOARD HEATER
BC	BARE COPPER
B/C	BACK OF CURB
BD BM	BOND BEAM
BDD	BACKDRAFT DAMPER
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTOR, BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BLK	BLOCK
BOD	BOTTOM OF DUCT, BIOLOGICAL OXYGEN DEMAND
BOP	BOTTOM OF PIPE
BM	BENCH MARKER
BOT	BOTTOM
BOW	BOTTOM OF WALL
BRG	BEARING
BRK	BRICK
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
BTWN	BETWEEN
BV	BALL VALVE
C	CONDUIT, CELSIUS, C STRUCTURAL SHAPE
CAP	CAPACITY
CB	CIRCUIT BREAKER
CC	COILING COIL, CONSTRUCTION CASTING
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CONCRETE HARDENER
CI	CAST IRON
CIP	CAST IN PLACE, CLEAN IN PLACE, CAST IRON PIPE
CJ	CONTROL OR CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING, COOLING
CLR	CLEAR, CLEARANCE
CMPR	COMPRESSOR
CMU	CONCRETE MASONRY UNIT
CND	CONDENSATE
CO	CLEAN OUT
COL	COLUMN
COMP	COMPRESSION
CONC	CONCRETE
COND	CONDENSER, CONDUIT
CONT	CONTINUE (OUS)
CONTR	CONTRACTOR
COORD	COORDINATE
COP	COEFFICIENT OF PERFORMANCE
CORP	CORPORATION
CP	CORNER POINT
CPT	CONTROL POWER TRANSFORMER, CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CRS	COURSES
CT	CURRENT TRANSFORMER
CTRS	CENTERS
CU	CONDENSING UNIT, COPPER
CU FT	CUBIC FEET
CU IN	CUBIC INCH
CW	CHILLED WATER
CWP	CONDENSER WATER PUMP
CY	CUBIC YARD
D	DECANT
DB	DRY BULB TEMPERATURE, DIRECT BURIED
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DG	DOOR GRILLE
DGS	DIGESTER SLUDGE
DI	DUCTILE IRON
DIA,ø	DIAMETER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DL	DEAD LOAD
DN	DOWN
DP	DEWPOINT TEMPERATURE
DPR	DAMPER
DRN	DRAIN
DS	DOWN SPOUT
DTL	DETAIL(S)
DWG	DRAWING(S)
DWL	DOWEL
DX	DIRECT EXPANSION
E	EQUIPMENT, EASTING
EA	EACH, EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
ECC	ECCENTRIC
ECP	ENVIRONMENTAL CONTROL PANEL
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN, EACH FACE
EFF	EFFICIENCY, EFFLUENT
EG	EXHAUST GRILLE, EQUIPMENT GENERATOR
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBED	EMBEDMENT
ENCL	ENCLOSURE
ENG	ENGINEER
EP	EXPLOSION PROOF, EPOXY PAINT
EQ, EQUIP	EQUAL, EQUIPMENT
EQMT	EQUIPMENT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETM	ELAPSED TIME METER
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY EACH FACE
EWT	ENTERING WATER TEMPERATURE
EXIST	EXISTING
EXP	EXPANSION
EXP MAT	EXPANSION MATERIAL
EXT	EXTERIOR, EXTERNAL
F	DEGREES FAHRENHEIT, FLUORIDE
FA	FACE AREA, FREE AREA
FAB	FABRICATE(D)
FAC	FLANGED ADAPTOR COUPLING
FB	FLAT BAR, FLOOR BEAM
FC	FAN COIL UNIT, FLEXIBLE CONNECTION
FCA	FLANGE COUPLING ADAPTOR
FD	FIRE DAMPER, FLOOR DRAIN
FDGGF	FREE DRAINING GRADED GRANULAR FILL
FDN	FOUNDATION
FE	FLANGED END, FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISHED FLOOR
FG	FLOOR GRILLE
FH	FIRE HYDRANT
FIL	FILTRATE
FIN	FINISH
FIN FLR	FINISHED FLOOR
FL	FLOW LINE, FLUORESCENT
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FM	FORCEMAIN
FO	FIBER OPTICS
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE
FOM	FACE OF MASONRY
FOS	FACE OF STEEL
FOT	FLAT ON TOP
FOW	FACE OF WALL
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FR	FLOOR REGISTER
FRP	FIBERGLASS REINFORCED PLASTIC OR PNL
FS	FLOOR STAND
FT	FEET, FLOW TRANSMITTER
FTG	FOOTING
FV	FIELD VERIFY
G	GATE, GROUND
GA	GAUGE, GAGE
GAL	GALLONS
GALV	GALVANIZED
GB	GYPSUM BOARD
GC	GAS CHROMATOGRAPH (FLOW COMPUTER)
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPT
GFR	GROUND FAULT RELAY
GFS	GROUND FAULT SLAVE (PROTECTED UPSTREAM)
GL	GLASS
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRTG	GRATING
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
GYP	GYPSUM
HB	HOSE BIBB
HC	HEATING COIL, HANDICAP (PED)
HCAP	HANDICAP (PED)
HD	HEAD
HDPE	HIGH DENSITY POLYETHYLENE
HDR	HEADER
HG	MERCURY
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HM	HOLLOW METAL
HMA	HOT MIX ASPHALT
HOA	HAND OFF AUTOMATIC
HOR	HORIZONTAL
HP	HORSEPOWER, HIGH POINT
HPG	HIGH PRESSURE GAS
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSGL	HEAT STRENGTHENED GLASS
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HU	HUMIDIFIER
HVAC	HEATING, VENTILATING, AIR CONDITIONING
HW	HOT WATER
HWC	HOT WATER RECIRCULATED
HWP	HEATING WATER PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWUH	HOT WATER UNIT HEATER
HX	HEAT EXCHANGER
HZ	HERTZ
IBC	INTERNATIONAL BUILDING CODE
IFC	INTERNATIONAL FIRE CODE
IPC	INTERNATIONAL PLUMBING CODE
IMC	INTERNATIONAL MECHANICAL CODE
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
I/F, IF	INSIDE FACE
IN	INCHES
INC	INCANDESCENT
INF	INFLUENT
INSUL	INSULATION
INT	INTERIOR
INVT	INVERT
JB	JUNCTION BOX
JS	JANITOR SINK
JT, JNT	JOINT
K	STRUCTURAL BAR JOIST SHAPE
KCMIL	THOUSAND CIRCULAR MILS
KVA	1,000 VOLT AMPS
kW	1,000 WATT
KWH	KILOWATT – HOUR
L	LOUVER, ANGLE
LA	LIGHTNING ARRESTOR
LAB	LABORATORY
LAP	LEVEL ALARM PNL
LAT	LEAVING AIR TEMP, LATENT, LATITUDE
LAV	LAVATORY
LB(S)	POUND(S)
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LFG	LANDFILL GAS
LFH	LANDFILL GAS (HIGH PRESS)
LFL	LANDFILL GAS (LOW PRESS)
LHR	LATENT HEAT RATIO
LIN	LINEAR
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LOS	LOCKOUT STOP PUSH–BUTTON
LP	LOW POINT
LPG	LOW PRESSURE GAS
LRA	LOCKED ROTOR AMPS
LS	LIMIT SWITCH, LIFT STA.
LT	LEVEL TRANSDUCER
LTG	LIGHTING
LWT	LEAVING WATER TEMPERATURE
M	METER
MA	MILLIAMPERES
MAINT	MAINTENANCE
MAS	MASONRY
MAU	MAKEUP AIR UNIT
MAX	MAXIMUM
MBH	ONE THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MG	MILLION GALLON
MGD	MILLION GALLONS PER DAY
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIRR	MIRRORED
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MK	MARK
MM	MAG METER
MO	MASONRY OPENING
MOCP	MAXIMUM OVERCURRENT PROTECTION
MPH	MILES PER HOUR
MTD	MOUNTED
MTL	METAL
MV	MUD VALVE
MW	MASONRY WALL
N	NEUTRAL, NORTHING
NA, N/A	NOT APPLICABLE
NC	NOISE CRITERIA, NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEG	NEGATIVE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NL	NIGHTLIGHT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPT	NATIONAL PIPE THREAD
NPS	NOMINAL PIPE SIZE
NRP	NON–REMOVABLE PIN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTDOOR AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OD	OUTSIDE DIAMETER, OVERFLOW DRAIN
OED	OPEN END DUCT
O/F, OF	OUTSIDE FACE, OPEN FACE, OVERFLOW
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
OL	MOTOR OVERLOAD CONTACTS
OPNG	OPENING
OPP	OPPOSITE
OSB	ORIENTED STRAND BOARD
P	POLE, PUMP
PART	PARTIAL
PB	PUSHBUTTON, PULL BOX, PANEL BOARD
PBD	PARALLEL BLADE DAMPER
PC	PRECAST CONCRETE
PCC	PORTLAND CEMENT CONCRETE
PCF	POUNDS PER CUBIC FOOT
PCST	PRECAST
PD	PRESSURE DROP
PE	PLAIN END, POLYETHYLENE
PERF	PERFORATED
PERP	PERPENDICULAR
PG	PROFILE GRADE
PH	PHASE
PJF	PREFORMED JOINT FILLER
PL	PLATE, PURGE LINE
PLWD	PLYWOOD
PNL	PANEL
POJ	PUSH ON JOINT
PPM	PARTS PER MILLION
PR	PAIR
PROJ	PROJECTION
PRV	PRESSURE REDUCING VALVE
PS	PRESSURE SWITCH, PUMP STA.
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	PSI, ABSOLUTE
PSIG	PSI, GAGE
PSW	PLANT SERVICE WATER
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PT	POTENTIAL TRANSFORMER, PAINT, PRESSURE TANK
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
R	RISER(S), RADIUS
RA	RETURN AIR
RAD	RADIUS
RAS	RETURN ACTIVATED SLUDGE
RB	ROOF BEAM, RESILIENT BASE
RCP	REINFORCED CONCRETE PIPE
RCMD	RECOMMENDED
RD	ROOF DRAIN
RECIRC	RECIRCULATE
RED	REDUCER
REF	REFERENCE
REINF	REINFORCE(ING)
REQ(D)	REQUIRE(D)
REV	REVISED
RF	RETURN FAN, RESILIENT FLOORING
RG	RETURN GRILLE
RH	RELIEF HOOD, RELATIVE HUMIDITY
RHC	REHEAT COIL
RJ	RESTRAINED JOINT
RM	ROOM
RO	ROUGH OPENING, REVERSE OSMOSIS
ROW	RIGHT OF WAY
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER, RAILROAD
RS	RAW SEWAGE
RTU	ROOFTOP UNIT
RW	RESILIENT WEDGE
S&F	SECURITY & FIRE PNL
SA	SUPPLY AIR
SAN	SANITARY, SANITARY SEWER
SAT	SATURATION
SB	SOIL BORING
SCFM	CFM, AT STANDARD CONDITIONS
SCH	SCHEDULE
SD	SMOKE DAMPER
SEER	SEASONAL ENERGY EFFICIENCY RATIO EFFICIENCY RATIO
SEN	SENSIBLE
SF	SUPPLY FAN, SQUARE FOOT
SG	SUPPLY GRILLE, SLIDE/SLUICE GATE
SH	SHIELDED, SHOWER, SHEET
SIM	SIMILAR
SJ	SOFT JOINT, SAW CUT JOINT
SHR	SENSIBLE HEAT RATIO
SHT	SHEET
SIM	SIMILAR
SK	SINK
SL	SNOW LOAD
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SP	STATIC PRESSURE, SUMP PUMP, SPACE(S)
SPEC	SPECIFICATION
SQ	SQUARE
SQ FT	SQUARE FEET
SR	SUPPLY REGISTER
SS	STAINLESS STEEL
SSH	SAFETY SHOWER
SSL	SECONDARY SLUDGE
SST	SATURATED SUCTION TEMPERATURE
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STL	STEEL
SUCT	SUCTION
SW	SWITCH, SAMPLING
T	TEMPERATURE, THREAD
T&B	TOP AND BOTTOM
TACH	TACHOMETER
TB	TERMINAL BOARD
TBS	THICKENED BLENDED SLUDGE
TCP	TEMP CONTROL PNL
TD	TEMPERATURE DIFFERENCE
TDH	TOTAL DYNAMIC HEAD
TEL	TELEPHONE
TEMP	TEMPERATURE, TEMPORARY, TEMPERED
TFR	TRICKLING FILTER RECYCLE
TGL	TEMPERED GLASS
TMV	THERMOSTATIC MIXING VALVE
T/	TOP OF
TOC	TOP OF CONCRETE
TOD	TOP OF DUCT
TONS	TONS OF REFRIGERATION
TOS	TOP OF STEEL
TOW	TOP OF WALL
TP	TWISTED PAIR
TR	TREAD(S)
TSG	TEMPERED SAFETY GLASS
TSP	TOTAL STATIC PRESSURE, TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD
TSTAT	THERMOSTAT
TWAS	THICKENED WASTE ACTIVATED SLUDGE
TYP	TYPICAL
U	HEAT TRANSFER COEFFICIENT
UBC	UNIFORM BUILDING CODE
UFC	UNIFORM FIRE CODE
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND TELEPHONE
UH	UNIT HEATER
UMC	UNIFORM MECHANICAL CODE
UNO	UNLESS NOTED OTHERWISE
UPC	UNIFORM PLUMBING CODE
UR	URINAL
V	VALVE, VENT, VOLTS
VA	VOLT – AMPERES
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VINYL BASE, VALVE BOX, VAPOR BARRIER
VC	VICTAULIC COUPLING
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE
VD	VOLUME DAMPER
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VLV	VALVE
VOL	VOLUME
VS	VARIABLE SPEED
VTR	VENT THRU ROOF
W	WATER, WATTS, WIDE FLANGE, WINDOW
W/	WITH
W/O	WITHOUT
WAP	WALL PIPE
WAS	WASTE ACTIVATED SLUDGE
WB	WET BULB
WC	WATER CLOSET, WATER COLUMN, WATER COOLER
WD	WOOD, WATER DISTILLED
WF	WIDE FLANGE
WG	WATER GAUGE
WH	WATER HEATER, WALL HYDRANT
WNDW	WINDOW, WINDOWS
WL	WIND LOAD
WP	WORK POINT, WEATHERPROOF, WATER PROOF
WS	WALL SLEEVE, WATERSTOP, WATER SURFACE
WSV	WALL SLEEVE
WSHP	WATER SOURCE HEAT PUMP
WT	WATER TANK
WW	WARM WATER, WASTE WATER
WWR	WELDED WIRE REINFORCING
XDCR	TRANSDUCER
XFMR	TRANSFORMER
XMTR	TRANSMITTER
YD	YARD
YDS	YARDS
YH	YARD HYDRANT
ZS	POSITION SWITCH

NOTE:

1. THE LIST OF ABBREVIATIONS SHOWN IS A STANDARD LIST. NOT ALL ABBREVIATIONS ARE USED IN THESE DRAWINGS

CIVIL LEGEND

- BENCHMARK, CONTROL POINT, ELEVATION INDICATOR
- CONCRETE MONUMENT
- IRON PIN FOUND
- IRON PIN SET
- OPEN PIPE
- ROW RAIL
- SECTION CORNER
- CHISELED X
- AREA INTAKE
- FIRE HYDRANT
- GUY WIRE
- MAILBOX
- POWERPOLE
- CONIFEROUS TREE
- DECIDUOUS TREE
- CORNER MONUMENT
- B–INT BEEHIVE INTAKE
- TV CABLE BOX
- CO CLEAN OUT
- ELECTRIC METER
- E ELECTRIC BOX
- PHONE BOOTH
- GAS METER
- CURB INTAKE
- HANDICAP INTAKE
- LIGHT POLE
- S SANITARY MANHOLE
- MW MONITORING WELL
- POST
- RAILROAD SIGN
- SATELLITE DISH
- SIGN
- SIGN
- SOIL BORING
- TREE STUMP
- T TELEPHONE BOX
- TELEPHONE PEDESTAL
- TRAFFIC SIGNAL
- TRAFFIC SIGN
- YARD LIGHT
- BURIED VALVE

NORTH — TRUE NORTH ARROW

0 20 — 1"=20' — CIVIL SCALE BAR

- 1050 — EXISTING MAJOR CONTOUR
- 1049 — EXISTING MINOR CONTOUR
- EXISTING FENCE
- EXISTING ROW FENCE
- EXISTING GRAVEL SURFACE
- EXISTING SECTION LINE
- UGTV — EXISTING UNDERGROUND TELEVISION
- OE — EXISTING OVERHEAD ELECTRIC
- UE — EXISTING UNDERGROUND ELECTRIC
- FO — EXISTING FIBEROPTIC
- G — EXISTING GAS
- 6"SAN — EXISTING SANITARY SEWER
- 15"SS — EXISTING STORM SEWER
- UGT — EXISTING UNDERGROUND TELEPHONE
- 1041 — EXISTING MINOR CONTOUR
- 1045 — EXISTING MAJOR CONTOUR
- W — EXISTING WATER
- WS — EXISTING FLUSHING WATER
- R/W — EXISTING RIGHT OF WAY
- PL — EXISTING PROPERTY LINE
- 1041 — PROPOSED MINOR CONTOUR
- 1045 — PROPOSED MAJOR CONTOUR
- TREE PROTECTION
- PROPOSED FENCE
- PROPOSED PERMANENT EASEMENT
- PROPOSED SILT FENCE
- PROPOSED TEMPORARY EASEMENT
- PROPOSED CULVERT
- DEMOLITION
- GAS — PROPOSED GAS LINE
- NO — PROPOSED PLANT EFFLUENT WATER
- SAN — PROPOSED SANITARY SEWER
- ST — PROPOSED STORM SEWER
- FIRE — PROPOSED FIRE PROTECTION WATER
- W — PROPOSED POTABLE WATER
- IRR — PROPOSED POTABLE WATER
- PROPOSED CRUSHED STONE
- PROPOSED CONCRETE PAVING
- PROPOSED HOT–MIX ASPHALT PAVING

PRELIMINARY
NOT FOR CONSTRUCTION

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CAD FILE: J:\2016\160473\CAD\Phase-1\Dwgs\G\G.02 ABBREVIATIONS AND LEGEND			

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CITY OF NEVADA
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GENERAL
ABBREVIATIONS, LEGEND, AND SHEET INDEX

SHEET NO.
G.02

Xrefs: xgt-1-dh01; XG-00-LEGENDS

NORTH

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GENERAL
GENERAL NOTES, ALIGNMENTS, AND CONTROL

SHEET NO.
G.03

Xrefs: xgt-1-dh01

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GENERAL

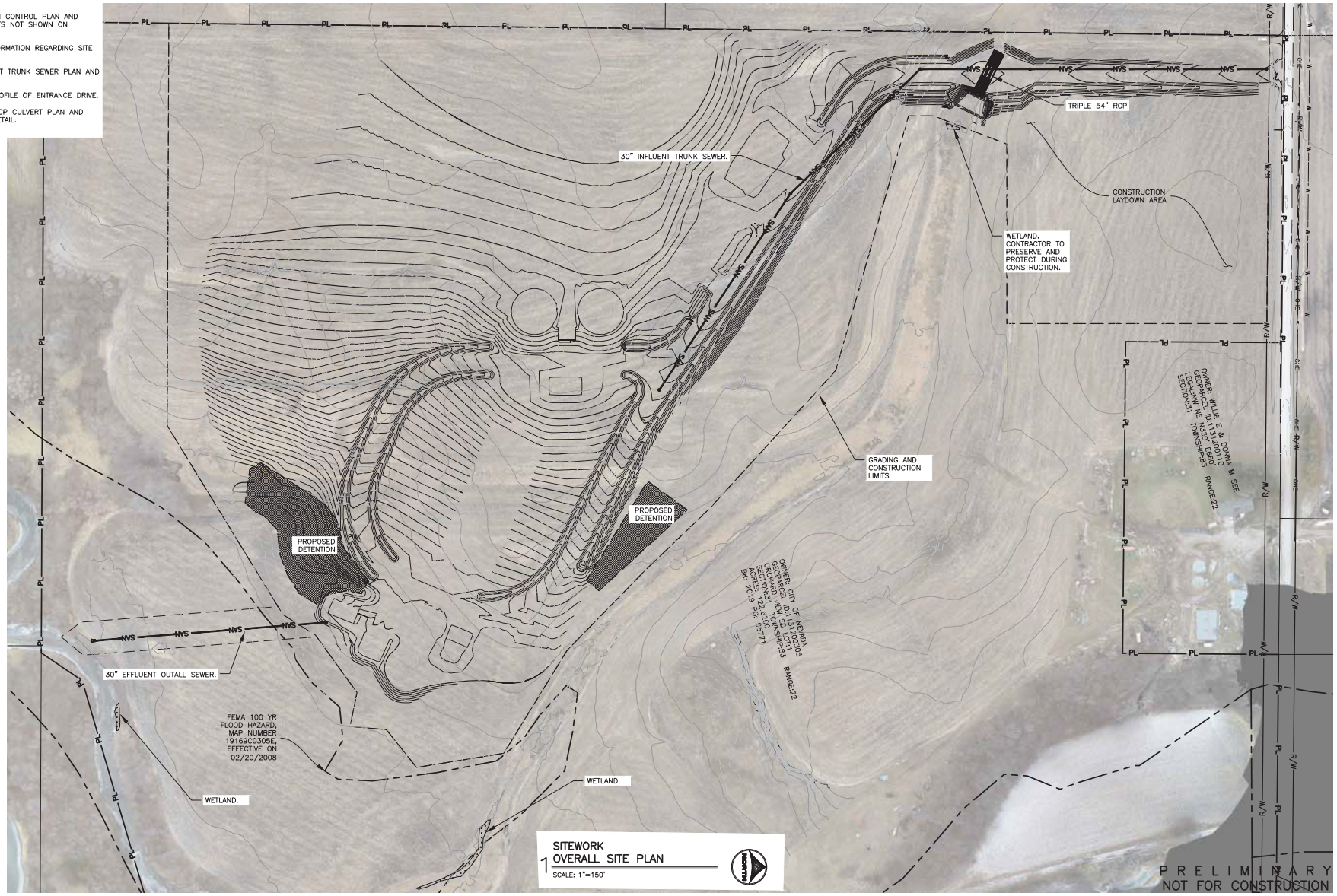
QUANTITIES AND ERI

SHEET NO.
G.04

Xrefs: xgt-1-dh01

GENERAL NOTES:

1. REFER TO C.02–C.03 FOR EROSION CONTROL PLAN AND NOTES. EROSION CONTROL ELEMENTS NOT SHOWN ON OVERALL SITE PLAN.
2. REFER TO C.04 FOR DETAILED INFORMATION REGARDING SITE GRADING.
3. REFER TO C.05–C.07 FOR INFLUENT TRUNK SEWER PLAN AND PROFILE.
4. REFER TO C.09 FOR PLAN AND PROFILE OF ENTRANCE DRIVE.
5. REFER TO C.10 FOR TRIPLE 54" RCP CULVERT PLAN AND PROFILE AND DISSIPATION BASIN DETAIL.



1 SITEWORK
OVERALL SITE PLAN
SCALE: 1"=150'

PRELIMINARY
NOT FOR CONSTRUCTION

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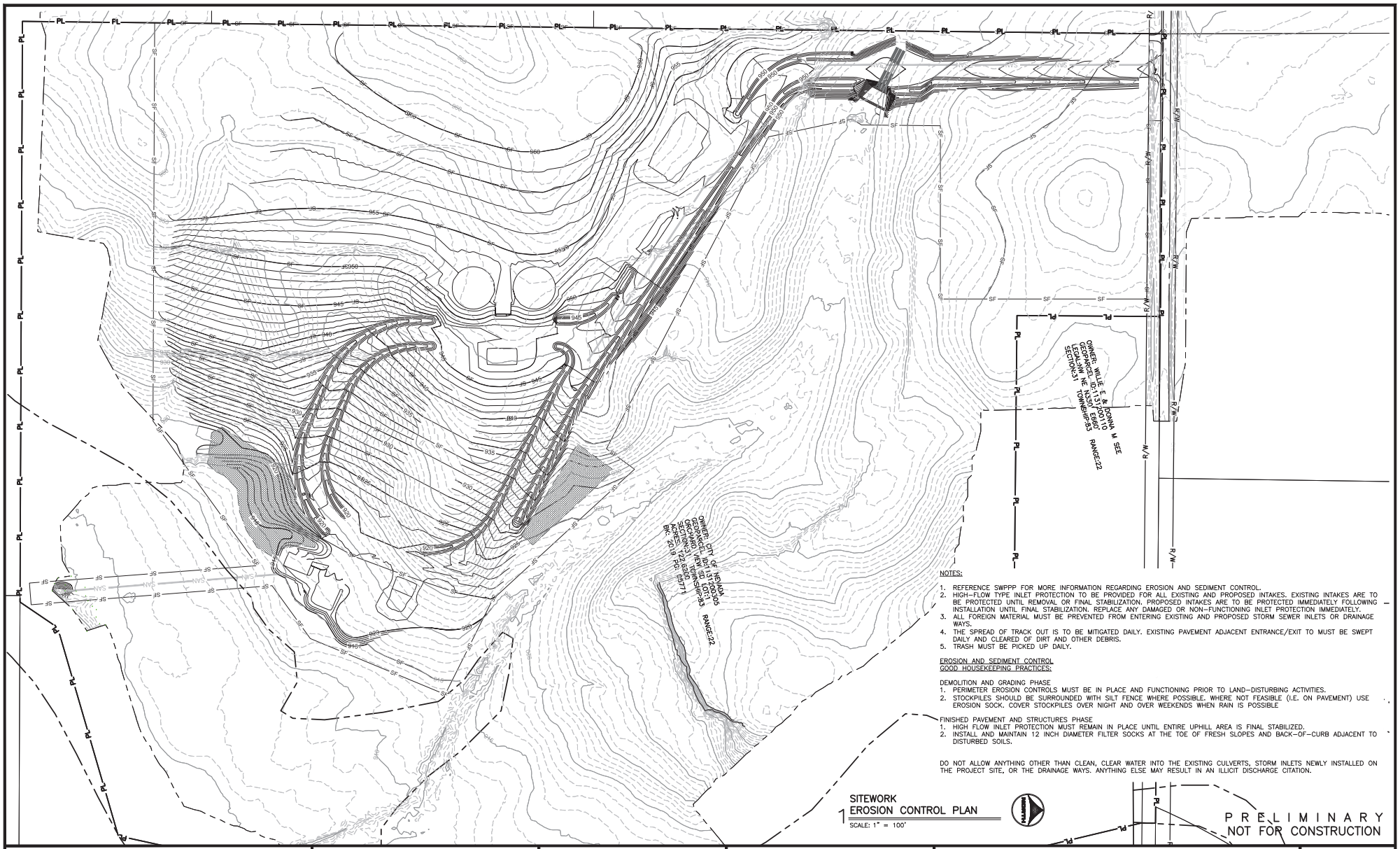
CIVIL SITEWORK
OVERALL SITE PLAN

SHEET NO.
C.01

Xrefs: xg1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XXX-IMAGE; XCS-BLDG-INDEX; XCP-PATT; XCG-CONSTRUCTION-LIMITS; XCU-STRM; XXS-GS-100YR-FLOOD; XCU-SANI; XVE-WETL-GIS



NOTES:

1. REFERENCE SWPPP FOR MORE INFORMATION REGARDING EROSION AND SEDIMENT CONTROL.
2. HIGH-FLOW TYPE INLET PROTECTION TO BE PROVIDED FOR ALL EXISTING AND PROPOSED INTAKES. EXISTING INTAKES ARE TO BE PROTECTED UNTIL REMOVAL OR FINAL STABILIZATION. PROPOSED INTAKES ARE TO BE PROTECTED IMMEDIATELY FOLLOWING INSTALLATION UNTIL FINAL STABILIZATION. REPLACE ANY DAMAGED OR NON-FUNCTIONING INLET PROTECTION IMMEDIATELY.
3. ALL FOREIGN MATERIAL MUST BE PREVENTED FROM ENTERING EXISTING AND PROPOSED STORM SEWER INLETS OR DRAINAGE WAYS.
4. THE SPREAD OF TRACK OUT IS TO BE MITIGATED DAILY. EXISTING PAVEMENT ADJACENT ENTRANCE/EXIT TO MUST BE SWEPT DAILY AND CLEARED OF DIRT AND OTHER DEBRIS.
5. TRASH MUST BE PICKED UP DAILY.

EROSION AND SEDIMENT CONTROL
GOOD HOUSEKEEPING PRACTICES:

DEMOLITION AND GRADING PHASE
1. PERIMETER EROSION CONTROLS MUST BE IN PLACE AND FUNCTIONING PRIOR TO LAND-DISTURBING ACTIVITIES.
2. STOCKPILES SHOULD BE SURROUNDED WITH SILT FENCE WHERE POSSIBLE. WHERE NOT FEASIBLE (I.E. ON PAVEMENT) USE EROSION SOCK. COVER STOCKPILES OVER NIGHT AND OVER WEEKENDS WHEN RAIN IS POSSIBLE

FINISHED PAVEMENT AND STRUCTURES PHASE
1. HIGH FLOW INLET PROTECTION MUST REMAIN IN PLACE UNTIL ENTIRE UPHILL AREA IS FINAL STABILIZED.
2. INSTALL AND MAINTAIN 12 INCH DIAMETER FILTER SOCKS AT THE TOE OF FRESH SLOPES AND BACK-OF-CURB ADJACENT TO DISTURBED SOILS.

DO NOT ALLOW ANYTHING OTHER THAN CLEAN, CLEAR WATER INTO THE EXISTING CULVERTS, STORM INLETS NEWLY INSTALLED ON THE PROJECT SITE, OR THE DRAINAGE WAYS. ANYTHING ELSE MAY RESULT IN AN ILLICIT DISCHARGE CITATION.

1 SITEWORK
EROSION CONTROL PLAN
SCALE: 1" = 100'

PRELIMINARY
NOT FOR CONSTRUCTION

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CIVIL SITEWORK
EROSION CONTROL PLAN

SHEET NO.
C.02

Xrefs: sgl-1-dh01; XCS-BASE; XCS-PARCELS; XCS-ROW; XCG-CONT-FG; XCU-SANI; XCU-STRM; XVG-CONT-FG; XVS-GIS-100YR-FLOOD; XCG-EROS-PHASE01; XCG-CONSTRUCTION-LIMITS

PRELIMINARY
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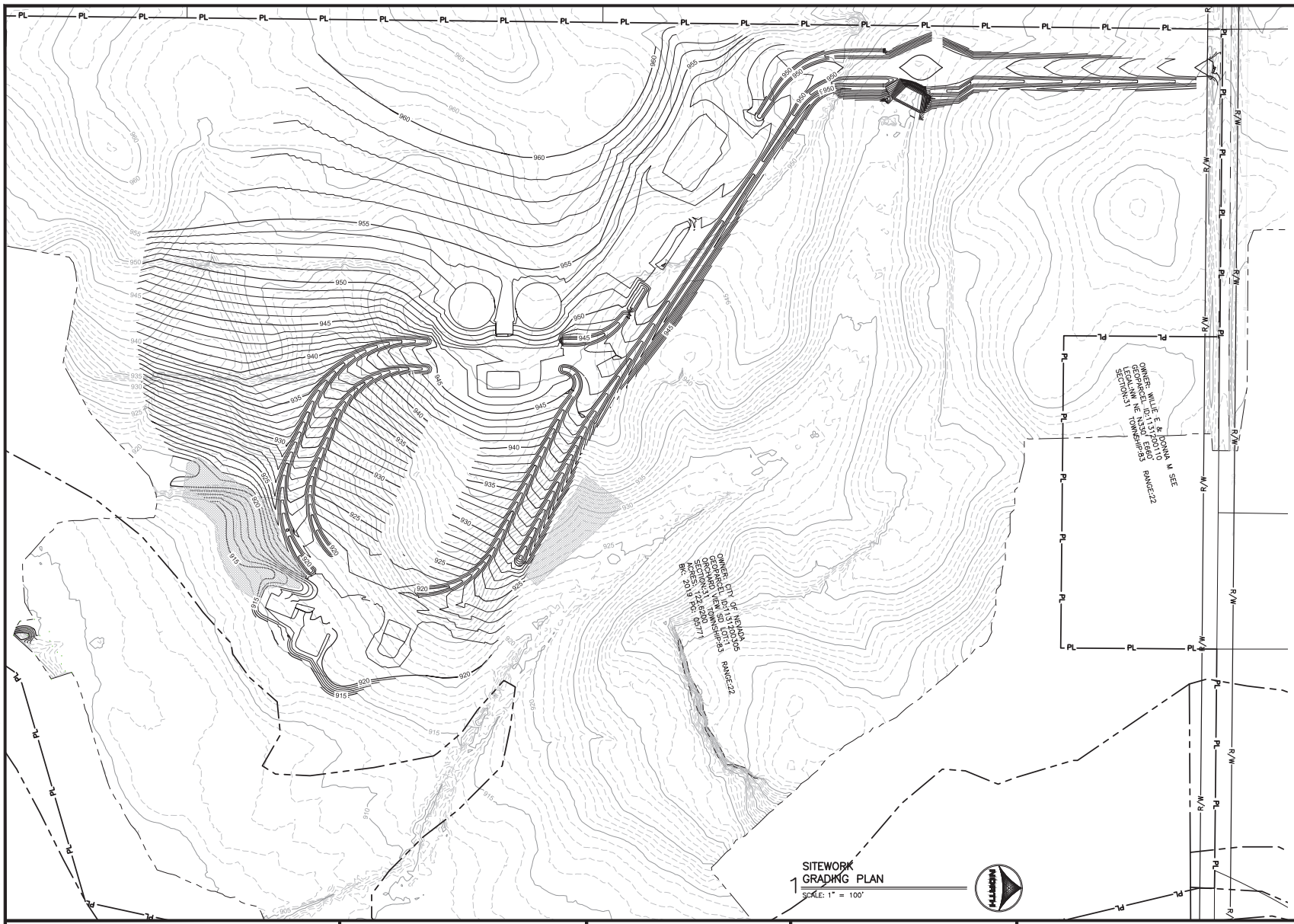
CIVIL SITEWORK
EROSION CONTROL NOTES

SHEET NO.
C.03

Xrefs: xgt-1-dh01



1 SITEWORK GRADING PLAN
SCALE: 1" = 100'

NORTH

PRELIMINARY
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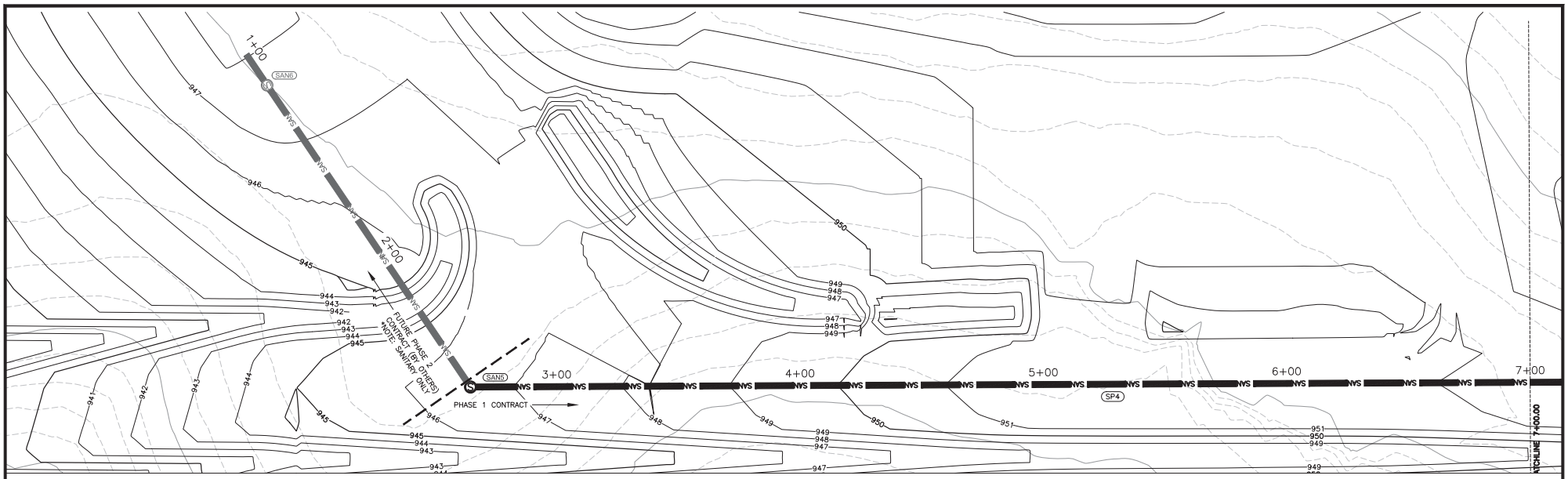
NEVADA, IOWA

CIVIL SITEWORK
GRADING PLAN

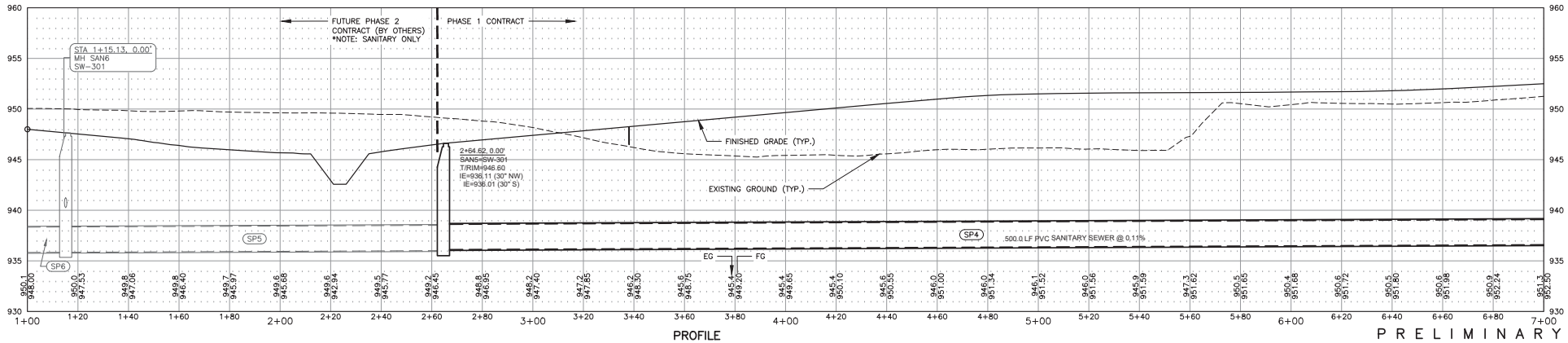
SHEET NO.
C.04

Xrefs: xgl-1-dh01; XCS-BASE; XCS-PARCELS; XCS-ROW; XCG-CONT-FG; XCU-SANI; XCU-STRM; XVG-CONT-EG; XVS-GIS-100YR-FLOOD



PLAN

SCALE: 0 20 1"=20'



PROFILE

SCALE: H:1"=20' V:1"=5'

PRELIMINARY
NOT FOR CONSTRUCTION

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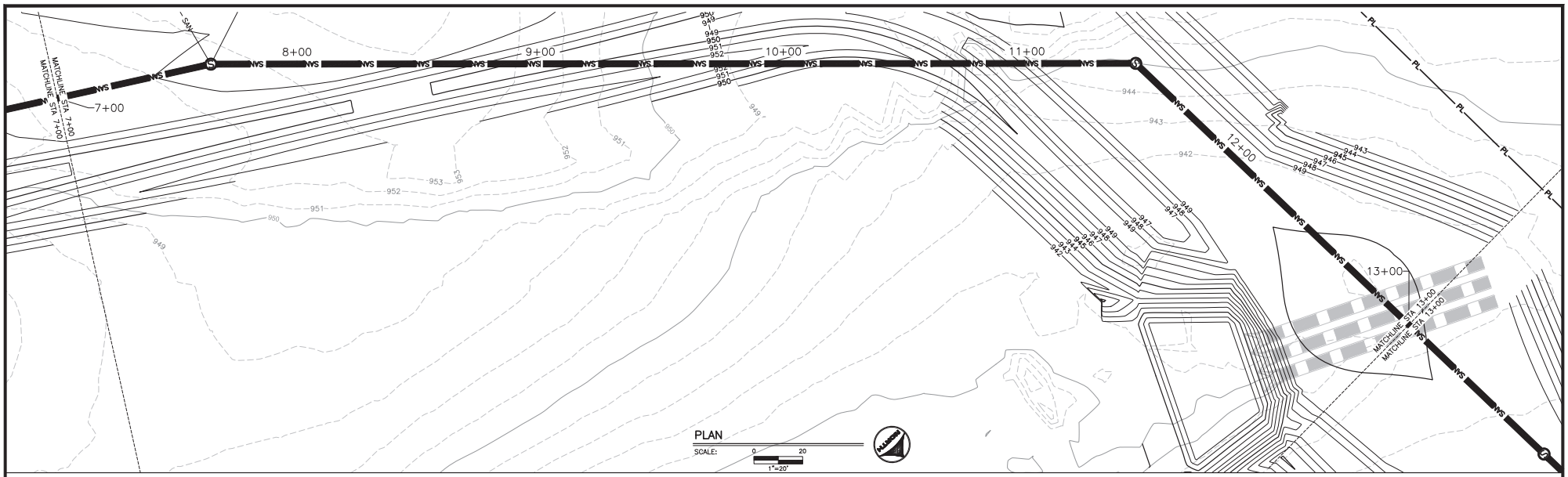
NEVADA, IOWA

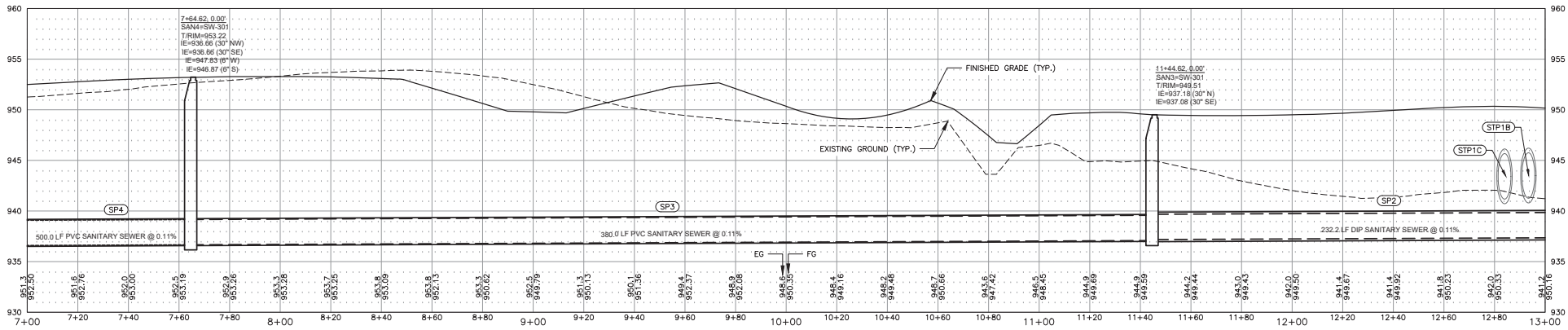
CIVIL SITEWORK

INFLUENT TRUNK SEWER PLAN AND PROFILE

SHEET NO. C.05

Xrefs: xgl-1-dh01; XCS-DSGN; XCS-BASE; XVG-CONT-F02; XCG-CONT-F02; XCP-PATT; XCT-ALIGNMENT; XCU-ELEC; XCU-STRM; XCU-WATR; XCS-210-P01; XA-210-P01; XEP-210-P01; XP-210-P01; XS-210-GR02; XS-210-P00; XS-210-S01; XCU-SANI





PROFILE

SCALE: H:1"=20' V:1"=5'

PRELIMINARY
NOT FOR CONSTRUCTION

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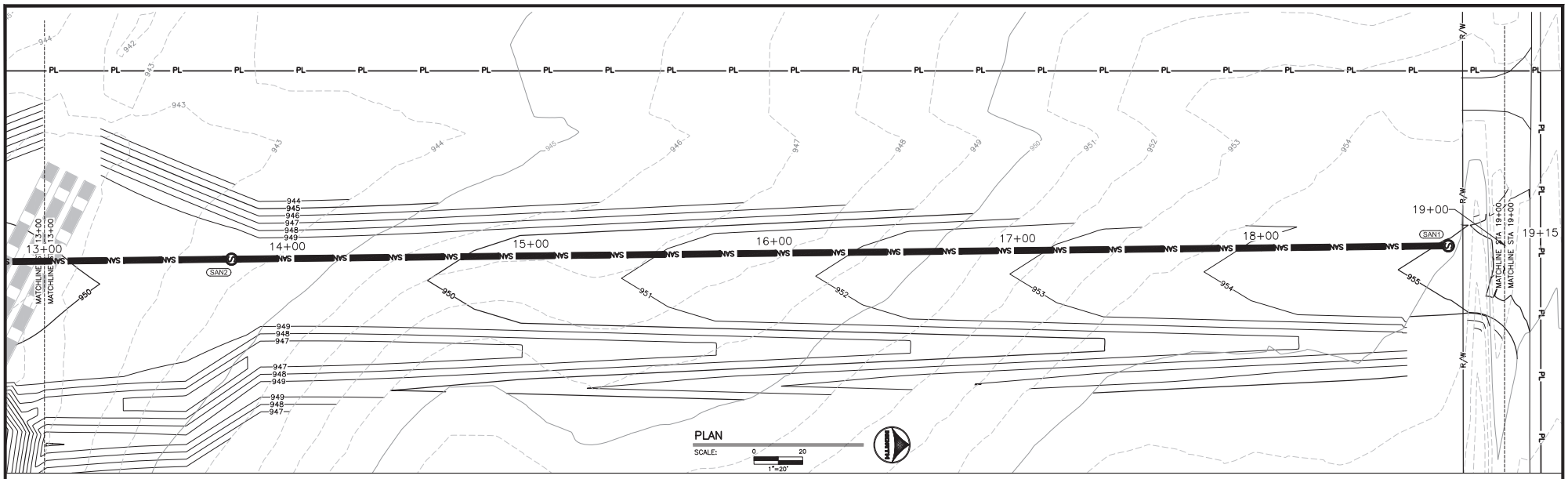
CIVIL SITEWORK

INFLUENT TRUNK SEWER PLAN AND PROFILE

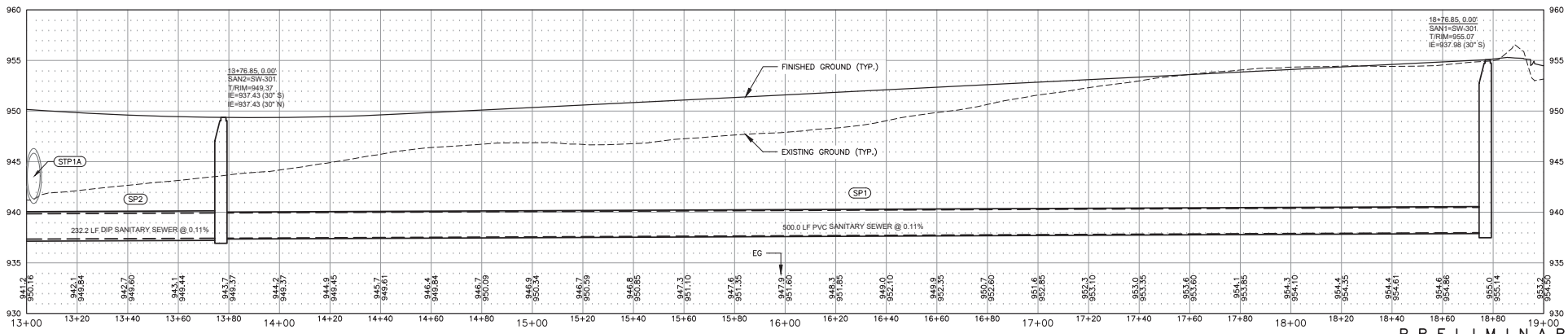
SHEET NO.
C.06

Xrefs: xgl-1-dh01; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCU-PROC; XCU-STRM; XVC-CONT-EG; XCS-CONT-FG; XCP-PATT; XCU-SANI



PLAN

SCALE: 0 20 1"=20'



PROFILE

SCALE: H:1"=20' V:1"=5'

PRELIMINARY
NOT FOR CONSTRUCTION

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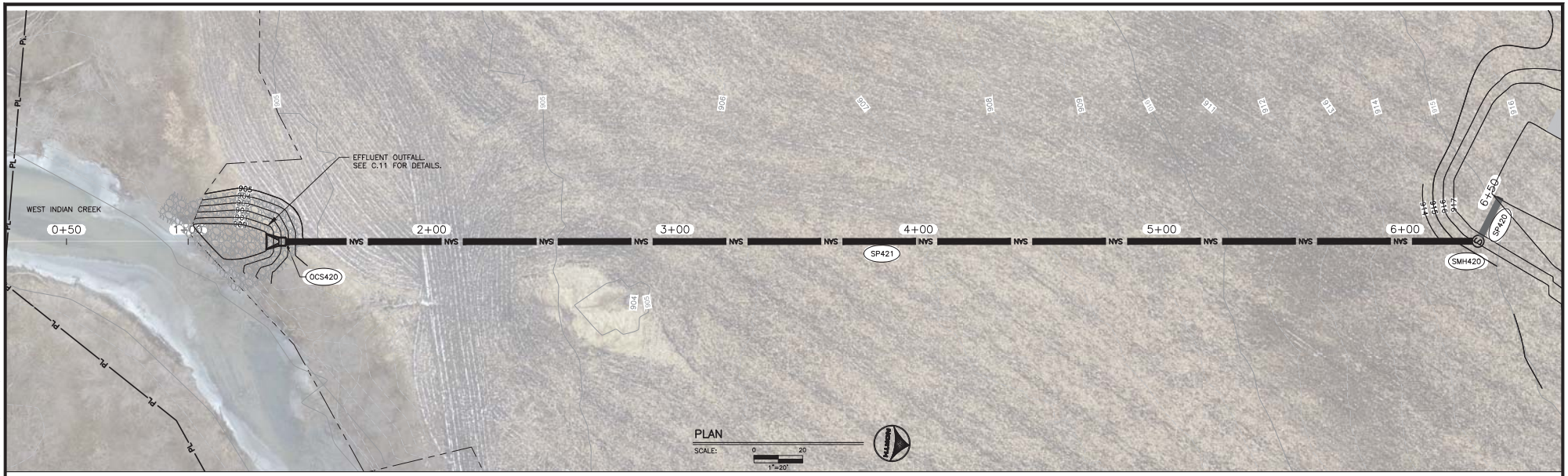
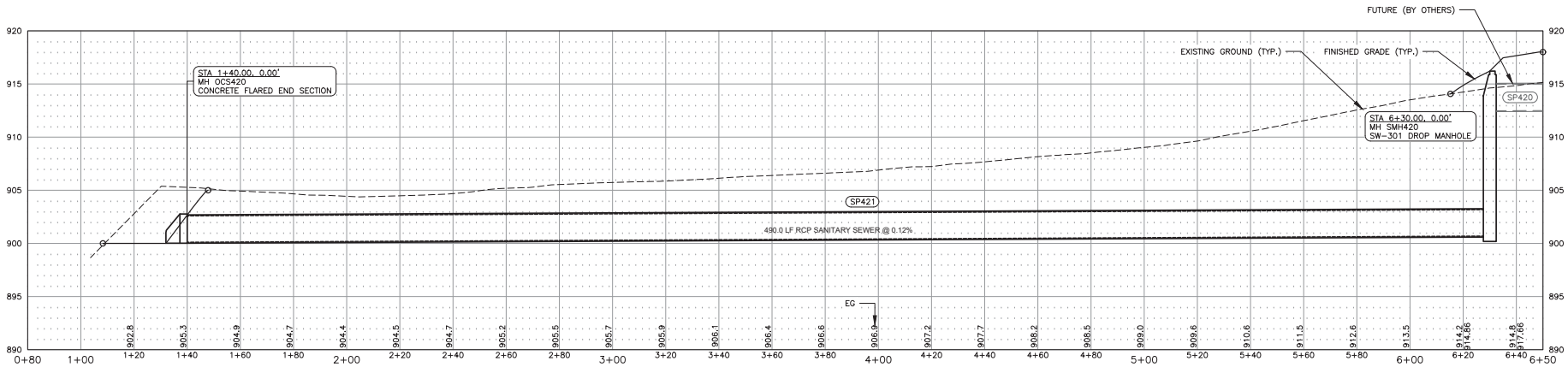
INFLUENT TRUNK SEWER PLAN AND PROFILE

SHEET NO. C.07

Xrefs: xgl-1-dh01; XCG-CONT-FG; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCU-ELEC; XCU-STRM; XCU-WATR; XVG-CONT-EG; XCU-SANI





PROFILE

SCALE: H:1"=20' V:1"=5'

PRELIMINARY
NOT FOR CONSTRUCTION

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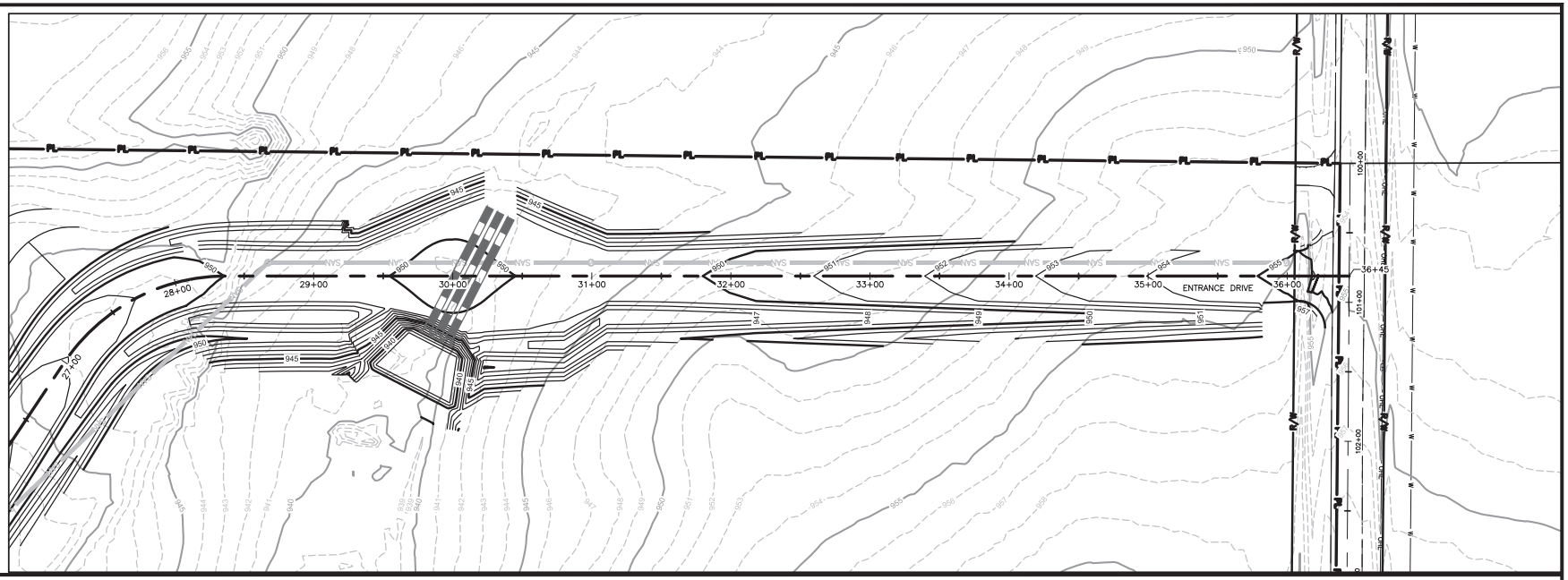
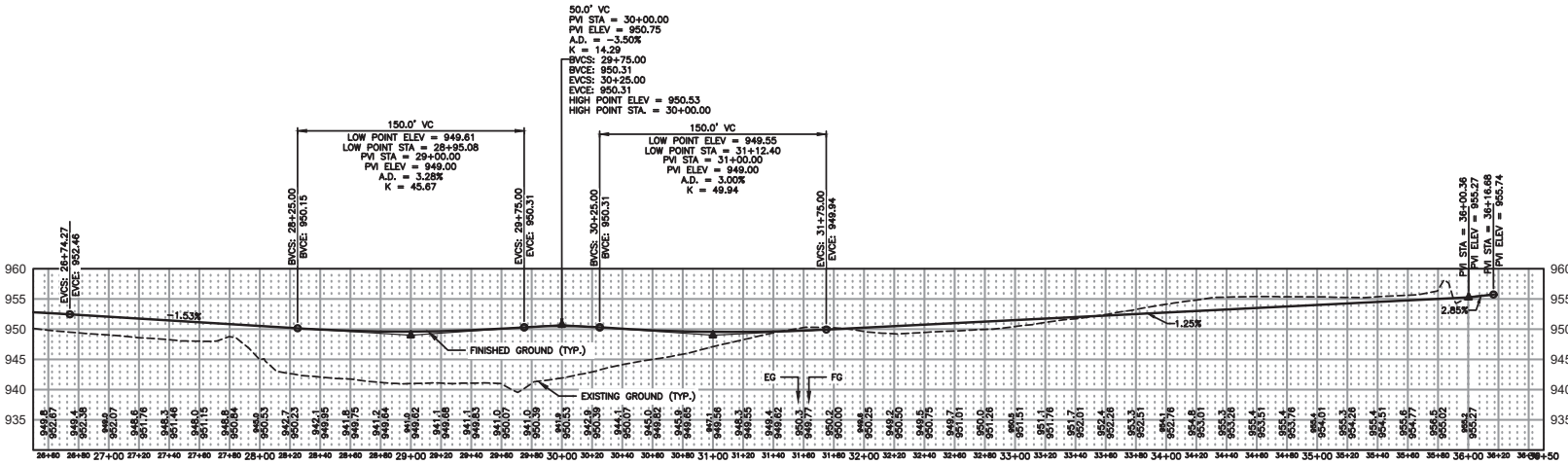
EFFLUENT OUTFALL PLAN AND PROFILE

SHEET NO.
C.08

Xrefs: xgi-1-dh01; XCG-CONT-FG; XCS-420-P01; XA-420-P01; XEP-420-P01; XS-420-GRID; XP-420-P01; XS-420-P01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCU-PROC; XCU-STRM; XCU-WATR; XVG-CONT-EG; XVI-IMAGE; XVG-CONT-EG-LIDAR; XCP-PATT





1 SITEWORK
ENTRANCE DRIVE GRADING PLAN AND PROFILE

SCALE: 1"=40'

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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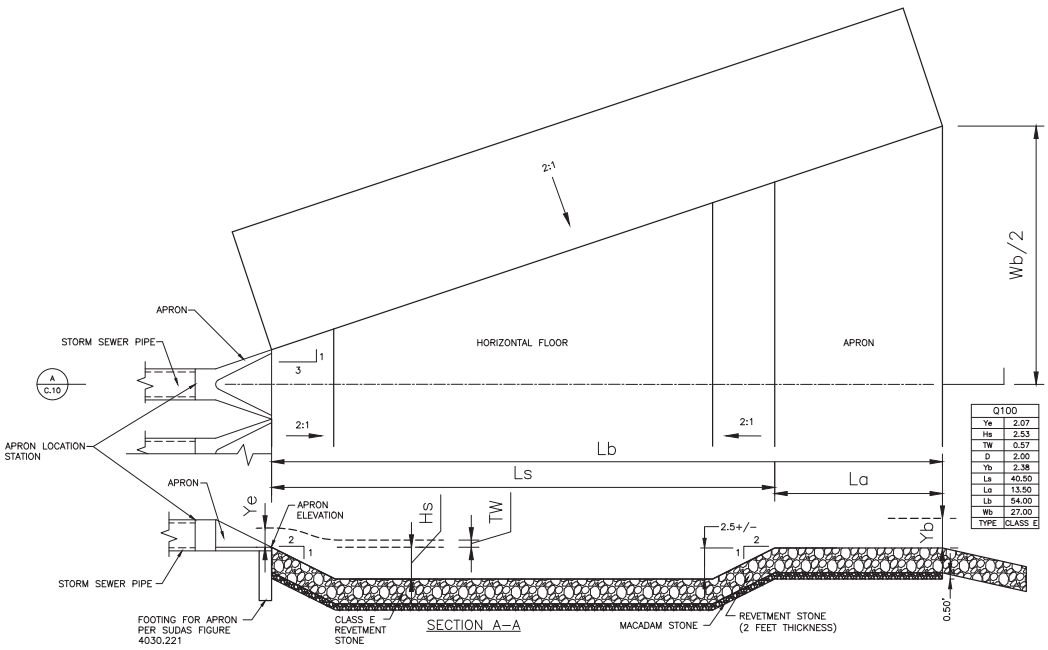
ENTRANCE DRIVE GRADING PLAN AND PROFILE

SHEET NO.
C.09

Xrefs: sgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCO-CONT-FG; XCU-ELEC; XCP-PATT; XCU-WWTR; XCU-SANI; XCU-STRM; XVG-CONT-EG; XCT-PROFILE

GENERAL NOTES:

1. ALL ENTRANCE DRIVE PIPING IS SHOWN ON THIS SHEET.
2. ALL APPLICABLE GENERAL NOTES FOUND IN THE YARD PIPING AND UTILITY PIPING SHEETS SHALL APPLY TO THE PIPING SHOWN ON THIS SHEET.



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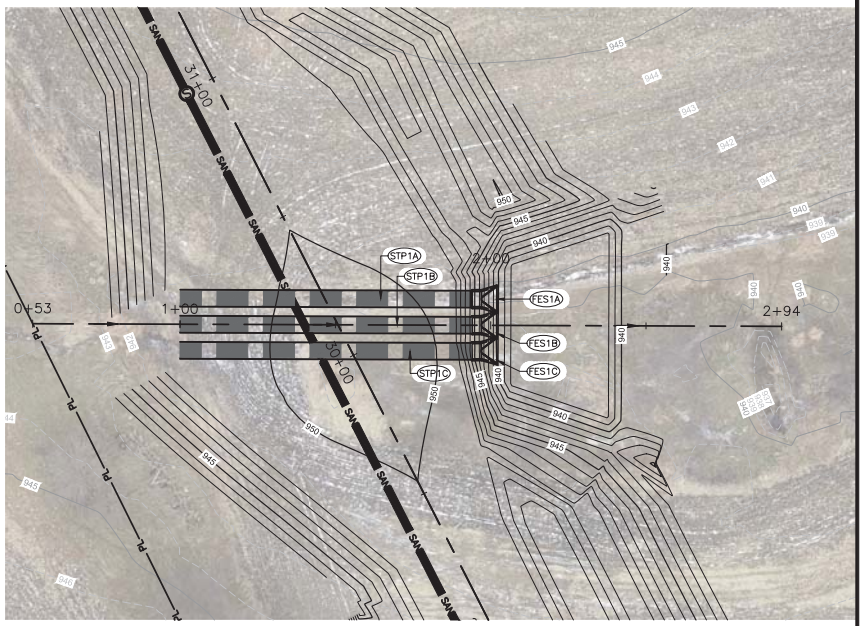
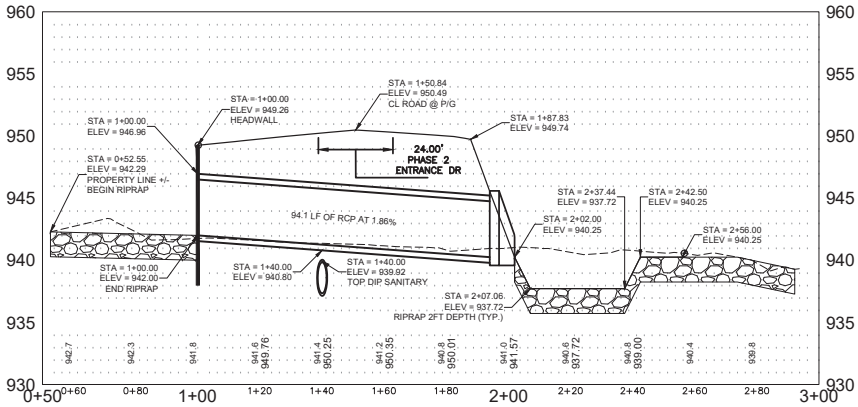
Hs	2.53
TW	0.57
D	2.00
Yb	2.38
Ls	40.50
La	13.50
Lb	54.00
Wb	27.00
TYPE	CLASS E

1 TYPICAL REVETMENT STONE BASIN

SCALE: NTS





2 SITEWORK
DRAINAGE CULVERTS PLAN AND PROFILE

SCALE: 1" = 20'

PRELIMINARY
NOT FOR CONSTRUCTION

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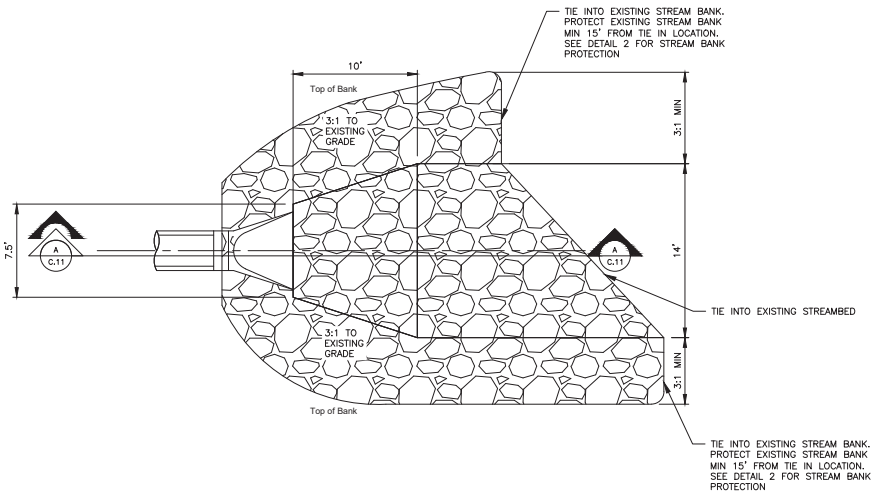
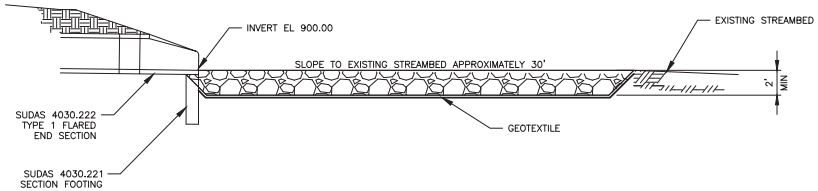
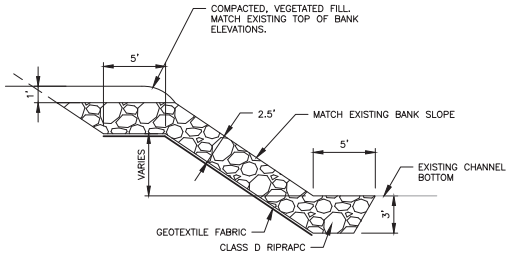
CIVIL SITEWORK
DRAINAGE CULVERTS PLAN AND PROFILE

SHEET NO.
C.10





1 EFFLUENT OUTFALL FLARED END SECTION AND RIPRAP APRON
NTS



2 TYPICAL STREAM BANK AND TOE PROTECTION
NTS

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NEVADA, IOWA

CIVIL SITEWORK
SECTIONS AND DETAILS

SHEET NO.
C.11

Xrefs: xgl-1-dh01; XCP-PATT

PHASE 2 NEVADA WASTEWATER TREATMENT FACILITY IMROVEMENTS

CITY OF NEVADA

NEVADA, IOWA

2020

CERTIFICATION

LICENSED PROFESSIONAL ENGINEER — MICHAEL J. ROTH 18424 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

MICHAEL J. ROTH, P.E. DATE
License Number: 18424
My license renewal date is December 31, 2020.
Pages or sheets covered by this seal:
G SHEETS,

LICENSED PROFESSIONAL ENGINEER — GREGORY P. BAENZIGER 09703 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

GREGORY P. BAENZIGER, P.E. DATE
License Number: 09703
My license renewal date is December 31, 2020.
Pages or sheets covered by this seal:
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LICENSED PROFESSIONAL ENGINEER — JAMES R. RASMUSSEN 14546 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

JAMES R. RASMUSSEN, P.E. DATE
License Number: 14546
My license renewal date is December 31, 2021.
Pages or sheets covered by this seal:
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LICENSED PROFESSIONAL ENGINEER — DOUGLAS A SULLIVAN 15589 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

DOUGLAS A SULLIVAN, P.E. DATE
License Number: 15589
My license renewal date is December 31, 2020.
Pages or sheets covered by this seal:
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LICENSED PROFESSIONAL ENGINEER — JOSEPH P. FRANKL 23145 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

JOSEPH P. FRANKL, P.E. DATE
License Number: 23145
My license renewal date is December 31, 2020.
Pages or sheets covered by this seal:
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LICENSED ARCHITECT — DAVID J. HARRISON 2287

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge.
I am a duly licensed architect under the laws of the State of Iowa.

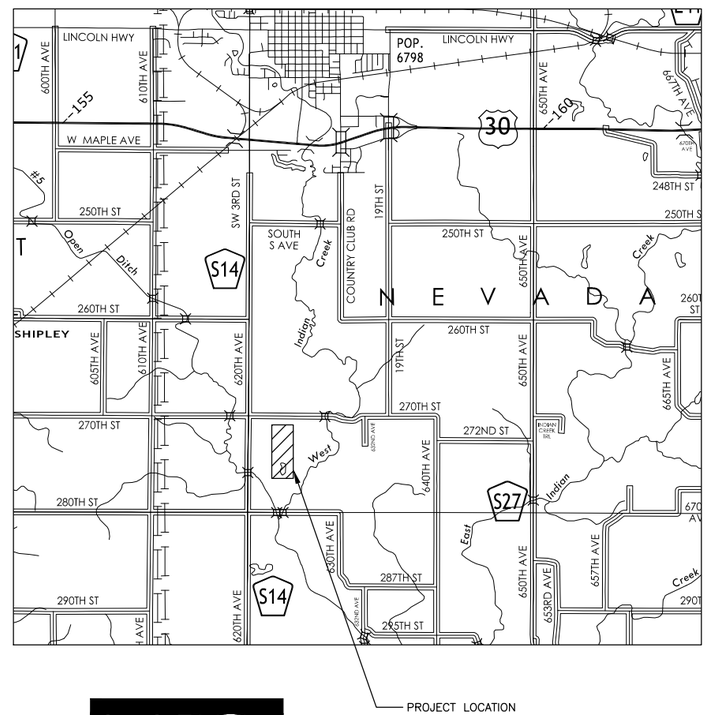
DAVID J. HARRISON, A.I.A. DATE
License Number: 2287
My license renewal date is June 30, 2022.
Pages or sheets covered by this seal:
ALL A SHEETS

LICENSED PROFESSIONAL ENGINEER — ANDREW R. VENZKE 17764 — IOWA

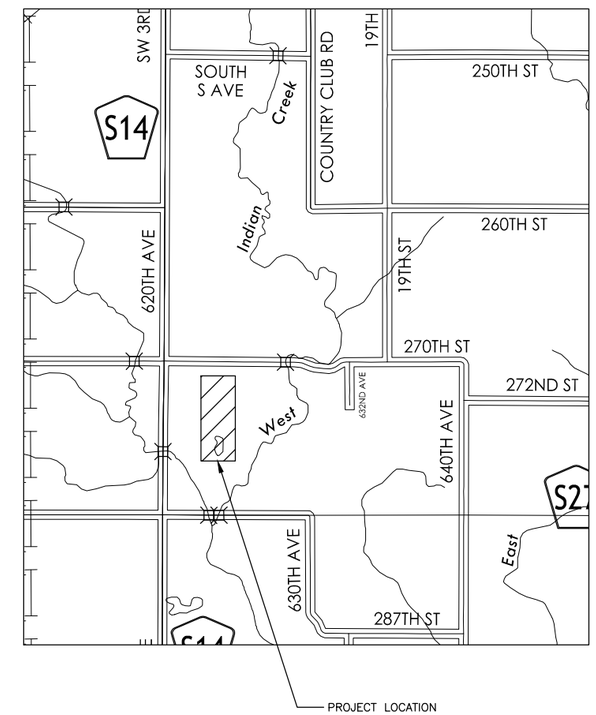
I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

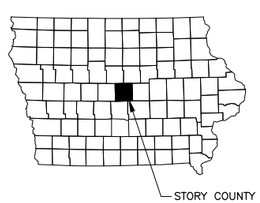
ANDREW R. VENZKE, P.E. DATE
License Number: 17764
My license renewal date is December 31, 2021.
Pages or sheets covered by this seal:
-

VICINITY MAP



LOCATION MAP





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GENERAL
COVER SHEET

SHEET NO.
G.01

Xrefs: xgt-1-dh01; story-co

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P.361	SECTIONS
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S.423	SECTIONS
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S.425	SECTIONS
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P.423	UV DISINFECTION SECTIONS
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S.522	SECTIONS
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P.521	LOWER LEVEL PLAN
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S.550	LOWER LEVEL AND OPERATING PLANS
S.551	ROOF PLAN
S.552	SECTIONS
P.550	LOWER AND OPERATING LEVEL PLANS
P.551	SECTIONS
M.550	LOWER LEVEL PLUMBING AND HVAC PLAN
M.551	OPERATING LEVEL PLUMBING AND HVAC PLAN
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E.551	LOWER AND OPERATING LEVEL POWER PLAN
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P.571	SECTIONS
M.570	LOWER AND OPERATING LEVEL HVAC PLAN
E.570	LOWER AND OPERATING LEVEL LIGHTING PLANS
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A.603	WALL DETAILS
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S.605	DETAILS
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E.603	ONE–LINE DIAGRAMS
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E.605	DETAILS
E.606	DETAILS
E.607	DETAILS
E.608	DETAILS
E.609	DETAILS
E.610	DETAILS
E.611	SCHEDULES
E.612	SCHEDULES
E.613	SCHEDULES
E.614	SCHEDULES
E.615	SCHEDULES
E.616	CABLE SCHEDULES
E.617	CABLE SCHEDULES
E.618	CABLE SCHEDULES
E.619	CABLE SCHEDULES
E.620	CABLE SCHEDULES

PRELIMINARY
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GENERAL
SHEET INDEX

SHEET NO.
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ABBREVIATIONS

@	AT
A	AMPS, AMPERES
AAV	AUTOMATIC AIR VENT
AB	ANCHOR BOLT
AC	ALTERNATING CURRENT
ACC	ASPHALTIC CEMENT CONCRETE
ACT	ACOUSTIC CEILING TILE
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR, AIR DRYER
ADP	AUTO DIALER PNL
ADH	ADHESIVE
A/E	ARCHITECTURAL / ENGINEERING FIRM
AF	AMPERE FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY
AFG	ABOVE FINISHED GRADE
AH	ACCESS HATCH
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CAPACITY
ALT	ALTERNATE
ALUM, AL	ALUMINUM
AMB	AMBIENT
ANCH	ANCHOR
ANOD	ANODIZED
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH	ARCHITECT, ARCHITECTURAL
AS	AIR SEPARATOR
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
B/	BOTTOM OF, BACK OF
B/B	BACK TO BACK (OF CURBS)
BBH	BASEBOARD HEATER
BC	BARE COPPER
B/C	BACK OF CURB
BD BM	BOND BEAM
BDD	BACKDRAFT DAMPER
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTOR, BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BLK	BLOCK
BOD	BOTTOM OF DUCT, BIOLOGICAL OXYGEN DEMAND
BOP	BOTTOM OF PIPE
BM	BENCH MARKER
BOT	BOTTOM
BOW	BOTTOM OF WALL
BRG	BEARING
BRK	BRICK
BTU	BRITISH THERMAL UNIT
BTUH	BTU PER HOUR
BTWN	BETWEEN
BV	BALL VALVE
C	CONDUIT, CELSIUS, C STRUCTURAL SHAPE
CAP	CAPACITY
CB	CIRCUIT BREAKER
CC	COILING COIL, CONSTRUCTION CASTING
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CONCRETE HARDENER
CI	CAST IRON
CIP	CAST IN PLACE, CLEAN IN PLACE, CAST IRON PIPE
CJ	CONTROL OR CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTER LINE
CLG	CEILING, COOLING
CLR	CLEAR, CLEARANCE
CMPR	COMPRESSOR
CMU	CONCRETE MASONRY UNIT
CND	CONDENSATE
CO	CLEAN OUT
COL	COLUMN
COMP	COMPRESSION
CONC	CONCRETE
COND	CONDENSER, CONDUIT
CONT	CONTINUE (OUS)
CONTR	CONTRACTOR
COORD	COORDINATE
COP	COEFFICIENT OF PERFORMANCE
CORP	CORPORATION
CP	CORNER POINT
CPT	CONTROL POWER TRANSFORMER, CARPET
CPVC	CHLORINATED POLYVINYL CHLORIDE
CRS	COURSES
CT	CURRENT TRANSFORMER
CTRS	CENTERS
CU	CONDENSING UNIT, COPPER
CU FT	CUBIC FEET
CU IN	CUBIC INCH
CW	CHILLED WATER
CWP	CONDENSER WATER PUMP
CY	CUBIC YARD
D	DECANT
DB	DRY BULB TEMPERATURE, DIRECT BURIED
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DG	DOOR GRILLE
DGS	DIGESTER SLUDGE
DI	DUCTILE IRON
DIA,Ø	DIAMETER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DL	DEAD LOAD
DN	DOWN
DP	DEWPOINT TEMPERATURE
DPR	DAMPER
DRN	DRAIN
DS	DOWN SPOUT
DTL	DETAIL(S)
DWG	DRAWING(S)
DWL	DOWEL
DX	DIRECT EXPANSION
E	EQUIPMENT, EASTING
EA	EACH, EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
ECC	ECCENTRIC
ECP	ENVIRONMENTAL CONTROL PANEL
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN, EACH FACE
EFF	EFFICIENCY, EFFLUENT
EG	EXHAUST GRILLE, EQUIPMENT GENERATOR
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBED	EMBEDMENT
ENCL	ENCLOSURE
ENG	ENGINEER
EP	EXPLOSION PROOF, EPOXY PAINT
EQ, EQUIP	EQUAL, EQUIPMENT
EQMT	EQUIPMENT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
ETM	ELAPSED TIME METER
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY EACH FACE
EWT	ENTERING WATER TEMPERATURE
EXIST	EXISTING
EXP	EXPANSION
EXP MAT	EXPANSION MATERIAL
EXT	EXTERIOR, EXTERNAL
F	DEGREES FAHRENHEIT, FLUORIDE
FA	FACE AREA, FREE AREA
FAB	FABRICATE(D)
FAC	FLANGED ADAPTOR COUPLING
FB	FLAT BAR, FLOOR BEAM
FC	FAN COIL UNIT, FLEXIBLE CONNECTION
FCA	FLANGE COUPLING ADAPTOR
FD	FIRE DAMPER, FLOOR DRAIN
FDGGF	FREE DRAINING GRADED GRANULAR FILL
FDN	FOUNDATION
FE	FLANGED END, FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF	FINISHED FLOOR
FG	FLOOR GRILLE
FH	FIRE HYDRANT
FIL	FILTRATE
FIN	FINISH
FIN FLR	FINISHED FLOOR
FL	FLOW LINE, FLUORESCENT
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FM	FORCEMAIN
FO	FIBER OPTICS
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE
FOM	FACE OF MASONRY
FOS	FACE OF STEEL
FOT	FLAT ON TOP
FOW	FACE OF WALL
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FR	FLOOR REGISTER
FRP	FIBERGLASS REINFORCED PLASTIC OR PNL
FS	FLOOR STAND
FT	FEET, FLOW TRANSMITTER
FTG	FOOTING
FV	FIELD VERIFY
G	GATE, GROUND
GA	GAUGE, GAGE
GAL	GALLONS
GALV	GALVANIZED
GB	GYPSUM BOARD
GC	GAS CHROMATOGRAPH (FLOW COMPUTER)
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPT
GFR	GROUND FAULT RELAY
GFS	GROUND FAULT SLAVE (PROTECTED UPSTREAM)
GL	GLASS
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRTG	GRATING
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
GYP	GYPSUM
HB	HOSE BIBB
HC	HEATING COIL, HANDICAP (PED)
HCAP	HANDICAP (PED)
HD	HEAD
HDPE	HIGH DENSITY POLYETHYLENE
HDR	HEADER
HG	MERCURY
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HM	HOLLOW METAL
HMA	HOT MIX ASPHALT
HOA	HAND OFF AUTOMATIC
HOR	HORIZONTAL
HP	HORSEPOWER, HIGH POINT
HPG	HIGH PRESSURE GAS
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSGL	HEAT STRENGTHENED GLASS
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HU	HUMIDIFIER
HVAC	HEATING, VENTILATING, AIR CONDITIONING
HW	HOT WATER
HWC	HOT WATER RECIRCULATED
HWP	HEATING WATER PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWUH	HOT WATER UNIT HEATER
HX	HEAT EXCHANGER
HZ	HERTZ
IBC	INTERNATIONAL BUILDING CODE
IFC	INTERNATIONAL FIRE CODE
IPC	INTERNATIONAL PLUMBING CODE
IMC	INTERNATIONAL MECHANICAL CODE
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
I/F, IF	INSIDE FACE
IN	INCHES
INC	INCANDESCENT
INF	INFLUENT
INSUL	INSULATION
INT	INTERIOR
INVT	INVERT
JB	JUNCTION BOX
JS	JANITOR SINK
JT, JNT	JOINT
K	STRUCTURAL BAR JOIST SHAPE
KCMIL	THOUSAND CIRCULAR MILS
KVA	1,000 VOLT AMPS
kW	1,000 WATT
KWH	KILOWATT – HOUR
L	LOUVER, ANGLE
LA	LIGHTNING ARRESTOR
LAB	LABORATORY
LAP	LEVEL ALARM PNL
LAT	LEAVING AIR TEMP, LATENT, LATITUDE
LAV	LAVATORY
LB(S)	POUND(S)
LD	LINEAR DIFFUSER
LF	LINEAR FEET
LFG	LANDFILL GAS
LFH	LANDFILL GAS (HIGH PRESS)
LFL	LANDFILL GAS (LOW PRESS)
LHR	LATENT HEAT RATIO
LIN	LINEAR
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LOS	LOCKOUT STOP PUSH–BUTTON
LP	LOW POINT
LPG	LOW PRESSURE GAS
LRA	LOCKED ROTOR AMPS
LS	LIMIT SWITCH, LIFT STA.
LT	LEVEL TRANSDUCER
LTG	LIGHTING
LWT	LEAVING WATER TEMPERATURE
M	METER
MA	MILLIAMPERES
MAINT	MAINTENANCE
MAS	MASONRY
MAU	MAKEUP AIR UNIT
MAX	MAXIMUM
MBH	ONE THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MG	MILLION GALLON
MGD	MILLION GALLONS PER DAY
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIRR	MIRRORED
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MK	MARK
MM	MAG METER
MO	MASONRY OPENING
MOCP	MAXIMUM OVERCURRENT PROTECTION
MPH	MILES PER HOUR
MTD	MOUNTED
MTL	METAL
MV	MUD VALVE
MW	MASONRY WALL
N	NEUTRAL, NORTHING
NA, N/A	NOT APPLICABLE
NC	NOISE CRITERIA, NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEG	NEGATIVE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NL	NIGHTLIGHT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPT	NATIONAL PIPE THREAD
NPS	NOMINAL PIPE SIZE
NRP	NON–REMOVABLE PIN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAT	OUTDOOR AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OD	OUTSIDE DIAMETER, OVERFLOW DRAIN
OED	OPEN END DUCT
O/F, OF	OUTSIDE FACE, OPEN FACE, OVERFLOW
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
OL	MOTOR OVERLOAD CONTACTS
OPNG	OPENING
OPP	OPPOSITE
OSB	ORIENTED STRAND BOARD
P	POLE, PUMP
PART	PARTIAL
PB	PUSHBUTTON, PULL BOX, PANEL BOARD
PBD	PARALLEL BLADE DAMPER
PC	PRECAST CONCRETE
PCC	PORTLAND CEMENT CONCRETE
PCF	POUNDS PER CUBIC FOOT
PCST	PRECAST
PD	PRESSURE DROP
PE	PLAIN END, POLYETHYLENE
PERF	PERFORATED
PERP	PERPENDICULAR
PG	PROFILE GRADE
PH	PHASE
PJF	PREFORMED JOINT FILLER
PL	PLATE, PURGE LINE
PLWD	PLYWOOD
PNL	PANEL
POJ	PUSH ON JOINT
PPM	PARTS PER MILLION
PR	PAIR
PROJ	PROJECTION
PRV	PRESSURE REDUCING VALVE
PS	PRESSURE SWITCH, PUMP STA.
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	PSI, ABSOLUTE
PSIG	PSI, GAGE
PSW	PLANT SERVICE WATER
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PT	POTENTIAL TRANSFORMER, PAINT, PRESSURE TANK
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
R	RISER(S), RADIUS
RA	RETURN AIR
RAD	RADIUS
RAS	RETURN ACTIVATED SLUDGE
RB	ROOF BEAM, RESILIENT BASE
RCP	REINFORCED CONCRETE PIPE
RCMD	RECOMMENDED
RD	ROOF DRAIN
RECIRC	RECIRCULATE
RED	REDUCER
REF	REFERENCE
REINF	REINFORCE(ING)
REQ(D)	REQUIRE(D)
REV	REVISED
RF	RETURN FAN, RESILIENT FLOORING
RG	RETURN GRILLE
RH	RELIEF HOOD, RELATIVE HUMIDITY
RHC	REHEAT COIL
RJ	RESTRAINED JOINT
RM	ROOM
RO	ROUGH OPENING, REVERSE OSMOSIS
ROW	RIGHT OF WAY
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER, RAILROAD
RS	RAW SEWAGE
RTU	ROOFTOP UNIT
RW	RESILIENT WEDGE
S&F	SECURITY & FIRE PNL
SA	SUPPLY AIR
SAN	SANITARY, SANITARY SEWER
SAT	SATURATION
SB	SOIL BORING
SCFM	CFM, AT STANDARD CONDITIONS
SCH	SCHEDULE
SD	SMOKE DAMPER
SEER	SEASONAL ENERGY EFFICIENCY RATIO EFFICIENCY RATIO
SEN	SENSIBLE
SF	SUPPLY FAN, SQUARE FOOT
SG	SUPPLY GRILLE, SLIDE/SLUICE GATE
SH	SHIELDED, SHOWER, SHEET
SIM	SIMILAR
SJ	SOFT JOINT, SAW CUT JOINT
SHR	SENSIBLE HEAT RATIO
SHT	SHEET
SIM	SIMILAR
SK	SINK
SL	SNOW LOAD
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SP	STATIC PRESSURE, SUMP PUMP, SPACE(S)
SPEC	SPECIFICATION
SQ	SQUARE
SQ FT	SQUARE FEET
SR	SUPPLY REGISTER
SS	STAINLESS STEEL
SSH	SAFETY SHOWER
SSL	SECONDARY SLUDGE
SST	SATURATED SUCTION TEMPERATURE
STC	SOUND TRANSMISSION CLASS
STD	STANDARD
STL	STEEL
SUCT	SUCTION
SW	SWITCH, SAMPLING
T	TEMPERATURE, THREAD
T&B	TOP AND BOTTOM
TACH	TACHOMETER
TB	TERMINAL BOARD
TBS	THICKENED BLENDED SLUDGE
TCP	TEMP CONTROL PNL
TD	TEMPERATURE DIFFERENCE
TDH	TOTAL DYNAMIC HEAD
TEL	TELEPHONE
TEMP	TEMPERATURE, TEMPORARY, TEMPERED
TFR	TRICKLING FILTER RECYCLE
TGL	TEMPERED GLASS
TMV	THERMOSTATIC MIXING VALVE
T/	TOP OF
TOC	TOP OF CONCRETE
TOD	TOP OF DUCT
TONS	TONS OF REFRIGERATION
TOS	TOP OF STEEL
TOW	TOP OF WALL
TP	TWISTED PAIR
TR	TREAD(S)
TSG	TEMPERED SAFETY GLASS
TSP	TOTAL STATIC PRESSURE, TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD
TSTAT	THERMOSTAT
TWAS	THICKENED WASTE ACTIVATED SLUDGE
TYP	TYPICAL
U	HEAT TRANSFER COEFFICIENT
UBC	UNIFORM BUILDING CODE
UFC	UNIFORM FIRE CODE
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND TELEPHONE
UH	UNIT HEATER
UMC	UNIFORM MECHANICAL CODE
UNO	UNLESS NOTED OTHERWISE
UPC	UNIFORM PLUMBING CODE
UR	URINAL
V	VALVE, VENT, VOLTS
VA	VOLT – AMPERES
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VB	VINYL BASE, VALVE BOX, VAPOR BARRIER
VC	VICTAULIC COUPLING
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE
VD	VOLUME DAMPER
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VLV	VALVE
VOL	VOLUME
VS	VARIABLE SPEED
VTR	VENT THRU ROOF
W	WATER, WATTS, WIDE FLANGE, WINDOW
W/	WITH
W/O	WITHOUT
WAP	WALL PIPE
WAS	WASTE ACTIVATED SLUDGE
WB	WET BULB
WC	WATER CLOSET, WATER COLUMN, WATER COOLER
WD	WOOD, WATER DISTILLED
WF	WIDE FLANGE
WG	WATER GAUGE
WH	WATER HEATER, WALL HYDRANT
WNDW	WINDOW, WINDOWS
WL	WIND LOAD
WP	WORK POINT, WEATHERPROOF, WATER PROOF
WS	WALL SLEEVE, WATERSTOP, WATER SURFACE
WSV	WALL SLEEVE
WSHP	WATER SOURCE HEAT PUMP
WT	WATER TANK
WW	WARM WATER, WASTE WATER
WWR	WELDED WIRE REINFORCING
XDCR	TRANSDUCER
XFMR	TRANSFORMER
XMTR	TRANSMITTER
YD	YARD
YDS	YARDS
YH	YARD HYDRANT
ZS	POSITION SWITCH

NOTE:

1. THE LIST OF ABBREVIATIONS SHOWN IS A STANDARD LIST. NOT ALL ABBREVIATIONS ARE USED IN THESE DRAWINGS

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GENERAL

ABBREVIATIONS

SHEET NO.
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Xrefs: xgt-1-dh01

	INITIAL CONDITIONS	DESIGN CONDITIONS
DESIGN YEAR	2018	2044
POPULATION SERVED	6,798	8,764
100-YR FLOOD ELEVATION		910.00

PROJECTED FLOW

AVERAGE WET WEATHER, MGD	2.382	3.02
MAXIMUM DAY, MGD	5.219	6.13
PEAK HOUR, MGD	NA	8.23

PROJECTED LOADINGS

	INITIAL CONDITIONS		DESIGN CONDITIONS	
	AVERAGE DAY	MAX DAY	AVERAGE DAY	MAX DAY
BOD, LBS/DAY	3,114	5,287	6,692	12,130
TOTAL SUSPENDED SOLIDS, LBS/DAY	2,822	5,976	4,300	7,978
TOTAL KJELDAHL NITROGEN, LBS/DAY	467	762	869	1,491
TOTAL NITROGEN , LBS/DAY	515	719	879	1,501
TOTAL PHOSPHORUS , LBS/DAY	160	205	309	459

FINAL EFFLUENT DISCHARGE PERMIT LIMITS

	AVERAGE MONTH	MAX 7 DAY
CARBONACEOUS BOD, MG/L,	25	40
LBS/DAY	630	1,007
TOTAL SUSPENDED SOLIDS, MG/L,	30	45
LBS/DAY	755	1,133

FINAL EFFLUENT DISCHARGE PERMIT LIMITS

	AVERAGE		MAXIMUM	
AMMONIA-NITROGEN				
JANUARY	3.5	15.2	87.6	382.8
FEBRUARY	4.1	14.2	101.6	357.8
MARCH	3.5	14.7	87.5	370.1
APRIL	1.6	15.7	39.2	395.7
MAY	1.8	15.2	44.7	382.7
JUNE	1.4	12.7	33.7	292.2
JULY	1.0	8.8	25.8	199.0
AUGUST	1.0	8.2	24.5	186.4
SEPTEMBER	1.1	11.3	27.2	256.9
OCTOBER	1.6	15.7	40.0	395.7
NOVEMBER	2.4	14.7	59.7	370.1
DECEMBER	2.6	16.0	63.6	402.2

E. COL, ORG/100ML	211[1]
TOTAL NITROGEN (ANNUAL AVG), MG/L	10.0
TOTAL PHOSPHORUS (ANNUAL AVG), MG/L	1.0
DISSOLVED OXYGEN (MIN), MG/L	5.0
pH	6.5-9.0

(1) DETERMINED BY GEOMETRIC MEAN, MARCH 15 – NOVEMBER 15 ONLY.

FLOW MEASUREMENT

INFLUENT

TYPE	PARSHALL FLUME
NUMBER OF UNITS	1
THROAT WIDTH	3'-0"
DESIGN FLOW RANGE, MGD	1.64 – 8.23 MGD
FLUME RANGE, MGD	0.40 – 32.57 MGD

EFFLUENT

TYPE	PARSHALL FLUME
NUMBER OF UNITS	1
THROAT WIDTH	1'-6"
DESIGN FLOW RANGE, MGD	1.64 – 8.23 MGD
FLUME RANGE, MGD	0.11 – 15.87 MGD

INFLUENT SCREENING

TYPE	MECHANICAL
NUMBER OF UNITS	2
WIDTH OF CHANNEL	4'-0"
CLEAR OPENING SIZE, IN	1/4
DEPTH, BOTTOM OF CHANNEL TO OPERATING FLOOR, FT	5.42
MAXIMUM UPSTREAM WATER DEPTH, FT	1.67
PHWW VELOCITY THROUGH SCREEN, FPS (CLEAN)	6.69

GRIT REMOVAL

GRIT SEPARATION

TYPE	VORTEX
NUMBER OF UNITS	1
CHAMBER DIAMETER, FT	12
CHAMBER DEPTH, FT	8
GRIT HOPPER DIAMETER, FT	5
GRIT HOPPER DEPTH, FT	6.75
DESIGN FLOW EACH, MGD	8.23
ANTICIPATED GRIT PRODUCTION, CF/DAY	
AVERAGE DAY	X
MAXIMUM DAY	X

GRIT REMOVAL

TYPE	SELF-PRIMING PUMP
NUMBER OF UNITS	1
RATED CAPACITY, EA, GPM	250

GRIT CONCENTRATOR

TYPE	COMBINED WASHER/CLASSIFIER
NUMBER OF UNITS	1
RATED CAPACITY, EA, GPM	250
HEAD LOSS, PSI	5.2

GRIT DEWATERING

TYPE	INCLINED SCREW
NUMBER OF UNITS	1

OXIDATION DITCH PROCESS

OXIDATION DITCH

TYPE	THREE STAGE
NUMBER OF UNITS	2
SIDEWATER DEPTH, FT	11.25
AEROBIC VOLUME, EA, GALLONS	1,668,000
ANAEROBIC VOLUME, EA, GALLONS	94,000
ANOXIC VOLUME, EA, GALLONS	132,000
MIN. WASTEWATER TEMPERATURE, C	10.0
MAX. WASTEWATER TEMPERATURE, C	25.0
ELEVATION, FT ABOVE MSL	1,000
HYDRAULIC RETENTION TIME, HRS	
TOTAL, DAILY AVG	30.1
ANAEROBIC, DAILY AVG	1.5
MLSS, MG/L	3,800
ORGANIC LOADING, LBS. BOD 5/1000 CF	15.0
SRT, DAYS	19.8
MIN. RAS RATE, QRAS/QAWW, %	75
MIN. INTERNAL RECYCLE RATE, QIR/QAWW, %	150
NET YIELD, LB TSS/LB BOD5 REMOVED	0.81
SPECIFIC DENITRIFICATION RATE, g NO3-N/g VSS/D	0.0373
AERATION/MIXING EQUIPMENT TYPE	MECHANICAL AERATOR/MIXER, VERTICAL SHAFT
NUMBER OF UNITS	4
SIZE, EA, HP	100
ADDITIONAL MIXING	SUBMERSIBLE MIXERS-ANAEROBIC
ADDITIONAL MIXING	SUBMERSIBLE MIXERS-ANOXIC
LBS. 02/LBS. BOD, APPLIED	1.27
LBS. 02/LBS. TKN, APPLIED	4.60
ALPHA FACTOR	0.93
BETA FACTOR	0.97

SECONDARY CLARIFICATION

TYPE	CIRCULAR CENTER-FEED, PERIPHERAL DRAW
NUMBER OF UNITS	3
DIAMETER, FT	70
BOTTOM SLOPE, FT/FT	1:12
WEIR LENGTH, EA, FT	206.3
SIDEWATER DEPTH, FT	14
VOLUME, EACH, CU FT	53,800
SURFACE OVERFLOW RATE, GPD/SF	535
DETENTION TIME, HOURS	1.6
SOLIDS LOADING RATE, AVG, LBS/SF/DAY	29.3
SOLIDS LOADING RATE, MAX, LBS/SF/DAY	39.0

RETURN ACTIVATED SLUDGE PUMPS

TYPE	DRY PIT SUBMERSIBLE
NUMBER OF UNITS	6
RATED CAPACITY, EA, GPM	833
OPERATING RANGE, FT	14-33
RATED HEAD, FT	33
CONTROL	VFD

WASTE ACTIVATED SLUDGE PUMPS

TYPE	DRY PIT SUBMERSIBLE
NUMBER OF UNITS	2
RATED CAPACITY, EA, GPM	200
OPERATING RANGE, FT	12-18
RATED HEAD, FT	18

SCUM PUMPS

TYPE	CENTRIFUGAL
NUMBER OF UNITS	1
RATED CAPACITY, EA, GPM	100
RATED HEAD, FT	25

DISINFECTION

UV DISINFECTION

TYPE	OPEN CHANNEL/INCLINED
# OF CHANNELS	1
MAXIMUM HYDRAULIC FLOW RATE, MGD	8.23
UV TRANSMITTANCE	60
UV RADIATION DOSE, MJ/CM2	30
DESIGN	
NUMBER OF BANKS	2
NUMBER OF MODULES/BANK	VARIES PER MFR
NUMBER OF LAMPS/MODULE	VARIES PER MFR
LEVEL CONTROL	FIXED FINGER WEIR

SOLIDS PROCESSING

PROJECTED SLUDGE QUANTITIES

LOADING CONDITION	WASTE ACTIVATED (PPD)	EST. DIGESTED TOTAL (PPD)
ANNUAL AVERAGE	XXXX	XXXX
MAXIMUM MONTH	5,340	3,532
PEAK DAY	XXXX	XXXX

AEROBIC DIGESTION

NUMBER OF UNITS	2
DIMENSIONS, EA, FT	68 X 34
SIDEWATER DEPTH, FT	24
TOTAL VOLUME, GAL	821,511
MIN. SRT, DAYS	42.1
MIN. VSS DESTRUCTION, %	38
DESIGN AERATION SOLIDS, %	3%
AIR REQUIREMENT, SCFM	STAGE 1 – 1,665; STAGE 2 – 1,630
NUMBER OF BLOWERS	3
BLOWER TYPE	POSITIVE DISPLACEMENT
BLOWER FIRM CAPACITY, SCFM	3,330

AEROBIC DIGESTION MIXING

DIFFUSERS W/SHEAR TUBES MIXERS, PER UNIT	18

DIGESTER TRANSFER PUMP

TYPE	AIR LIFT
NUMBER OF UNITS	1 PER STAGE; 2 TOTAL
SIZE, INCHES	STAGE 1 – 6; STAGE 2 – 4
RATED CAPACITY, EA, GPM	STAGE 1 – 226.3; STAGE 2 – 89.3

SLUDGE THICKENING EQUIPMENT

TYPE	2-STAGE INTEGRAL CERAMIC MEMBRANE MODULES
NUMBER OF UNITS	6 PER STAGE, 12 TOTAL
RATED CAPACITY, TOTAL, GPD	STAGE 1 – 34,024; STAGE 2 – 14,119
RATED CAPACITY, EA, GPD	STAGE 1 – 8,549; STAGE 2 – 3,360
THICKENED CONCENTRATION, MG/L	STAGE 1 – 15,000; STAGE 2 – 30,000
AIR REQUIREMENT, SCFM	STAGE 1 – 300; STAGE 2 – 250
NUMBER OF BLOWERS	3
BLOWER TYPE	POSITIVE DISPLACEMENT
BLOWER FIRM CAPACITY, SCFM	600

PERMEATE/BACKPULSE PUMP

TYPE	POSITIVE PLACEMENT
NUMBER OF UNITS	2 PER STAGE, 4 TOTAL
RATED CAPACITY, EA, GPM	STAGE 1 – 71; STAGE 2 – 28
RATED HEAD, PSIG	STAGE 1 – 10; STAGE 2 – 10

DIGESTED BIOSOLIDS TRANSFER PUMP

TYPE	POSITIVE PLACEMENT
NUMBER OF UNITS	2
RATED CAPACITY, EA, GPM	100
RATED HEAD, FT	XX

BIOSOLIDS STORAGE TANK

TYPE	ABOVE GRADE OPEN TOP STEEL
No. OF UNIT	2
CAPACITY, MG (EACH)	1.4
CAPACITY, MG (TOTAL)	2.8
CAPACITY AT DESIGN, DAYS	180
MIXING SYSTEM	PUMPED CIRCULATION
No. OF NOZZLES	4
MIXING PUMP TYPE	CHOPPER
MIXING PUMP SIZE, HP	100
LOADOUT PUMP TYPE	CHOPPER
LOADOUT PUMP SIZE, HP	10

EMERGENCY (STAND-BY) POWER GENERATION

TYPE	DIESEL
TRANSFER SWITCH TYPE	AUTOMATIC
SIZE, KW	1,750
FACILITY RELIABILITY CLASS	1

CHEMICAL FEED SYSTEMS

SUPPLEMENTAL CARBON FEED SYSTEM	
STORAGE TANK, GAL	3,000
CONTAINMENT VOLUME, CUBIC FT.	400
FEED POINTS	OXIDATION DITCH FLOW SPLITTER
MAX FEED RATE, GPH	10
FERRIC CHLORIDE FEED SYSTEM	
STORAGE TANK, GAL	6,000
CONTAINMENT VOLUME, CUBIC FT.	975
FEED POINTS	SECONDARY CLARIFIER FLOW SPLITTER
MAX FEED RATE, GPH	20

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GENERAL
DESIGN PARAMETERS

SHEET NO.
G.04

Xrefs: xgt-1-dh01

ARCHITECTURAL LEGEND

- 101 ROOM NUMBER
- 101 DOOR NUMBER
- 101 WINDOW NUMBER
- EXISTING DOOR AND OR FRAME TO REMAIN
- NEW DOOR AND OR FRAME
- EXISTING WALL
- NEW CONCRETE WALL
- NEW MASONRY WALL SEE STRUCTURAL SHEETS FOR CONSTRUCTION
- TOC 1151.25 ELEVATION MARKER
- ROOF DRAIN (RD)
- SLOPE STRUCTURAL SLOPE
- TAPERED INSULATION SLOPE
- SCUPPER
- ANTENNA
- ROOF HATCH
- GUYWIRE ANCHOR
- SOIL PIPE (SP)
- TOWER
- HEAT STACK (HS)
- ROOF VENT
- WALKWAY PADS
- MECHANICAL OPENING WITH CURB
- RIGID INSULATION SEE STRUCTURAL SHEETS FOR CONSTRUCTION

EQUIPMENT/VALVE TAGS
BFV BUTTERFLY VALVE
CKV CHECK VALVE
DHS DUMPSTER HOOKLOAD SYSTEM
FLM FLOW METER
HFP HIGH FLOW PUMP
KGV KNIFE GATE VALVE
MS MECHANICAL SCREEN
OCU ODOR CONTROL UNIT
OHD OVERHEAD DOOR
PV PLUG VALVE
SG SLUICE GATE
SP SUMP PUMP

PROCESS ONE-LINE SYMBOLS

- PIPING CUT LOOKING AWAY
- PIPING CUT TOWARDS
- BEND
- CAP OR PLUG
- CONCENTRIC REDUCER
- MECHANICAL COUPLING
- CROSS
- ECCENTRIC REDUCER
- SINGLE FLANGE
- DOUBLE FLANGE
- FLEX CONNECTION
- GROOVED JOINT COUPLING
- MECHANICAL JOINT
- TEE
- UNION
- WYE
- AIR VACUUM RELIEF
- BALL VALVE
- BALL CHECK VALVE
- CHECK VALVE
- V-BALL VALVE
- BUTTERFLY VALVE
- DIAPHRAGM VALVE
- GATE VALVE
- GLOBE VALVE
- FLAP GATE VALVE
- KNIFE GATE VALVE
- MUD VALVE
- MULTI PORT VALVE
- NEEDLE VALVE
- PINCH VALVE
- PLUG VALVE
- PRESSURE CONTROL VALVE
- SLIDE GATE VALVE
- SLUICE GATE VALVE
- STOP GATE VALVE
- M ELECTRIC ACTUATOR
- P PNEUMATIC ACTUATOR
- S SAMPLER LOCATION

CIVIL LEGEND

- BENCHMARK, CONTROL POINT, ELEVATION INDICATOR
- CONCRETE MONUMENT
- IRON PIN FOUND
- IRON PIN SET
- OPEN PIPE
- ROW RAIL
- SECTION CORNER
- CHISELED X
- AREA INTAKE
- FIRE HYDRANT
- GUY WIRE
- MAILBOX
- POWERPOLE
- CONIFEROUS TREE
- DECIDUOUS TREE
- CORNER MONUMENT
- B-INT BEEHIVE INTAKE
- TV CABLE BOX
- CO CLEAN OUT
- ELECTRIC METER
- E ELECTRIC BOX
- PHONE BOOTH
- GAS METER
- CURB INTAKE
- HANDICAP
- INTAKE
- LIGHT POLE
- S SANITARY MANHOLE
- MW MONITORING WELL
- POST
- RAILROAD SIGN
- SATELLITE DISH
- SIGN
- SIGN
- SOIL BORING
- TREE STUMP
- T TELEPHONE BOX
- TELEPHONE PEDESTAL
- TRAFFIC SIGNAL
- TRAFFIC SIGN
- YARD LIGHT
- BURIED VALVE

NORTH — TRUE NORTH ARROW

0 20 1"=20' — CIVIL SCALE BAR

1 BLDG DETAIL OR SECTION
SCALE: TO SCALE

1 BLDG PLAN/DETAIL/SECTION NOT TO SCALE OR CIVIL
NTS

- PROPOSED PAVEMENT DEMOLITION
- EXISTING GRAVEL
- EXISTING PAVING

- 1050 EXISTING MAJOR CONTOUR
- 1049 EXISTING MINOR CONTOUR
- EXISTING FENCE
- EXISTING ROW FENCE
- EXISTING GRAVEL SURFACE
- EXISTING SECTION LINE
- UGTV EXISTING UNDERGROUND TELEVISION
- OE EXISTING OVERHEAD ELECTRIC
- UE EXISTING UNDERGROUND ELECTRIC
- FO EXISTING FIBEROPTIC
- G EXISTING GAS
- 6"SAN EXISTING SANITARY SEWER
- 10"BF EXISTING STORM SEWER
- UGT EXISTING UNDERGROUND TELEPHONE
- 1041 EXISTING MINOR CONTOUR
- 1045 EXISTING MAJOR CONTOUR
- W EXISTING WATER
- W3 EXISTING FLUSHING WATER
- R/W EXISTING RIGHT OF WAY
- PL EXISTING PROPERTY LINE
- 1041 PROPOSED MINOR CONTOUR
- 1045 PROPOSED MAJOR CONTOUR
- TREE PROTECTION
- PROPOSED FENCE
- PROPOSED PERMANENT EASEMENT
- PROPOSED SILT FENCE
- PROPOSED TEMPORARY EASEMENT
- PROPOSED CULVERT
- DEMOLITION
- GAS PROPOSED GAS LINE
- W3 PROPOSED PLANT EFFLUENT WATER
- SAN PROPOSED SANITARY SEWER
- SF PROPOSED STORM SEWER
- FIRE PROPOSED FIRE PROTECTION WATER
- W PROPOSED POTABLE WATER
- IRR PROPOSED POTABLE WATER
- PROPOSED CRUSHED STONE
- PROPOSED CONCRETE PAVING
- PROPOSED HOT-MIX ASPHALT PAVING

Equipment/Valve Tags							
		XXX	YY	ZZ			
					Equipment Number (01-99)		
					Area Designation (See List)		
					Equipment Type (See List)		
	Equipment Type						Area Designation
AB	Aeration Blower					00	Sitework
AG	Access Gate					10	Electrical Service Building
AH	Access Hatch					12	Admin/Vehicle Storage Building
AU	Air Handling Unit					21	Headworks Building
BFV	Butterfly Valve					23	Grit Building
BP	Biosolids Pump					25	Equalization Tank
CFP	Chemical Feed Pump					27	Peak Flow Treatment
CAV	Combination Air Valve					32	Oxidation Ditches
CKV	Check Valve					35	Secondary Treatment Building
CP	Control Panel					38	Secondary Clarifiers
DR	Drive					42	UV Disinfection Building
EF	Exhaust Fan					52	Aerobic Digesters
EJ	Expansion Joint					55	Solids Processing Building
GEN	Engine Generator					57	Biosolids Storage
FM	Flow Meter						
GD	Grit Dewatering Unit						
GP	Grit Pump						
GU	Grit Unit						
HT	Hydropneumatic Tank						
LT	Level Transmitter						
MA	Mixer/Aerator						
MCC	Motor Control Center						
MS	Mechanical Fine Screen						
MV	Mud Valve						
MX	Mixer						
PEW	Plant Effluent Water						
PF	Parshall Flume						
PFS	Polymer Feed System						
PFT	Peak Flow Treatment Unit						
PRV	Power Roof Ventilator						
PT	Pressure Transmitter						
PV	Plug Valve						
RDT	Rotary Drum Thickener						
RP	Return Pump						
RSP	Return Sludge Pump						
RWP	Raw Wastewater Pump						
SA	Sampler						
SC	Screenings Compactor						
SCP	Scum Pump						
SG	Slide Gate/Sluice Gate						
SUP	Sump Pump System						
TV	Telescoping Valve						
UV	Ultraviolet Disinfection						
VFD	Variable Frequency Drive						
WSP	Waste Sludge Pump						

UTILITY NOTES

WHERE PUBLIC UTILITY FIXTURES ARE SHOWN AS EXISTING ON THE PLANS OR ENCOUNTERED WITHIN THE CONSTRUCTION AREA, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE OWNERS OF THOSE UTILITES PRIOR TO THE BEGINNING OF ANY CONSTRUCTION. THE CONTRACTOR SHALL AFFORD ACCESS TO THESE FACILITIES FOR NECESSARY MODIFICATION OF SERVICES. UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE SURVEYS AND RECORDS, AND THEREFORE THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. IT IS POSSIBLE THERE MAY BE OTHERS, THE EXISTENCE OF WHICH PRESENTLY NOT KNOWN OR SHOWN. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THEIR EXISTENCE AND EXACT LOCATION AND TO AVOID DAMAGE THERETO. NO CLAIMS FOR ADDITIONAL COMPENSATION WILL BE ALLOWED TO THE CONTRACTOR FOR ANY INTERFERENCE OR DELAY CAUSED BY SUCH WORK.

THE CONTRACTOR IS REQUIRED TO UTILIZE THE UTILITY ONE-CALL SERVICE AT (800) 292-8989 AT LEAST 48 HOURS PRIOR TO EXCAVATING ANYWHERE ON THE PROJECT.

NOTE:

NOT ALL SYMBOLS SHOWN IN THESE LISTS MAY BE USED IN THIS PROJECT. CONTACT ENGINEER FOR CLARIFICATION OF ANY DISCREPANCIES.

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CITY OF NEVADA
NEVADA, IOWA

GENERAL
CIVIL, PROCESS AND ARCHITECTURAL LEGENDS

SHEET NO.
G.05

Xrefs: xgt-1-dh01; XG-00-LEGENDS

PIPING SYMBOLS

- ELBOW TURNED UP OR TOWARDS.
- ELBOW TURNED DOWN OR AWAY.
- TEE TURNED UP OR TOWARDS.
- TEE TURNED DOWN OR AWAY.
- ARROW IN LINE INDICATES DIRECTION OF FLOW.
- PITCH DOWN IN DIRECTION OF ARROW.
- GATE VALVE.
- GLOBE VALVE.
- ANGLE GATE VALVE.
- ANGLE GLOBE VALVE.
- BALL VALVE.
- BALANCING OR SHUT-OFF COCK.
- BUTTERFLY VALVE.
- AUTOMATIC CONTROL VALVE, TWO-WAY.
- AUTOMATIC CONTROL VALVE, THREE-WAY.
- PRESSURE REDUCING VALVE.
- CHECK VALVE.
- VALVE IN RISER.
- UNION.
- RELIEF OR SAFETY VALVE.
- REDUCED PRESSURE PRINCIPLE BACKFLOW ASSEMBLY
- BALANCING STATION.
- AUTOMATIC FLOW CONTROL VALVE.
- STRAINER.
- PIPE ANCHOR.
- EXPANSION COMPENSATOR.
- FLEXIBLE PIPE CONNECTION.
- M — FLOW METER FITTING FOR ALL PIPING LARGER THAN 4". PART OF COMBINATION BALANCING VALVE AND FLOW METER FITTING FOR ALL PIPING 4" AND SMALLER.
- AV — AIR VENT.
- VACUUM BREAKER.
- PETE'S PLUG. PRESSURE AND TEMPERATURE TEST STATION.
- PRESSURE GAUGE.
- THERMOMETER.
- F&T — STEAM TRAP. F=FLOAT, T= THERMOSTATIC, D=THERMODYNAMIC.
- STEAM DRIP ASSEMBLY.
- REDUCER.

PLUMBING SYMBOLS

- SANITARY SEWER BELOW GRADE. S=SOIL, W=WASTE, VSP=VITRIFIED SEWER PIPE, CIP=CAST IRON PIPE, AW=ACID WASTE.
- SANITARY SEWER ABOVE GRADE. AW=ACID WASTE.
- STORM SEWER BELOW GRADE. VSP=VITRIFIED SEWER PIPE, CIP=CAST IRON PIPE, CP=CONCRETE PIPE.
- STORM SEWER ABOVE GRADE.
- CLEANOUT. CO=CLEANOUT, FMCO= FLOOR MOUNTED CLEANOUT
- FT — FOOTING OR UNDER FLOOR DRAIN TILE.
- D — CONDENSATE DRAIN LINE.
- PLUMBING VENT. V=VENT, VTR=VENT THRU ROOF, AV=ACID VENT.
- CW — COLD WATER-CW.
- HW — HOT WATER-HW. (120° UNLESS NOTED OTHERWISE).
- HWC — HOT WATER CIRCULATING-HWC.
- SW — SEAL WATER
- TW — TEMPERED WATER
- NPW — NON-POTABLE WATER
- G — GAS. (NATURAL OR MANUFACTURED).
- PEW — PLANT EFFLUENT WATER
- PCA — PLANT COMPRESSED AIR.
- FLOOR DRAIN-FD
- BELL-UP DRAIN W/TRAP
- ROOF DRAIN-RD, DOWNSPOUT-DS.
- WALL HYDRANT-WH.
- HOSE BIBB-HB.
- SHOWER-SH.

SHEETMETAL SYMBOLS

- MANUAL VOLUME DAMPER.-VD
- SPLITTER DAMPER.
- FD — FIRE DAMPER-FD, SMOKE DAMPER-SD.
- TRANSITION PIECE FROM RECTANGULAR TO ROUND.
- TRANSITION PIECE.
- 3a — FLEXIBLE CONNECTION.
- ELBOW WITH AIR VANES.
- 1 1/2xr, 1/2xr — RADIUS ELBOW-WITH AIR VANES FOR DUCT WITH 'R' 30" OR MORE.
- GRILLE OR REGISTER IN SIDE OF DUCT. SUPPLY, RETURN OR EXHAUST AS INDICATED.
- M M — MOTOR OPERATED DAMPER- SUPPLY, RETURN, EXHAUST OR OUTDOOR AIR AS INDICATED.
- EXHAUST OR RETURN AIR REGISTER OR GRILLE AS INDICATED IN BOTTOM OF DUCT.
- DIFFUSER IN BOTTOM OF DUCT-SQUARE OR ROUND AS INDICATED.
- AIR EXTRACTOR-FULL DEPTH OF BRANCH DUCT, GRILLE OR REGISTER.
- SUPPLY OR DISCHARGE AIR DUCT. SOLID CROSS-OP OR TOWARDS, DASHED CROSS-DOWN OR AWAY.
- EXHAUST OR RELIEF AIR DUCT. SOLID CROSS-UP OR TOWARDS, DASHED CROSS-DOWN OR AWAY.
- RETURN OR OUTDOOR AIR DUCT. SOLID CROSS-UP OR TOWARDS, DASHED CROSS-DOWN OR AWAY.
- SINGLE LINE SUPPLY DUCT.
- SINGLE LINE RETURN DUCT.
- SINGLE LINE EXHAUST DUCT.
- FLEXIBLE DUCT (72" MAXIMUM LENGTH)

MISCELLANEOUS

- POINT OF NEW CONNECTION TO EXISTING.

PLUMBING ABBREVIATIONS

BFP	BACK FLOW PREVENTOR
DF	DRINKING FOUNTAIN
EWC	ELECTRIC WATER COOLER
ESH	EMERGENCY SHOWER/EYE WASH
EWH	ELECTRIC WATER HEATER
FD	FLOOR DRAIN
IM	ICE MAKER
JS	JANITOR SINK
LAV	LAVATORY
OD	OVERFLOW ROOF DRAIN
RD	ROOF DRAIN
SH	SHOWER
SK	SINK
SP	SUMP PUMP
SSK	SERVICE SINK
WC	WATER CLOSET
WH	WATER HEATER
WS	WASH STATION
UR	URINAL

SHEETMETAL ABBREVIATIONS

SA - SUPPLY AIR	SG - SUPPLY GRILLE
RA - RETURN AIR	RG - RETURN GRILLE
EA - EXHAUST AIR	EG - EXHAUST GRILLE
SR - SUPPLY REGISTER	CD - CEILING DIFFUSER
RR - RETURN REGISTER	BDD - BACK DRAFT DAMPER
ER - EXHAUST REGISTER	BOD - BOTTOM OF DUCT

HVAC EQUIPMENT IDENTIFICATION

ACC	AIR-COOLED CONDENSER
ACCU	AIR-COOLED CONDENSING UNIT
AC	AIR CONDITIONING UNIT
AHU	AIR HANDLING UNIT
CUH	CABINET UNIT HEATER
CD	CONTROL DAMPER
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EUH	ELECTRIC UNIT HEATER
ET	EXPANSION TANK
FC	FLEXIBLE CONNECTION
FD	FIRE DAMPER
MAU	MAKE-UP AIR UNIT
MD	MOTORIZED DAMPER
RH	REHEAT COIL
RF	RETURN FAN
SF	SUPPLY FAN
UH	UNIT HEATER

NOTE:

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GENERAL MECHANICAL NOTES:

1. PROVIDE ALL EQUIPMENT, MATERIALS, AND LABOR AS REQUIRED FOR THE COMPLETE INSTALLATION OF ALL WORK SHOWN AND TO PROVIDE FOR A COMPLETE OPERABLE SYSTEM. ALL WORK SHALL BE PERFORMED IN A CLEAN AND WORKMANLIKE MANNER.
2. THE DRAWINGS ARE DIAGRAMMATIC, INTENDED TO CONVEY THE SCOPE OF WORK AND TO INDICATE THE GENERAL ARRANGEMENT AND APPROXIMATE ROUTING. CERTAIN BASIC ITEMS SUCH AS OFFSETS, FITTINGS, ACCESS PANELS, HANGERS AND SLEEVES MAY NOT BE SHOWN. WHERE SUCH ITEMS ARE REQUIRED FOR PROPER INSTALLATION OF THE WORK, SUCH ITEMS SHALL BE INCLUDED. CONTRACTOR TO VERIFY CONNECTIONS, CLEARANCES AND SERVICE PRIOR TO INSTALLATION.
3. COORDINATE FINAL LOCATIONS OF DUCTWORK, PIPING AND MECHANICAL EQUIPMENT IN NEW ADDITION WITH OTHER TRADES TO AVOID INTERFERENCE'S WITH EQUIPMENT, STRUCTURE, PIPING, LIGHTING, AND CONDUIT. PROVIDE OFFSETS AS REQUIRED TO MEET SPACE REQUIREMENTS AND TO AVOID INTERFERENCES. NO PIPING SHALL RUN OVER THE TOP OF ANY ELECTRICAL PANELS OR ELECTRICAL EQUIPMENT.
4. CONTRACTOR SHALL COORDINATE ALL WALL AND ROOF OPENINGS AS IT RELATES TO HIS WORK. CUTTING OF STRUCTURAL SUPPORT MEMBERS WILL NOT BE PERMITTED WITHOUT PRIOR APPROVAL OF THE STRUCTURAL ENGINEER. EXTENT OF CUTTING SHALL BE MINIMIZED TO PROVIDE THE NEAT MINIMUM OPENING REQUIRED. PATCHING SHALL MATCH ADJACENT MATERIALS AND SURFACES.
5. EQUIPMENT AND MATERIALS SHALL BE PROTECTED FROM WEATHER, PAINTING, PLASTER, ETC. UNTIL THE PROJECT IS COMPLETE. DAMAGE FROM RUST, PAINT SCRATCHES, ETC. SHALL BE REPAIRED AS REQUIRED TO RESTORE EQUIPMENT TO ORIGINAL CONDITION.
6. TEMPORARY SHUTDOWNS IF REQUIRED SHALL BE COORDINATED WITH THE OWNER TO MINIMIZE THE INTERRUPTIONS TO THE OWNER.
7. THE SITE SHALL BE KEPT ORDERLY AND REASONABLY CLEAN AT ALL TIMES DURING CONSTRUCTION. AT THE CONCLUSION OF THE CONSTRUCTION, THE SITE SHALL BE CLEANED THOROUGHLY OF ALL WASTE, RUBBLE, DEBRIS, AND UNUSED MATERIALS.
8. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2018 INTERNATIONAL BUILDING CODE, 2018 INTERNATIONAL MECHANICAL CODE, 2018 UNIFORM PLUMBING CODE, 2018 INTERNATIONAL ENERGY CODE, 2018 INTERNATIONAL FUEL GAS CODE, AND ALL APPLICABLE STATE AND LOCAL CODES, RULES, AND REGULATIONS AND ORDINANCES.

GENERAL PLUMBING NOTES:

1. PIPING IS SHOWN IN SCHEMATIC FORM. ROUTE PIPING AS REQUIRED FOR CLEARANCE WITH STRUCTURAL CONDITIONS. COORDINATE WITH OTHER TRADES AS REQUIRED. PIPING SHALL BE INSTALLED WITH ADEQUATE SLOPE AS REQUIRED FOR EACH PARTICULAR SYSTEM.
2. INSTALL PIPING TO MAINTAIN HEADROOM, CONSERVE SPACE, AND NOT INTERFERE WITH USE OF SPACE. GROUP PIPING WHERE PRACTICAL AT COMMON ELEVATIONS. ROUTE PIPING IN AN ORDERLY MANNER AND MAINTAIN GRADIENT. ROUTE PARALLEL AND PERPENDICULAR TO WALLS.
3. COORDINATE ROUGH-IN AND FINAL LOCATIONS OF NEW AND RELOCATED PIPING WITH EXISTING LIGHTING, STRUCTURE, PIPING, SPRINKLER AND DUCTWORK, ETC. PROVIDE OFFSETS AND/OR EASEMENTS AS REQUIRED TO AVOID CONFLICTS WITH WORK OF ALL OTHER TRADES.
4. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.
5. PROVIDE CLEARANCE IN HANGERS AND FROM STRUCTURE AND OTHER EQUIPMENT FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS.
6. ROUGH-IN AND CONNECT ALL PLUMBING REQUIRED TO EQUIPMENT FURNISHED AND INSTALLED BY OTHERS.
7. FURNISH AND INSTALL SHUTOFF VALVES IN ALL DOMESTIC WATER BRANCH PIPING OFF OF THE MAINS AND IN ALL OTHER BRANCH PIPING SERVING 4 OR MORE PLUMBING FIXTURES.
8. SANITARY WASTE PIPING SHALL BE SLOPED AT 1/4" PER FT. MINIMUM UNLESS OTHERWISE NOTED.
9. STORM PIPING SHALL BE SLOPED AT 1/8" PER FT. MINIMUM UNLESS OTHERWISE NOTED.
10. INSULATE ALL WATER LINES IN ACCORDANCE WITH THE SPECIFICATIONS.
11. INSULATE ALL STORM DRAIN AND OVERFLOW STORM DRAIN LINES IN ACCORDANCE WITH THE SPECIFICATIONS.
12. ALL WATER LINES SHALL BE PAINTED IN ACCORDANCE WITH THE SPECIFICATIONS.
13. ALL FIXTURES FED BY NON-POTABLE WATER SYSTEM SHALL BE MARKED AND LABELED "NON-POTABLE WATER - DO NOT DRINK."
14. PIPE OPENINGS THROUGH FIRE RATED WALLS SHALL BE CAULKED WITH AN INTUMESCENT MATERIAL.

GENERAL HVAC NOTES:

1. ALL DUCTWORK IS SHOWN IN SCHEMATIC FORM. DUCT RISES AND DROPS ARE NOT SHOWN, PROVIDE OFFSETS AS REQUIRED TO MEET SPACE REQUIREMENTS AND TO AVOID INTERFERENCE WITH OTHER TRADES.
2. COORDINATE FINAL LOCATIONS OF NEW DUCTWORK AND MECHANICAL EQUIPMENT WITH LIGHTING, STRUCTURE, PIPING, SPRINKLER, DUCTWORK, ETC. PROVIDE OFFSETS, EASEMENTS OR RELOCATE DUCT AS REQUIRED TO AVOID CONFLICTS WITH WORK OF ALL TRADES.
3. DIFFUSERS, GRILLES, AND REGISTER LOCATIONS SHALL BE COORDINATED WITH ARCHITECT'S REFLECTED CEILING PLANS AND ELECTRICAL LIGHTING PLANS.
4. ALL AUTOMATIC DAMPERS, FIRE DAMPERS, SMOKE DAMPERS, DAMPER OPERATORS, REHEAT COILS, ETC. SHALL BE LOCATED ABOVE CEILINGS OR OTHER CONCEALED ACCESSIBLE LOCATIONS WHERE DROP CEILINGS ARE PRESENT. LOCATE AND ARRANGE AUTOMATIC DAMPERS, SMOKE DAMPERS, DAMPER OPERATORS, ETC. TO BE ACCESSIBLE THROUGH LAY-IN CEILINGS OR 24"x24" ACCESS DOORS. PROVIDE AN ACCESS PANEL AS SPECIFIED FOR ALL NON-ACCESSIBLE INSTALLATIONS.
5. ELBOWS SHALL BE SQUARE ELBOWS CONSTRUCTED WITH TURNING VANES. RADIUS ELBOWS WITH CENTERLINE RADIUS OF NOT LESS THAN 1.5 TIMES THE DUCT WIDTH, MAY BE USED WHERE SPACE CONDITIONS PERMIT OR WHERE INDICATED ON DRAWINGS.
6. CHANGE DUCT SIZES GRADUALLY. LIMIT SLOPES FOR TRANSITIONS TO A MAXIMUM OF 1 INCH CHANGE IN WIDTH FOR EVERY 3 INCHES OF LENGTH OR APPROXIMATELY 15 DEGREE. A MAXIMUM OF 30 DEGREES IS ACCEPTABLE DIRECTLY ADJACENT TO EQUIPMENT.
7. ALL BRANCH DUCT TAPS SHALL BE CONICAL FITTINGS ON ROUND MAINS AND 45° ENTRY FITTINGS ON RECTANGULAR MAINS.
8. MANUAL VOLUME DAMPERS SHALL BE PROVIDED ON ALL RETURN, SUPPLY, AND EXHAUST BRANCH DUCTS.
9. SUPPORT ALL DUCTWORK, EQUIPMENT, ETC. FROM TOP CHORD OF BAR JOISTS OR STEEL FRAMING BEAMS.
10. NO MECHANICAL SERVICES OR EQUIPMENT SHALL BE LOCATED OVER ELECTRICAL EQUIPMENT, ELEVATOR EQUIPMENT, OR TELEPHONE EQUIPMENT ROOMS.
11. ALL DUCT SIZES SHOWN ARE CLEAR INSIDE DIMENSIONS. INCREASE SHEET METAL SIZE TO ACCOMMODATE DUCT LINER AS REQUIRED BY THE SPECIFICATIONS.
12. ALL SHEET METAL CONNECTIONS AND JOINTS SHALL BE SEALED TO SMACNA SEAL CLASS A.
13. FLEXIBLE RUNOUTS TO BE FACTORY INSULATED AND DO NOT REQUIRE FIELD INSULATION.
14. FLEXIBLE DUCTWORK SHALL BE A MINIMUM OF 36" TO A MAXIMUM OF 72" IN LENGTH.
15. PROVIDE DRAWBANDS AND DUCT TAPE ON ALL ROUND FLEXIBLE DUCT CONNECTIONS.
16. FABRICATE AND SUPPORT DUCTWORK IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED.
17. FIRE DAMPERS SHALL BE INSTALLED AS REQUIRED IN ALL DUCTS PENETRATING FIRE WALLS. PROVIDE FIRESTOPPING, ETC. AS REQUIRED.
18. DUCT PRESSURE CLASSIFICATIONS
    - A. UNLESS NOTED OTHERWISE, RECTANGULAR AND ROUND SUPPLY DUCTWORK SHALL BE CONSTRUCTED AND REINFORCED TO MAINTAIN STRUCTURAL INTEGRITY AT PRESSURES AS HIGH AS + 2 IN. W.G.
    - B. RECTANGULAR AND ROUND RETURN DUCTWORK AND ALL EXHAUST DUCTWORK SHALL BE CONSTRUCTED AND REINFORCED TO MAINTAIN STRUCTURAL INTEGRITY AT NEGATIVE PRESSURES AS LOW AS - 2 IN. W.G.
19. PROVIDE MANUAL VOLUME DAMPER UPSTREAM OF EACH EXHAUST AND SUPPLY GRILLE FOR BALANCING. DAMPER MATERIAL SHALL MATCH ADJACENT DUCTWORK. DAMPERS SHALL BE PROVIDED AT EACH GRILLE AND REGISTER REGARDLESS OF WHETHER THEY ARE DEPICTED ON THE DRAWINGS OR NOT.

STRUCTURAL NOTES

CODE CRITERIA

1. INTERNATIONAL BUILDING CODE: IBC 2018
2. AMERICAN SOCIETY OF CIVIL ENGINEERS MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES: ASCE 7–16
3. AMERICAN CONCRETE INSTITUTE BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE: ACI 318–14
4. ACI CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES: ACI 350–06
5. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) CONSTRUCTION MANUAL 15TH EDITION
6. AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE – STEEL: AWS D1.1
7. AWS STRUCTURAL WELDING CODE – ALUMINUM: AWS D1.2
8. BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES: TMS 402/602–16
9. ALUMINUM ASSOCIATION 2015 ALUMINUM DESIGN MANUAL

DESIGN CRITERIA

ASCE RISK CATEGORY III
SNOW LOAD GROUND: 30 PSF
SNOW IMPORTANCE FACTOR: 1.1
ICE IMPORTANCE FACTOR: 1.15
ROOF DEAD LOAD: SELF–WEIGHT
ROOF LIVE LOAD: 20 PSF UNLESS NOTED OTHERWISE
FLOOR LIVE LOAD: 100 PSF UNLESS NOTED OTHERWISE
ADMINISTRATION BUILDING MEZZANINE LIVE LOAD: 125 PSF
ALUMINUM STAIR AND PLATFORM LIVE LOAD: 100 PSF
BASE MAT FOUNDATION LIVE LOAD: 250 PSF
SPECIAL FLOOR LIVE LOADS: SEE INDIVIDUAL STRUCTURES
VEHICLE LOAD CATEGORY 1:
(ONE) LIGHT TRUCK VEHICLE, 4–WHEEL GATOR, OR BOBCAT: 8,000 LB. MAXIMUM GROSS VEHICLE WEIGHT
VEHICLE LOAD CATEGORY 2:
(ONE) UTILITY TRUCK VEHICLE OR FORKLIFT: 14,000 LB. MAXIMUM AXLE LOAD AND 20,000 LB. MAXIMUM GROSS VEHICLE WEIGHT
VEHICLE LOAD CATEGORY 3:
(ONE) VACTOR TRUCK OR HEAVY DUAL WHEEL AND TANDEM AXLE TRUCKS: HS20 LOADING 32,000 LB. AXLE LOAD OR GREATER MAXIMUM LOAD
NOTE: CATEGORY 3 VEHICLES AND HEAVY CONSTRUCTION EQUIPMENT SHALL NOT BE ALLOWED WITHIN 8 FEET OF TANK WALLS OR OPEN TOPPED DEEP FOUNDATIONS. PROVIDE AN 18"X24" SIGN WITH LARGE BLOCK LETTERING STATING "MAXIMUM VEHICLE AXLE LOAD SHALL NOT EXCEED 14,000 LBS AND GVW SHALL NOTE EXCEED 20,000 LBS WITHIN 8 FEET OF STRUCTURE" AT EQUALIZATION TANK DRIVEWAY AND OTHER SIMILAR LOCATIONS WHERE THIS OCCURS
BASIC WIND SPEED: 115 MPH
WIND EXPOSURE: C
WIND IMPORTANCE FACTOR: 1
SEISMIC SITE CLASS: D
SEISMIC Ss VALUE: 0.067
SEISMIC S1 VALUE: 0.048
SEISMIC DESIGN CATEGORY: B
SEISMIC IMPORTANCE FACTOR: 1.25

GEOTECHNICAL NOTES

1. GEOTECHNICAL ENGINEERING REPORT: TERRACON, PROJECT NO. 08195055–01, MAY 17, 2019
2. FROST DEPTH: 3'–6"
3. EXCAVATION FOR BUILDINGS AND STRUCTURES SHALL EXTEND TO A MINIMUM DEPTH OF 8 INCHES BELOW FOUNDATION BEARING AND TO A MINIMUM OF 1'–0" BEYOND FOUNDATION EDGE. SUBBASE SHALL CONSIST OF A MINIMUM OF 8" OF FREE DRAINING GRADED GRANULAR FILL (FDGGF) MATERIAL CONSISTING OF POROUS MATERIAL CORRESPONDING TO IOWA DOT 4131 GRADATION 29.
4. WHERE LOWER STRENGTH SOILS ARE ENCOUNTERED AT OR WITHIN 2 FEET BELOW THE FOUNDATION BEARING ELEVATION WHEN EXPOSED BY EXCAVATION OR BASED ON THE GEOTECHNICAL REPORT BORINGS, THEN OVER EXCAVATION SHALL EXTEND TO REMOVE THE LOWER STRENGTH SOILS AND REPLACE THEM WITH COMPACTED IMPERVIOUS FILL CAPABLE OF PROVIDING THE REQUIRED SUBGRADE BEARING CAPACITY. A MINIMUM OF 8" OF FDGGF SHALL BE PLACED ON TOP OF THE COMPACTED FILL OR UNDISTURBED SUBGRADE AND EXTEND BEYOND THE FOUNDATION A MINIMUM OF 1'–0".
5. WHERE INDICATED AS APPROPRIATE IN THE GEOTECHNICAL REPORT AND WHERE CALLED FOR ON THE DRAWINGS, RAMMED AGGREGATE PIERS SHALL BE USED TO IMPROVE SUBGRADE BEARING CAPACITY. WHERE NOT OTHERWISE SPECIFIED, NOTED, OR INDICATED ON THE DRAWINGS THE MINIMUM BEARING CAPACITY SHALL BE 2,500 PSF. FOR EQUALIZATION, AEROBIC DIGESTION, AND BIOSOLIDS STORAGE TANKS THE MINIMUM BEARING CAPACITY SHALL BE 3,000 PSF.
6. UNLESS NOTED OTHERWISE GRADE SHALL BE LOCATED AT AN ELEVATION 6" BELOW BUILDING OPERATING FLOOR LEVEL OR EXPOSED FOUNDATION AND SHALL SLOPE AWAY TO CIVIL DRAWING CONTOUR LEVELS.
7. ALL BUILDING AND TANK STRUCTURES SHALL HAVE A 2'–0" THICK IMPERVIOUS CLAY LAYER SLOPING AWAY FROM THE STRUCTURE AT 1% MINIMUM SLOPE, IMMEDIATELY BELOW THE SURFACE TOPSOIL OR OTHER GRADE SURFACE FEATURE, AS A BARRIER TO PREVENT SURFACE WATER FROM FLOWING DOWN ALONG THE FOUNDATIONS. THE IMPERVIOUS CLAY LAYER SHALL EXTEND A MINIMUM OF 10' AND TO A POINT WHERE SURFACE DRAINAGE IS CONTROLLED BY SITE DRAINAGE.
8. SUB–DRAINS SHALL CONSIST OF 6" MINIMUM DIAMETER PERFORATED PIPES AROUND BUILDINGS AND STRUCTURES, AS INDICATED ON SHEET C.08, AND SHALL BE LOCATED IN AND AT THE BASE OF FDGGF A MINIMUM OF 1'–0" BEYOND THE FOUNDATION EDGE. INVERT ELEVATIONS SHALL BE COORDINATED WITH ELEVATIONS ON SHEET C.08 TO PROVIDE DRAINAGE AWAY FROM THE STRUCTURES. WRAP PERFORATED SUB–DRAINS AND FDGGF MATERIAL AROUND FOUNDATIONS IN FILTER FABRIC COMPLYING WITH IOWA DOT TABLE 4196.01–2. FILTER FABRIC ENCLOSED FDGGF SHALL EXTEND UPWARD TO AND BENEATH THE 2–FOOT THICK IMPERVIOUS CLAY LAYER OF SOIL.
9. "STRUCTURAL FILL" IS A SELECT FILL CONSISTING OF MEDIUM DENSE COHESIONLESS SOILS OR STIFF COHESIVE SOILS OF GW, GP, SW, SP, GW–GM, GW–GC, GP–GM, GP–GC, SW–SM, SW–SC, SP–SM, SP–SC, OR CL WITH LL ≤ 45, PL ≤ 23, AND BEARING CAPACITY OF AT LEAST 2,500 PSF COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
10. "GRANULAR FILL" IS A WELL–GRADED FILL CONSISTING OF MEDIUM DENSE COHESIONLESS SOILS OF GW, SW, OR GW–SW WITH BEARING CAPACITY OF AT LEAST 2,500 PSF COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
11. FILL BENEATH FOUNDATIONS SHALL BE "STRUCTURAL FILL" OR "GRANULAR FILL" WITH BEARING CAPACITY INDICATED, UNLESS OTHERWISE SPECIFIED BY GEOTECHNICAL ENGINEER.
12. FOUNDATION SOILS SHALL BE INSPECTED BY A GEOTECHNICAL ENGINEER REGISTERED IN THE STATE OF IOWA. UPON EXCAVATION, WHERE UNSUITABLE SOILS ARE FOUND, REMOVE TO DEPTH REQUIRED BY GEOTECHNICAL ENGINEER AND REPLACE WITH SUITABLE COMPACTED "STRUCTURAL FILL" OR "GRANULAR FILL" TO ACHIEVE THE REQUIRED BEARING CAPACITY.
13. FOR STRUCTURES WHERE SUB–DRAINS ARE NOT REQUIRED, PROVIDE MINIMUM OF 6–INCH COMPACTED CRUSHED ROCK SUBBASE WITH LESS THAN 4% PASSING #200 SIEVE BENEATH FOUNDATIONS WITH SUBBASE EXTENDING A MINIMUM OF ONE–FOOT BEYOND STRUCTURE IN EACH DIRECTION AND PROVIDE GRANULAR FILL BACKFILL BELOW 2'–0" THICK IMPERVIOUS CLAY LAYER.
14. DO NOT BRING HEAVY COMPACTION OR PAVING EQUIPMENT WITHIN 3' OF FOUNDATIONS OR WALLS. USE MANUALLY OPERATED COMPACTION EQUIPMENT ADJACENT TO STRUCTURES. SEE DRAWINGS FOR ADDITIONAL RESTRICTIONS ON HEAVY VEHICLES AND EQUIPMENT.
15. GRADE AT BUILDINGS AND STRUCTURES SHALL BE 6" BELOW FLOOR LEVELS AND SHALL SLOPE AWAY FROM BUILDINGS AT A MINIMUM OF 1% SLOPE UNTIL GRADE INTERSECTS WITH AREA CONTOURS.
16. FROST FREE FOOTINGS SHALL BE BASED ON "GRANULAR FILL" BASE WITH LESS THAN 4% PASSING #200 SIEVE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY AND EXTENDING HORIZONTALLY ONE FOOT BEYOND FOUNDATION AND TO FROST DEPTH, AND ENCLOSED BY FILTER FABRIC ON ALL SURFACES EXPOSED TO SOIL.
17. BACKFILL AND COMPACT UNIFORMLY AROUND STRUCTURES PREVENTING UNBALANCED LATERAL FORCES ON FOUNDATIONS. DO NOT ALLOW BACKFILL ELEVATIONS ON OPPOSITE SIDES OF FOUNDATIONS TO DIFFER MORE THAN 2 FEET.

CONCRETE NOTES

1. CONCRETE STRUCTURES SHALL USE MIX 1: 4,500 PSI COMPRESSIVE STRENGTH CONCRETE MIX UNLESS OTHERWISE NOTED. SEE CONCRETE MATERIAL SCHEDULE DETAIL S.600.
2. CONCRETE DEFORMED BAR REINFORCEMENT SHALL BE GRADE 60.
3. COVER (CVR) IS THE LEAST DISTANCE BETWEEN THE SURFACE OF THE EMBEDDED REINFORCEMENT AND THE SURFACE OF THE CONCRETE. COVER IS A MINIMUM CLEAR DISTANCE BUT IS ALSO A MAXIMUM DISTANCE, SPECIFYING THE LOCATION OF THE REINFORCEMENT. THROUGH ACI 117–10 SPECIFICATIONS FOR TOLERANCES FOR CONCRETE, THE MAXIMUM DISTANCE BETWEEN THE SURFACE OF THE CONCRETE AND THE SURFACE OF THE REINFORCEMENT IS THE CVR DISTANCE PLUS THE REINFORCEMENT PLACEMENT TOLERANCE. BASED ON ACI 117, FOR CONCRETE MEMBERS 12 INCHES THICK OR LESS, THE TOLERANCE IS 3/8 INCH, AND FOR CONCRETE MEMBERS GREATER THAN 12 INCHES THICK, THE TOLERANCE IS 1/2 INCH. SEE CONCRETE PROTECTION TABLE DETAIL 5 SHEET S.600 FOR COVER REQUIREMENTS.
4. FOR REBAR DEVELOPMENT, SPLICES AND HOOKS SEE TABLE DETAIL 6 SHEET S.600. ALL BARS ARE CONSIDERED TOP BARS UNLESS NOTED OTHERWISE.
5. IN ADDITION TO MAIN BAR REINFORCEMENT SIZE AND SPACING INDICATED ON DRAWING, OPENINGS 16 INCHES OR LARGER SHALL HAVE 2 ADDITIONAL #5 BAR DIAGONALS BY 4–FOOT LONG CENTERED AT EACH CORNER. OPENINGS 30 INCHES OR LARGER SHALL HAVE A MINIMUM OF 2 ADDITIONAL HORIZONTAL AND VERTICAL EDGE REINFORCEMENT BARS CENTERED AT EACH EDGE OF THE OPENING MATCHING MAIN BAR SIZES AND EXTENDING THE BAR DEVELOPMENT LENGTH BEYOND THE FIRST BAR BEYOND THE OPENING. ROUND OPENINGS 30 INCHES OR LARGER SHALL ALSO HAVE 2 #5 HOOP BARS AROUND OPENING. FOR ADDITIONAL REQUIREMENTS SEE OPENING REINFORCEMENT DETAIL 2 SHEET S.601.
6. REINFORCEMENT ACROSS CONSTRUCTION JOINTS SHALL DEVELOP 125% OF BAR CAPACITY AND TERMINATE IN STANDARD HOOKS WHERE CONCRETE DIMENSIONS DO NOT ALLOW FULL DEVELOPMENT OF REINFORCEMENT.
7. CONSTRUCTION JOINTS AND/OR SAW CUT JOINTS SHALL BE AT SPACING LESS THAN 40 TIMES SLAB THICKNESS IN EACH DIRECTION IN SLABS ON GRADE UNLESS OTHERWISE NOTED AND ARE NOT ALLOWED IN MAT FOUNDATIONS WITH THICKNESS 1–FOOT OR GREATER.
8. SLOPE CONCRETE BASE TO DRAIN OR SUMP AT 1/8" PER FOOT MINIMUM UNLESS NOTED OTHERWISE.
9. SEE DETAIL 1 SHEET S.601 FOR ADDITIONAL REINFORCEMENT IN CORNERS OF ELEVATED SLABS.
10. FOR SUMPS SEE DETAIL 9 SHEET S.601 FOR REINFORCMENT DETAILS. PROVIDE #5 @ 8" OC HOOP BARS DOWN SIDE OF SUMP WITH A MINIMUM OF (3) EQUALLY SPACED.
11. CONTRACTOR SHALL VERIFY AND ALL ANCHOR BOLTS AND RELATED FORMING INFORMATION WITH THE APPLICABLE EQUIPMENT SUPPLIERS AND SUB–CONTRACTORS PRIOR TO CONCRETE PLACEMENT.
12. ALL LOCATIONS AND SIZES OF OPENINGS IN CONCRETE WALLS, FLOORS, AND ROOFS SHALL BE VERIFIED WITH APPLICABLE EQUIPMENT SUPPLIERS AND SUB–CONTRACTORS PRIOR TO CONCRETE PLACEMENT.
13. DO NOT FIELD CUT OR ALTER STRUCTURAL MEMBERS WITHOUT APPROVAL OF THE ENGINEER OF RECORD.
14. PROVIDE VAPOR BARRIER UNDER FOUNDATION BASE SLAB. PROVIDE BENTONITE WATER PROOFING BEGINNING UNDER THE EDGE OF THE FOUNDATION, LAPPING WITH THE VAPOR BARRIER, WRAPPING UP AROUND THE BASE SLAB, AND UP THE EXTERIOR WALL TO A POINT 6 INCHES BELOW GRADE. PROVIDE TOP SEAL AND ANCHOR. BENTONITE WATERPROOFING IS IN ADDITION TO ELASTOMERIC WATER PROOFING ON TOP OF THE STRUCTURE.
15. BENTONITE WATER PROOFING SHALL BE USED ON THE FOLLOWING STRUCTURES: GRIT BUILDING (NORTH, WEST AND SOUTH FACES OF THE FOUNDATION AND EXTENDING 2 FEET EAST OF GRID LINE B); EQ PUMP STATION (WEST, SOUTH, AND EAST WALLS EXTENDING 1 FOOT ALONG TANK WALL WHERE IT INTERSECTS); SECONDARY TREATMENT BUILDING; SOLIDS PROCESSING BUILDING (WEST AND SOUTH WALLS); UV VALVE VAULT; AND BIO–SOLIDS MIXING PUMP STATION (EXTEND 1 FOOT ALONG STAIR WALLS).
16. APPLY TROWELLED FINISH AND CHEMICAL HARDENER/SEALER TO ALL INTERIOR HORIZONTAL SURFACES.
17. WATERTIGHTNESS TESTING SHALL BE REQUIRED IN THE FOLLOWING STRUCTURES WITH WATER LEVEL TO THE ELEVATION NOTED:
    HEADWORKS EL 809.0
    GRIT CHAMBER EL 843.5
    EQUALIZATION TANK (CONCRETE BASE) EL 824.5
    OXIDATION DITCH FLOW SPLITTER EL 840.0
    OXIDATION DITCH EL 838.25
    CLARIFIER FLOW SPLITTER EL 834.5
    CLARIFIER EL 831
    AEROBIC DIGESTER EL 832.0
18. DO NOT BACKFILL STRUCTURES REQUIRING WATERTIGHTNESS TESTING UNTIL TESTING IS COMPLETE AND STRUCTURE HAS PASSED THE TEST.

MASONRY WALL CONSTRUCTION NOTES:

1. TERMINATE ALL MASONRY WALLS WITH BOND BEAMS AS SCHEDULED AT OPENINGS, BEARING LOCATIONS, OR TOP OF WALL.
2. TERMINATE ALL MASONRY VERTICAL REINFORCEMENT IN TOP BOND BEAMS WITH 90 DEGREE STANDARD HOOK DOWELS. HOOK DOWELS HAVE SAME SIZE AS VERTICAL BAR. HOOK INTO BOND BEAM ABOVE HORIZONTAL REINFORCEMENT AND LAP VERTICAL STEEL ACCORDING TO REBAR LAP AND SPLICE TABLE 6 SHEET S.600.
3. TERMINATE MASONRY REINFORCEMENT IN BOND BEAMS WITH 180 DEGREE STANDARD HOOKS.
4. MASONRY WALLS SHALL BE CONTINUOUSLY REINFORCED FROM FOUNDATIONS UP THROUGH SLABS, CMUS, PLANKS, AND PARRAPET TO TOP BOND BEAM. EACH TRANSITION SHALL BE WITH FULL BAR LAP SPLICE OR BY COMBINATIONS OF HOOKS AND LAP SPLICES IN EACH CASE DEVELOPING THE FULL CAPACITY OF THE REINFORCEMENT.
5. REINFORCE MASONRY EACH SIDE OF WINDOW, DOOR, OR OTHER OPENING 16 INCHES WIDE OR GREATER WITH JAMB AS SCHEDULED ASSURING THE REINFORCED CELL COUNT FOR EACH JAMB IS GREATER THAN OR EQUAL TO THE NUMBER OF REINFORCED CELLS IN THAT WALL WITHOUT OPENINGS. MINIMUM NUMBER OF REINFORCED JAMB CELLS AS SCHEDULED. SEE MASONRY WALL SCHEDULE 5 SHEET S.603.
6. LARGE OR MULTIPLE OPENINGS IN MASONRY WITH AN OVERALL WIDTH GREATER THAN 16 INCHES OR THE TYPICAL REINFORCEMENT SPACING WHICHEVER IS SMALLER REQUIRE BOND BEAMS AT HEAD AND SILL OF THE OPENINGS. BOND BEAMS EXTEND THE NUMBER OF JAMB CELLS COMPUTED ACCORDING TO NOTE 5 BEYOND THE OPENING, UNLESS NOTED OTHERWISE.
7. CONCRETE MASONRY UNITS WITH 2 VERTICAL REINFORCING BARS SHALL HAVE BARS INSTALLED WITH VERTICAL BARS INSIDE BOND BEAM BARS 2–1/2 INCHES FROM EACH EXTERIOR BLOCK FACE UNLESS NOTED OTHERWISE.
8. MASONRY VERTICAL REINFORCING BARS SHALL BE DOWELED INTO FOUNDATION TO PROVIDE FULL DEVELOPMENT LENGTH PER REBAR LAP AND SPLICE TABLE 6 SHEET S.600.
9. PROVIDE HOT DIPPED GALVANIZED LADDER STYLE JOINT REINFORCEMENT IN MASONRY AS SCHEDULED IN MASONRY WALL SCHEDULE 5 SHEET S.603.
10. SEE SECTION 04 2000 MASONRY SPECFICATIONS AND PLANS FOR MASONRY GENERAL REQUIREMENTS AND ADDITIONAL INFORMATION.

ALUMINUM NOTES

1. ALUMINUM MATERIALS SHALL BE ASTM B221 EXTRUDED ALUMINUM 6061–T6 OR 6063–T6.
2. ALUMINUM SHAPES ARE BASED ON ALUMINUM ASSOCIATION STANDARD CHANNELS AND SHAPES.
3. HARDWARE FOR FABRICATION OF ALUMINUM ASSEMBLIES SHALL BE 304 STAINLESS STEEL

PRELIMINARY
NOT FOR CONSTRUCTION

ABBREVIATIONS

A	AMPERES
AC	ALTERNATING CURRENT
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AICS	AMPERES INTERRUPTING CAPACITY, SYMMETRICAL
ASD	ADJUSTABLE SPEED DRIVE
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BC	BARE COPPER
C	CONDUIT
CB	CIRCUIT BREAKER
CO	CONDUIT ONLY
CKT	CIRCUIT
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
DB	DIRECT BURIED
DC	DIRECT CURRENT
DWG	DRAWING
DM	DIGITAL METER
ELEV	ELEVATION
ENCL	ENCLOSURE
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
EXIST	EXISTING
FLEX	FLEXIBLE
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
GND	GROUND
HH	HANDHOLE
HOA	HAND OFF AUTOMATIC
HP	HORSEPOWER
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING
HZ	HERTZ
JB	JUNCTION BOX
KVA	KILOVOLT–AMPERES
KW	KILOWATT
LA	LIGHTNING ARRESTOR
LOS	LOCKOUT STOP PUSH–BUTTON
LS	LIMIT SWITCH
LTG	LIGHTING
MA	MILLIAMPERE
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MCM	THOUSAND CIRCULAR MILS
MGB	MAIN GROUND BAR
MIN	MINIMUM
MT	EMPTY
MTD	MOUNTED
N	NEUTRAL
NC	NORMALLY CLOSED
NL	NIGHTLIGHT
NO	NORMALLY OPEN
NO.	NUMBER
NTS	NOT TO SCALE
OL'S	MOTOR OVERLOAD CONTACTS
P	POLE
PB	PUSHBUTTON, PULLBOX
PFR	PHASE FAILURE RELAY
PH	PHASE
PS	PRESSURE SWITCH
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
REF	REFERENCE
REQ'D	REQUIRED
SH	SHIELDED
SHT	SHEET
SPD	SURGE PROTECTIVE DEVICE
STD	STANDARD
SW	SWITCH
TB	TERMINAL BOARD
TEL	TELEPHONE
TEMP	TEMPERATURE
TP	TWISTED PAIR
XFMR	TRANSFORMER
TSP	TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD
TSTAT	THERMOSTAT
TYP	TYPICAL
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
V	VOLT
VFD	VARIABLE SPEED DRIVE
VS	VARIABLE SPEED
W	WATTS, WIRE
WP	WEATHERPROOF
ZS	POSITION SWITCH

ELECTRICAL SYMBOLS ONE–LINES

- UM — UTILITY METERING
- AM — METERING DEVICE: AM–AMMETER, VM–VOLTMETER, WM–WATTMETER, FM–FREQUENCY METER, WHM–KILOWATT HOUR METER, DM–DIGITAL MULTI–FUNCTION METER
- 3 — CURRENT TRANSFORMER, QUANTITY INDICATED
- 3 — POTENTIAL TRANSFORMER, QUANTITY INDICATED
- 30A MCP — CIRCUIT BREAKER, 3 POLE, UNLESS NOTED MCP INDICATES MOTOR CIRCUIT PROTECTOR
- THERMAL OVERLOAD RELAY
- SWITCH
- FUSE
- 10 — MOTOR, 10 HP
- G — GENERATOR
- K — KEY INTERLOCKING OF EQUIPMENT
- POWER FACTOR CORRECTING CAPACITOR
- DRAW–OUT TYPE EQUIPMENT
- LIGHTNING ARRESTER
- GROUND
- DELTA CONNECTION
- WYE CONNECTION
- M — MECHANICAL INTERLOCKING OF EQUIPMENT
- E — ELECTRICAL INTERLOCKING OF EQUIPMENT
- POWER MONITOR
- TVSS — TRANSIENT VOLTAGE SURGE SUPPRESSER
- TYPE/SIZE, FEATURES — MOTOR CONTROLLER

TYPE/SIZE

SUCCEEDING NUMBER INDICATES NEMA STARTER SIZE

FVR = FULL VOLTAGE REVERSING
FVNR = FULL VOLTAGE NON–REVERSING
RVSS = REDUCED VOLTAGE SOFT STARTER
VFD = VARIABLE FREQUENCY DRIVE
2S2W = TWO–SPEED TWO–WINDING
2S1W = TWO SPEED ONE–WINDING

FEATURES

1 – CONTROL POWER TRANSFORMER, 120V SECONDARY
2R – 2: DENOTES INDICATING LIGHT
MODIFIER: R – RED, G – GREEN, A – AMBER, W – WHITE
3A – 3: DENOTES CONTROL SWITCH
MODIFIER: A – HAND–OFF–AUTO, B – HAND–OFF–REMOTE, C – ON–OFF, D – FORWARD–OFF–REVERSE
4 – START–STOP PUSHBUTTONS, MOMENTARY
5 – ELAPSED TIME METER
6 – KEYPAD/DISPLAY ON DOOR
7 – OUTPUT dV/dT FILTER
8 – DISCONNECT SWITCH

EQUIPMENT FLOOR MOUNTING NOTE:

PROVIDE CONCRETE HOUSEKEEPING PAD UNDER ALL FLOOR–MOUNTED ELECTRICAL EQUIPMENT. REFER TO DETAIL 2/S.602.

SWITCHGEAR PROTECTIVE RELAYING

25 — SWITCHGEAR DEVICE:

13	SYNCHRONOUS–SPEED DEVICE
25	SYNCHRONIZING OR SYNCHRONISM CHECK DEVICE
27	UNDERVOLTAGE RELAY
32	DIRECTIONAL POWER RELAY
37	UNDERCURRENT OR UNDERPOWER RELAY
40	FIELD RELAY
41	FIELD CIRCUIT BREAKERS
43	MANUAL TRANSFER OR SELECTOR DEVICE
46	REVERSE–PHASE OR PHASE–BALANCE CURRENT RELAY
47	PHASE–SEQUENCE VOLTAGE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
50G	ZERO SEQUENCE GROUND FAULT RELAY
51	A–C TIME OVERCURRENT RELAY
52	A–C CIRCUIT BREAKER
59	OVERVOLTAGE RELAY
65	GOVERNOR
67	A–C DIRECTIONAL OVERCURRENT RELAY
81	FREQUENCY RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY

ELECTRICAL SYMBOLS SCHEMATICS

NORMALLY OPEN	NORMALLY CLOSED	DEVICE
		CONTACT
		TIMED CONTACT CONTACT ACTION RETARDED ON ENERGIZATION
		TIMED CONTACT CONTACT ACTION RETARDED ON DE–ENERGIZATION
		PUSH BUTTON SINGLE CIRCUIT MOMENTARY CONTACT
		PUSH BUTTON SINGLE CIRCUIT LOCK–OUT
		LIMIT SWITCH
		LIQUID LEVEL SWITCH
		PRESSURE OR VACUUM SWITCH
		FLOW SWITCH
		TEMPERATURE SWITCH
		SELECTOR SWITCH (NUMBER OF ARROWS INDICATES NUMBER OF POSITIONS. OXO INDICATES CONTACT OPERATION FOR EACH POSITION. X=CLOSED. O=OPEN)
		MANUAL MOTOR STARTER
	D/I	DOOR INTERLOCK SWITCH
OL'S		MOTOR OVERLOAD HEATER CONTACTS
		MOTOR OVERLOAD HEATER
	A	PILOT LIGHT R=RED, W=WHITE, G=GREEN, A=AMBER
	R	PILOT LIGHT – PUSH–TO–TEST R=RED, W=WHITE, G=GREEN, A=AMBER
	R	RELAY
	TD	TIME DELAY RELAY
	M	STARTER COIL
	SV	SOLENOID OPERATED VALVE
		120V, SINGLE PHASE MOTOR
		ALARM
	ETM	ELAPSED TIME METER
	PMR	PHASE MONITORING RELAY
		FUSE
		CONTROL POWER TRANSFORMER
		GROUND
		WIRING IN MOTOR STARTER
		FIELD WIRING
		WIRE TERMINAL

ELECTRICAL SYMBOLS PLANS

LIGHT FIXTURES

- CEILING MOUNTED FIXTURE, INCANDESCENT, HID, ETC. AS SPECIFIED.
- WALL MOUNTED FIXTURE, INCANDESCENT, HID, ETC. AS SPECIFIED.
- FLUORESCENT FIXTURE. AS SPECIFIED
- FLUORESCENT FIXTURE AS SPECIFIED, CONNECTED TO UNSWITCHED CIRCUIT.
- FLUORESCENT STRIP FIXTURE
- EXIT LIGHT, CEILING MOUNTED, ARROW DIRECTION AS INDICATED. SHADED SECTION INDICATES ILLUMINATION FACE.
- EXIT LIGHT, WALL MOUNTED, ARROW DIRECTION AS INDICATED. SHADED SECTION INDICATES ILLUMINATION FACE.
- BATTERY OPERATED EMERGENCY LIGHT FIXTURE TOP OF UNIT 6" BELOW FINISHED CEILING OR AS NOTED.
- REMOTE LIGHT FIXTURE FOR BATTERY OPERATED LIGHT FIXTURE

FIRE ALARM SYSTEM

- F — MANUAL PULL STATION, 48" ABOVE FLOOR
- VISUAL ALARM LIGHT 80" ABOVE FLOOR OR AS NOTED '110' – INDICATES 110CD VISUAL DEVICE '30' – INDICATES 30CD VISUAL DEVICE BLANK – INDICATES 75CD DEVICE
- AUDIBLE ALARM DEVICE WITH VISUAL ALARM LIGHT 80" ABOVE FLOOR OR AS NOTED '110' – INDICATES 110CD VISUAL DEVICE '30' – INDICATES 30CD VISUAL DEVICE '15' – INDICATES 15CD VISUAL DEVICE BLANK – INDICATES 75CD DEVICE
- F — COMBINATION AUDIBLE ALARM DEVICE AND VISUAL ALARM LIGHT 80" ABOVE FLOOR, AND MANUAL PULL STATION 48" ABOVE FLOOR '110' – INDICATES 110CD VISUAL DEVICE '30' – INDICATES 30CD VISUAL DEVICE BLANK – INDICATES 75CD DEVICE
- GENERAL ALARM BELL 80" ABOVE FLOOR OR AS NOTED
- F — VISUAL ALARM LIGHT 80" ABOVE FLOOR, AND MANUAL PULL STATION 48" ABOVE FLOOR.
- F — THERMAL FIRE DETECTOR, COMBINATION RATE OF RISE AND FIXED TEMPERATURE. '200' – INDICATES 200 DEGREE FIXED TEMPERATURE. '135' – INDICATES 135 DEGREE FIXED TEMPERATURE. 'ST' – INDICATES DETECTOR TO INITIATE ELEVATOR C.B. SHUNT–TRIP.
- F — AUTOMATIC DOOR RELEASE CONNECTION
- SMOKE DAMPER CONNECTION
- F — SMOKE DETECTOR ON CEILING; 'D'–INDICATES DUCT DETECTOR TYPE 'R'–INDICATES RELAY FOR AUXILIARY CONTROLS. 'ER' INDICATES DETECTOR TO INITIATE ELEVATOR RECALL. 'PT' INDICATES PROJECTED BEAM TYPE TRANSMITTER. 'PR' INDICATES PROJECTED BEAM TYPE RECEIVER.
- F — FAN SHUT–DOWN CONNECTION
- R — REMOTE DETECTOR INDICATOR LIGHT
- R — DUCT SMOKE DETECTOR REMOTE TEST/RESET STATION
- FS — SPRINKLER FLOW SWITCH CONNECTION
- TS — TAMPER–PROOF SPRINKLER VALVE SWITCH CONNECTION.
- FAZ — FIRE ALARM ZONE ANNUNCIATOR
- FAM — FIRE ALARM MASTER ANNUNCIATOR
- FACP — FIRE ALARM CONTROL PANEL
- C — TELEPHONE STATION

SITE

- LIGHTING CONTROL STATION, PAD MOUNTED
- LIGHTING CONTROL STATION, POLE MOUNTED
- H — HAND HOLE
- J — JUNCTION BOX
- T — UTILITY TRANSFORMER, PAD MOUNTED
- T — UTILITY TRANSFORMER, POLE MOUNTED
- PC — PHOTOCELL
- EMH — ELECTRIC MANHOLE
- UGE — UNDERGROUND CONDUIT
- POLE MOUNTED LIGHTING UNIT, AS SPECIFIED
- BACK MOUNTED LIGHTING UNIT, AS SPECIFIED
- TOWER LIGHTING UNIT, AS SPECIFIED
- GROUND MOUNTED YARD LIGHTING UNIT, AS SPECIFIED

CONDUIT, RACEWAY AND WIRING

- UNDERGROUND CONDUIT
- CONDUIT CONCEALED IN WALL OR CEILING CONSTRUCTION
- MT — 'MT' INDICATES EMPTY CONDUIT
- HOME RUN TO PANELBOARD
- CABLE TRAY, SIZE AS NOTED
- PLUG IN STRIP–TYPE RECEPTACLES OR OTHER OUTLETS AS INDICATED
- LAY IN WIREWAY DUCT, SIZE AS NOTED
- FEEDER DUCT–RATING AND NUMBER OF CONDUCTORS AS NOTED
- PLUG IN DUCT–RATING AND NUMBER OF CONDUCTORS AS NOTED
- CENTER RAIL TYPE CABLE TRAY, AS NOTED
- LADDER TYPE CABLE TRAY, AS NOTED
- E — UNDERFLOOR DUCT–ELECTRICAL
- T — UNDERFLOOR DUCT–TELEPHONE OR OTHER LOW TENSION AS NOTED
- J — J–HOOKS ABOVE CEILING

COMMUNICATIONS SYSTEM

- S — SPEAKER OUTLET RECESSED IN CEILING (UNLESS NOTED OTHERWISE), 'S'–INDICATES SURFACE TYPE, 'C'–INDICATES SPEAKER CONCEALED ABOVE CEILING, 'P'–INDICATES PROJ. HORN TYPE, 'DF'–INDICATES DOUBLE FACE TYPE
- M — MICROPHONE OUTLET IN CEILING
- M — MICROPHONE OUTLET IN WALL
- CLOCK OUTLET IN CEILING WITH PROGRAM OR OTHER SYSTEM CLOCK AS SPECIFIED 'DF' INDICATES DOUBLE FACE CLOCK, DIMENSION INDICATES DIAL SIZE
- CLOCK OUTLET IN WALL WITH PROGRAM OR OTHER SYSTEM CLOCK AS SPECIFIED 'DF' INDICATES DOUBLE FACE CLOCK, DIMENSION INDICATES DIAL SIZE, 84" ABOVE FLOOR OR AS NOTED
- S — COMBINATION CLOCK AND SPEAKER OUTLETS IN COMMON BACK BOX–WITH CLOCK AND SPEAKER AS SPECIFIED, 84" ABOVE FLOOR OR AS NOTED
- VIDEO SYSTEM OUTLET, IN WALL AT 84" ABOVE FLOOR OR AS NOTED
- VIDEO SYSTEM OUTLET, IN CEILING
- TELEVISION CAMERA OR VIDEO TAPE JACK
- M — INTERCOM MASTER–DESK MOUNTED
- M — INTERCOM MASTER, WALL MOUNTED 54" ABOVE FLOOR OR AS NOTED
- R — INTERCOM REMOTE UNIT–DESK MOUNTED
- R — INTERCOM REMOTE UNIT, WALL MOUNTED 54" ABOVE FLOOR OR AS NOTED
- TELEPHONE OUTLET, IN WALL 16" ABOVE FLOOR OR AS NOTED. 'W' INDICATES WALL MOUNTED TELEPHONE AT 54"
- COMPUTER TERMINAL OUTLET–IN WALL OR AS NOTED
- COMBINATION TELEPHONE & COMPUTER TERMINAL OUTLET IN WALL 16" ABOVE FLOOR OR AS NOTED.
- TELEPHONE OUTLET, IN FLOOR BOX
- V — VOLUME CONTROL, NUMERAL DESIGNATES ASSOCIATED SPEAKERS

NOTE:

NOT ALL ABBREVIATIONS OR SYMBOLS SHOWN IN THESE LISTS MAY BE USED IN THIS PROJECT. CONTACT ARCHITECT OR ENGINEER FOR CLARIFICATION OF ANY DISCREPANCIES.

WIRING DEVICE

- C — CLOCK HANGER RECEPTACLE–20A , 125V, 2P, 3W (NEMA 5–20R), IN WALL +84" OR AS' NOTED
- SIMPLEX RECEPTACLE – 125V, 2P, 3W 20A, 30A, OR 50A AT OUTLET INDICATES AMP. RATING (NEMA 5–20R, 5–30R, OR 5–50R), IN WALL OR AS NOTED
- DUPLEX RECEPTACLE–20A, 125V, 2P, 3W (NEMA 5–20R), IN WALL
- DUPLEX RECEPTACLE–20A, 125V, 2P, 3W (NEMA 5–20R) IN CEILING
- DUPLEX RECEPTACLE–20R, 125V, 2P,3W (NEMA 5–20R), IN WALL ABOVE COUNTER TOP OR BACK SPLASH 'GFI'–INDICATES GROUND FAULT INTERRUPTER TYPE 'SS'–INDICATES SURGE SUPPRESSER TYPE 'IG'–INDICATES ISOLATED GROUND TYPE
- DUPLEX RECEPTACLE–20R, 125V, 2P, 3W (NEMA 5–20R), IN WALL OR AS NOTED, ONE RECEPTACLE HOT, ON RECEPTACLE SWITCH
- FLOOR OUTLET BOX WITH SIMPLEX RECEPTACLE–20A, 125V, 2P, 3W (NEMA 5–20R)
- FLOOR OUTLET WITH DUPLEX RECEPTACLE
- OUTLET WITH SPECIAL DEVICE AS NOTED, IN WALL
- OUTLET WITH SPECIAL DEVICE AS NOTED, IN FLOOR
- OUTLET WITH SPECIAL DEVICE AS NOTED, IN CEILING
- J — JUNCTION BOX OR OUTLET BOX
- SINGLE POLE WALL SWITCH, '2'–INDICATES 2 POLE SWITCH, '3'–INDICATES 3–WAY, '4'–INDICATES 4–WAY, 'PL'–INDICATES SWITCH WITH PILOT LIGHT, 'L/T'–INDICATES LOCKING TYPE SWITCH, 'LV'–INDICATES LOW VOLTAGE TYPE, T–INDICATES TIMER SWITCH.
- P — PULL BOX
- PUSHBUTTON, AS NOTED
- LOCAL LIGHT DIMMER, 'M' INDICATES MASTER CONTROLLER 'F' INDICATES FLUORESCENT '1000' INDICATES 1000 WATTS '1500' INDICATES 1500 WATTS '2000' INDICATES 2000 WATTS
- 3 — MOTOR SPEED CONTROLLER 2–SPEED, 3–SPEED OR VARIABLE SPEED AS INDICATED

MISCELLANEOUS

- S — SOLENOID
- T — THERMOSTAT 48" ABOVE FLOOR.
- FL — FLOAT SWITCH
- P — PRESSURE SWITCH
- PC — PHOTOCELL CONTROL
- HD — ELECTRIC HAND DRYER AS NOTED.
- FB — FLOOR BOX
- E1 — REFERENCED NOTE
- PAGING ZONE
- TS — TIME SWITCH
- TMGB — TELECOMMUNICATIONS MAIN GROUND BAR AT 80" OR AS NOTED.
- TGBXX — TELECOMMUNICATIONS GROUND BAR. 'XX' INDICATES GROUND BAR NUMBER.
- S — OCCUPANCY SENSOR, CEILING MOUNTED
- S — OCCUPANCY SENSOR, WALL MOUNTED, 48" ABOVE FLOOR

SECURITY SYSTEM

- K — KEYPAD ACCESS CONTROL
- C — CARD ACCESS READER – PROXIMITY
- C K — COMBINATION KEYPAD ACCESS CONTROL & CARD ACCESS READER
- D — SECURE DOOR. ELECTRIC LOCKING DEVICE, REQUEST TO EXIT CONTACT & DOOR POSITION CONTACT UNLESS NOTED OTHERWISE
- W — SECURE WINDOW. ELECTRICAL STRIKE & CONTACTS AS SCHEDULED.
- CLOSE CIRCUIT TELEVISION CAMERA FIXED MOUNTED.
- PTZ — CLOSED CIRCUIT TELEVISION CAMERA REMOTE PAN, TILT & ZOOM CONTROL
- M — SECURITY MOTION SENSOR, AS INDICATED

EQUIPMENT

- MOTOR CONNECTION
- E — EQUIPMENT TERMINAL POINT
- SAFETY DISCONNECT SWITCH, NON–FUSED UNLESS NOTED (F)
- FS — FUSE HOLDER WITH FUSESTAT AND TOGGLE SWITCH
- MOTOR STARTER–MAGNETIC UNLESS NOTED MAN. (MANUAL)
- COMBINATION MOTOR STARTER AND DISCONNECT SWITCH–MAGNETIC STARTER
- BRANCH CIRCUIT PANELBOARD SURFACE MOUNTED
- BRANCH CIRCUIT PANELBOARD FLUSH MOUNTED
- SPECIAL CABINET OR EQUIPMENT AS NOTED SURFACE MOUNTED
- SPECIAL CABINET OR EQUIPMENT AS NOTED FLUSH MOUNTED
- T15 — DRY–TYPE TRANSFORMER, NUMBER INDICATES KVA SIZE
- POWER DISTRIBUTION PANELBOARD SURFACE MOUNTED OR FREESTANDING, AS NOTED.
- POWER DISTRIBUTION PANELBOARD, FLUSH MOUNTED
- ELECTRICAL EQUIPMENT MCC OR SWITCHBOARD, AS NOTED
- ATS — AUTOMATIC TRANSFER SWITCH
- MTS — MANUAL TRANSFER SWITCH

NOTES

1. ALL WALL RECEPTACLES, TELEPHONE OUTLETS OR SIMILAR OUTLETS TO BE 16" ABOVE FLOOR TO BOTTOM UNLESS OTHERWISE INDICATED
2. ALL WALL SWITCHES, PUSHBUTTONS AND DIMMERS TO BE 48" ABOVE FLOOR TO BOTTOM UNLESS OTHERWISE INDICATED
3. UPPER CASE LETTERS 'DD' AT DUPLEX RECEPTACLE INDICATE DOUBLE DUPLEX RECEPTACLES IN TWO GANG BOX
4. LETTERS 'WP' AT DEVICE OR EQUIPMENT INDICATE WEATHERPROOF TYPE
5. LETTERS 'XP' AT DEVICE OR EQUIPMENT INDICATES EXPLOSION–PROOF TYPE.
6. LETTERS 'TL' AT RECEPTACLE INDICATE TWIST–LOCK TYPE.
7. LETTERS 'WG' AT DEVICE OR LIGHT FIXTURE INDICATE A WIREGUARD IS TO BE PROVIDED.
8. LETTERS 'RI' AT DEVICE OR EQUIPMENT CONNECTION INDICATE ROUGH–IN ONLY.
9. LOWER CASE LETTERS AT SWITCHES AND FIXTURES INDICATE ASSOCIATED UNITS FOR SWITCHING
10. UPPER CASE LETTERS AT FIXTURE INDICATE FIXTURE TYPE.
11. NUMBER AT FIXTURE OR OUTLET INDICATES PANEL CIRCUIT NUMBER.
12. PLUS (+) SIGN WITH DIMENSION AT OUTLET INDICATES HEIGHT ABOVE FINISHED FLOOR LINE OR HEIGHT ABOVE FINISHED GRADE.
13. LETTERS 'IG' AT RECEPTACLE INDICATE ISOLATED GROUND TYPE.
14. LETTERS 'SS' AT RECEPTACLE INDICATE SURGE SUPPRESSION TYPE.
15. PROVIDE CONCRETE HOUSEKEEPING PAD UNDER ALL FLOOR–MOUNTED ELECTRICAL EQUIPMENT. REFER TO DETAIL 2/S.602.
16. CONNECT EXIT LIGHTS, EMERGENCY BATTERY PACKS, AND EMERGENCY BATTERY UNIT FIXTURES TO NEAREST UNSWITCHED NORMAL LIGHTING CIRCUIT SERVING CORRESPONDING AREA, UNLESS OTHERWISE INDICATED. CONNECT BATTERY PACKS SO THAT ASSOCIATED LUMINAIRES ARE CONTROLLED WITH OTHER LUMINAIRES IN THE SAME SPACE, AND ARE ENERGIZED UPON POWER FAILURE.
17. "NL" DESIGNATES NIGHTLIGHT OPERATION. CONNECT FIXTURE UNSWITCHED TO CIRCUIT INDICATED.

EM — SPECIAL SYSTEM WIRING TO CENTRAL EQUIPMENT, PANEL, TERMINAL CABINET OR NEXT DEVICE.

- EM = EMERGENCY SYSTEM
- C = CRITICAL SYSTEM
- L = LIFE SAFETY SYSTEM
- S = LIFE SUPPORT SYSTEM
- E = EMERGENCY EQUIPMENT SYSTEM
- FA = FIRE ALARM
- TA = TELEPHONE SYSTEM–TA,TB,TC,ETC. INDICATES TO TERMINAL CABINET OR MOUNTING BOARD TA,TB,TC, ETC.
- GF = CIRCUIT TO GROUND FAULT CIRCUIT INTERRUPTER
- EIL = EQUIPMENT INTERLOCK
- MC = MOTOR CONTROL

PRELIMINARY
NOT FOR CONSTRUCTION

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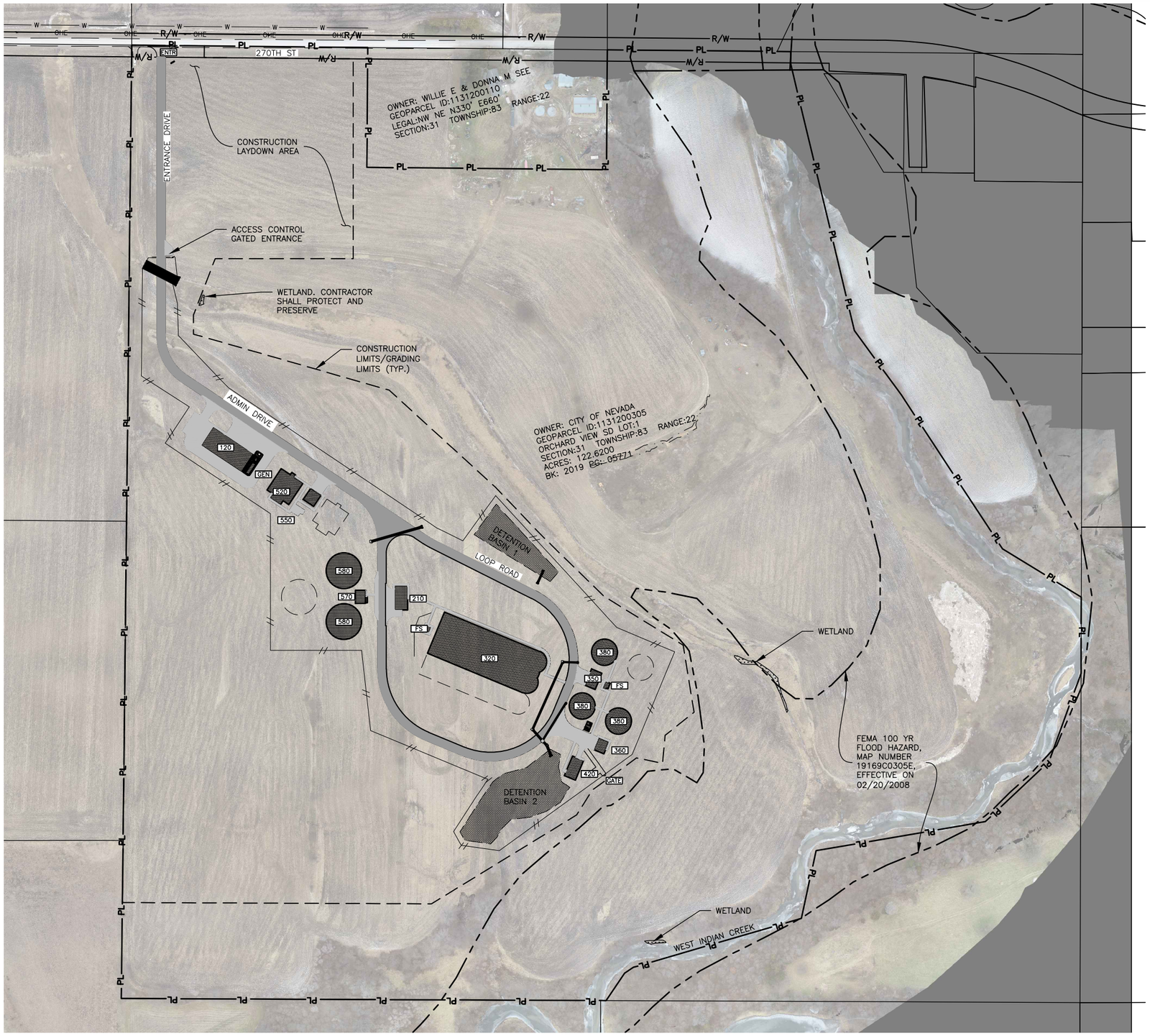
CITY OF NEVADA
NEVADA, IOWA

GENERAL

ELECTRICAL LEGEND

SHEET NO.
G.08

Xrefs: xgt-1-dh01



1 SITEWORK
OVERALL SITE PLAN
SCALE: 1"=150'

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

NORTH

PRELIMINARY
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APPROVED: MJR JOB NUMBER: 160473
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GENERAL
OVERALL SITE PLAN

SHEET NO.
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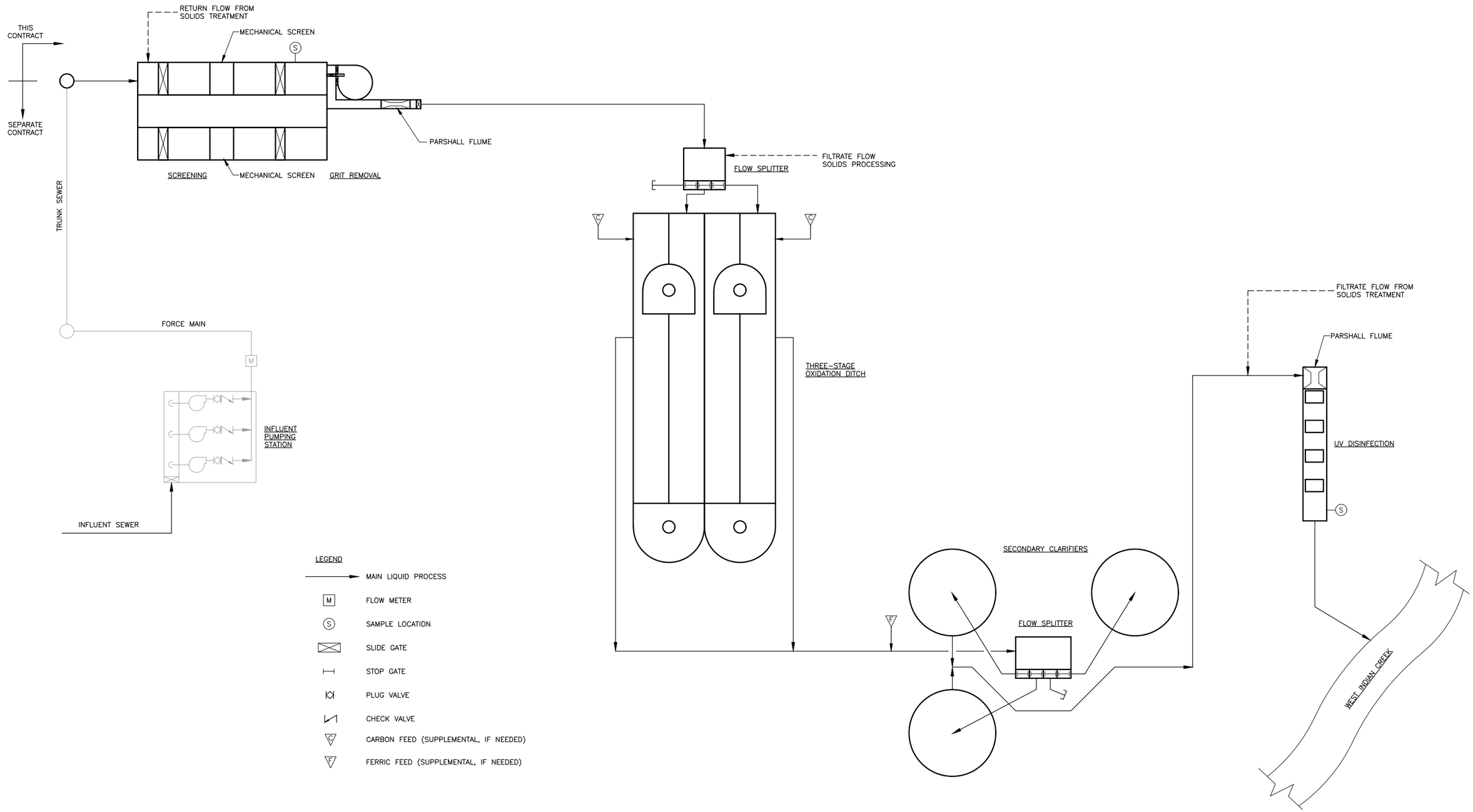
Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XVX-IMAGE; XCS-BLDG-INDEX; XCU-STRM; XVS-GIS-100YR-FLOOD; XVE-WETL-GIS; XCP-PATT



PRELIMINARY
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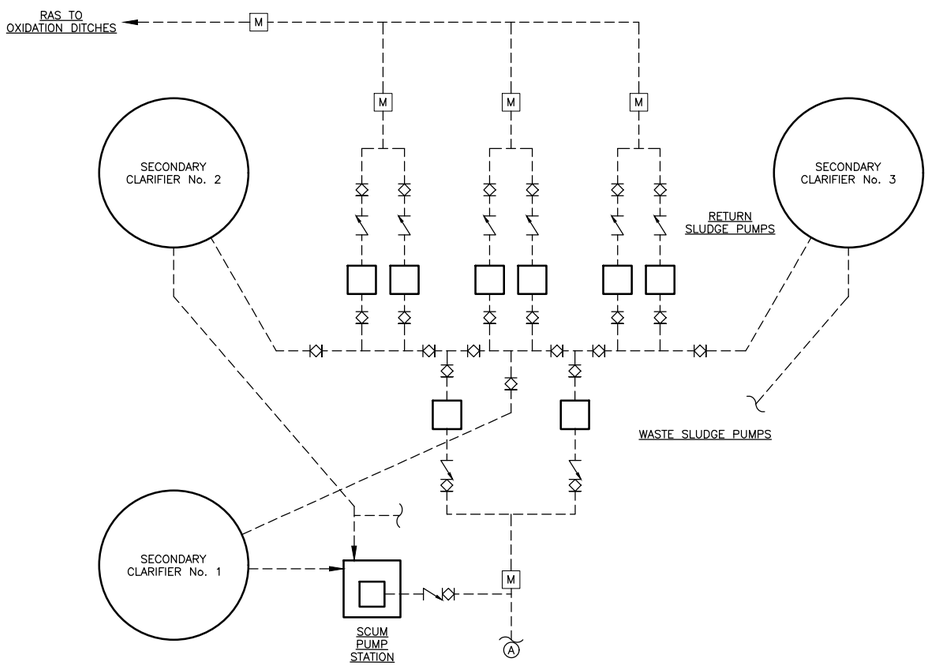
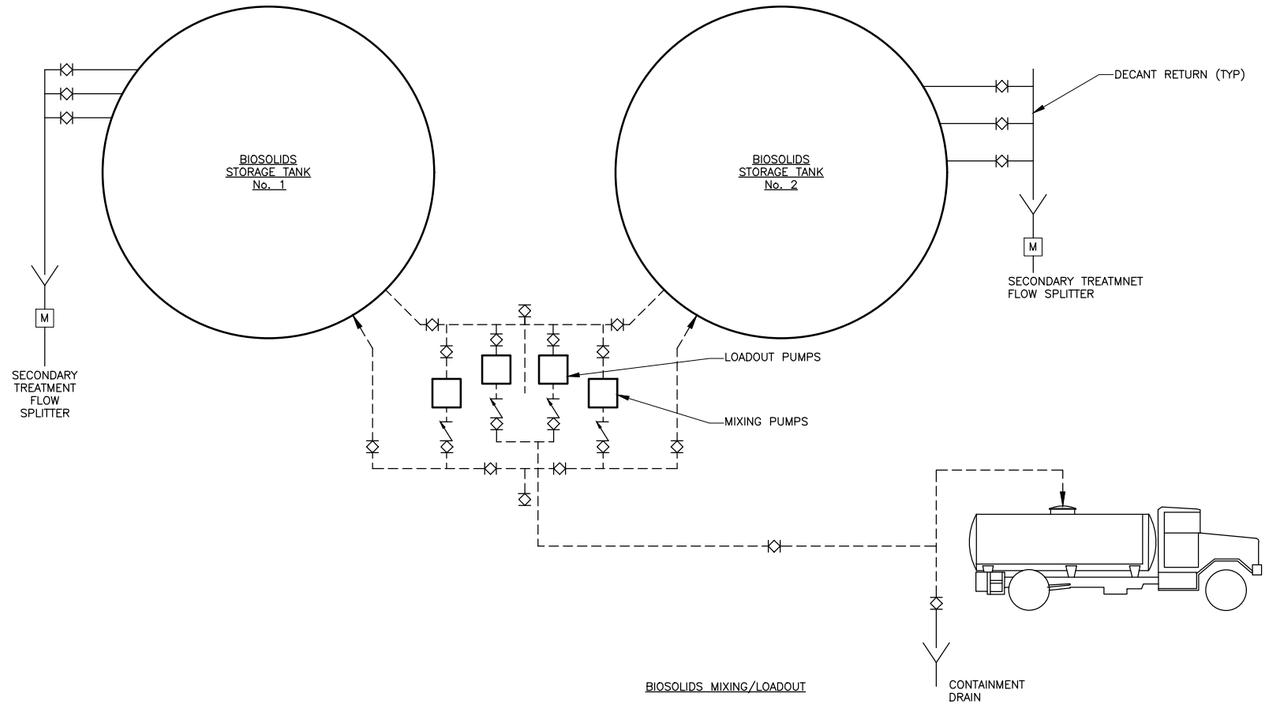
GENERAL
LIQUID PROCESS SCHEMATIC

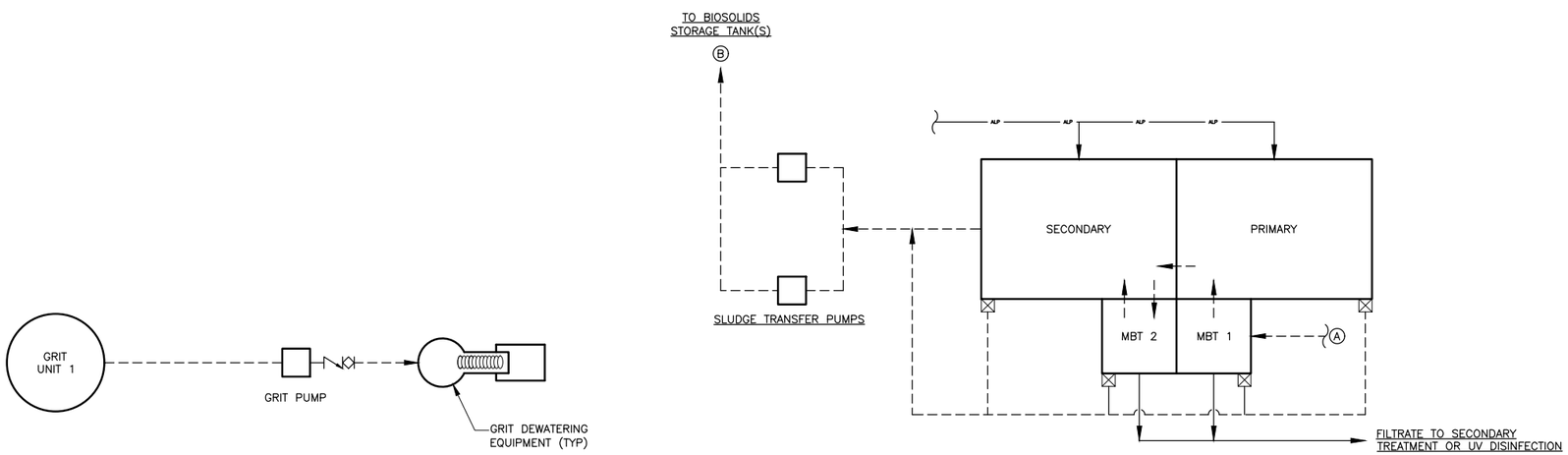
SHEET NO.
G.10

Xrefs: xgl-1-dh01; XP-00-SCHEMATICS





BIOSOLIDS MIXING/LOADOUT



GRIT REMOVAL SCHEMATIC

AEROBIC DIGESTION

LEGEND

- LIQUID FLOW
- SOLIDS FLOW
- PUMP
- M — FLOW METER
- S — SAMPLE LOCATION
- PLUG VALVE
- CHECK VALVE
- MUD VALVE
- ALP — AERATION LOW PRESSURE
- TO DRAIN

PRELIMINARY
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SOLIDS PROCESS SCHEMATIC

SHEET NO.
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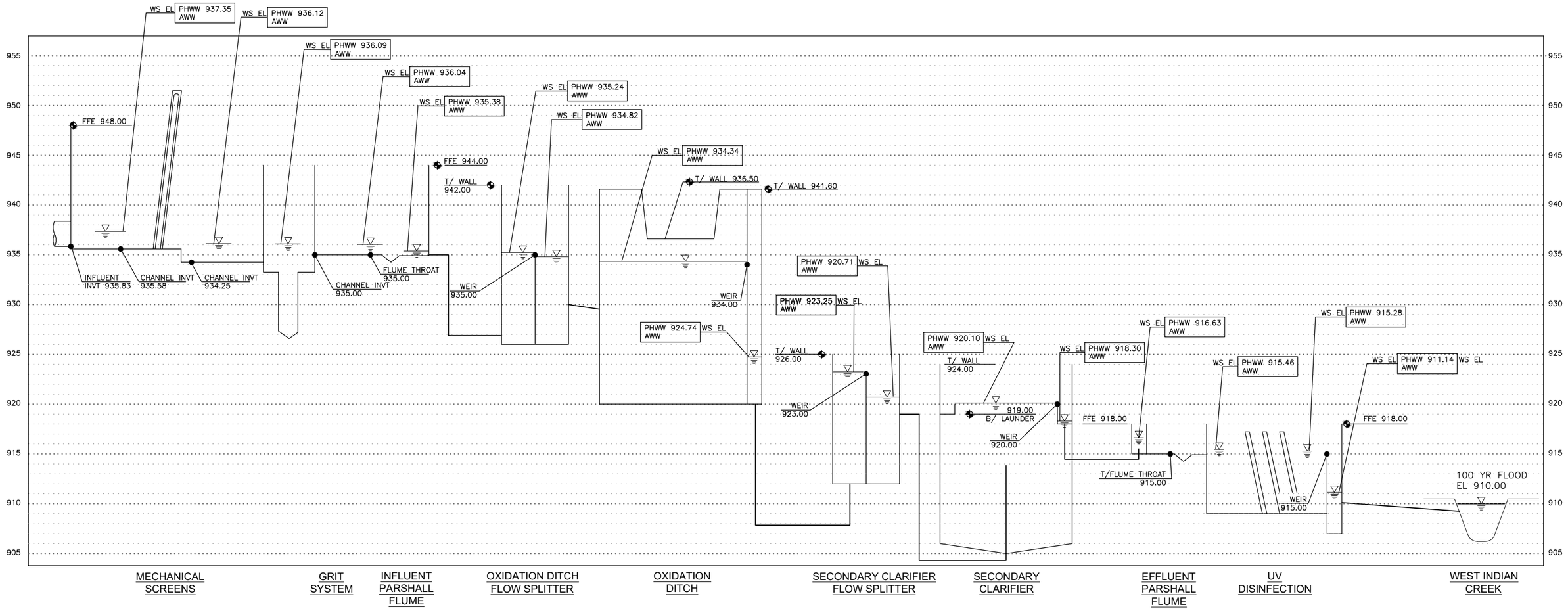
Xrefs: xgl-1-dh01; XP-00-SCHEMATICS



AWW = AVERAGE WET WEATHER = 3.02 MGD
PHWW = PEAK HOURLY WET WEATHER = 8.23 MGD

PRELIMINARY
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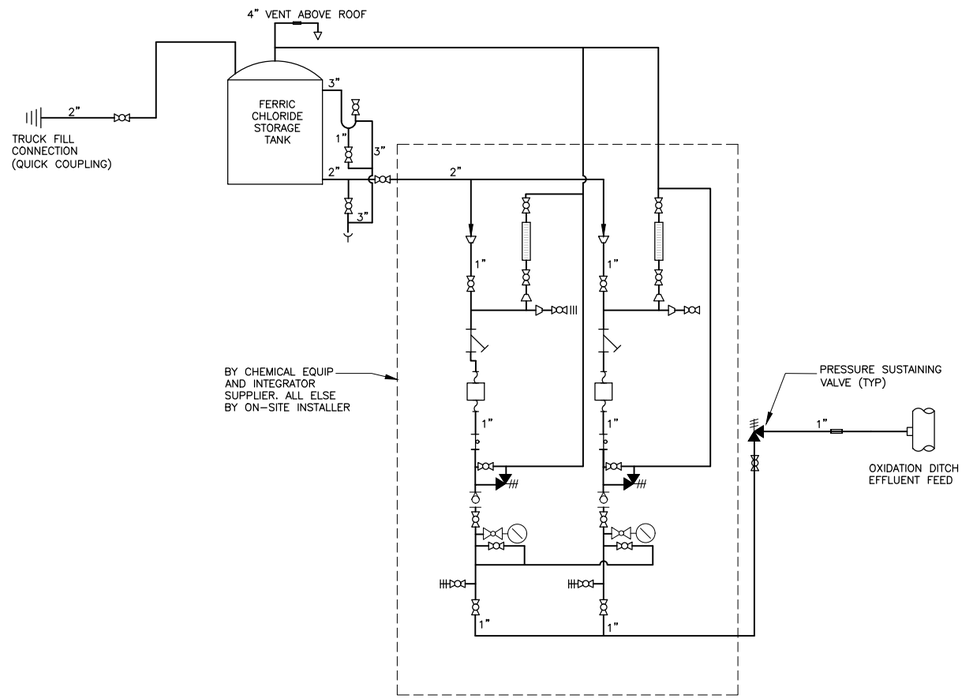
NEVADA, IOWA

GENERAL

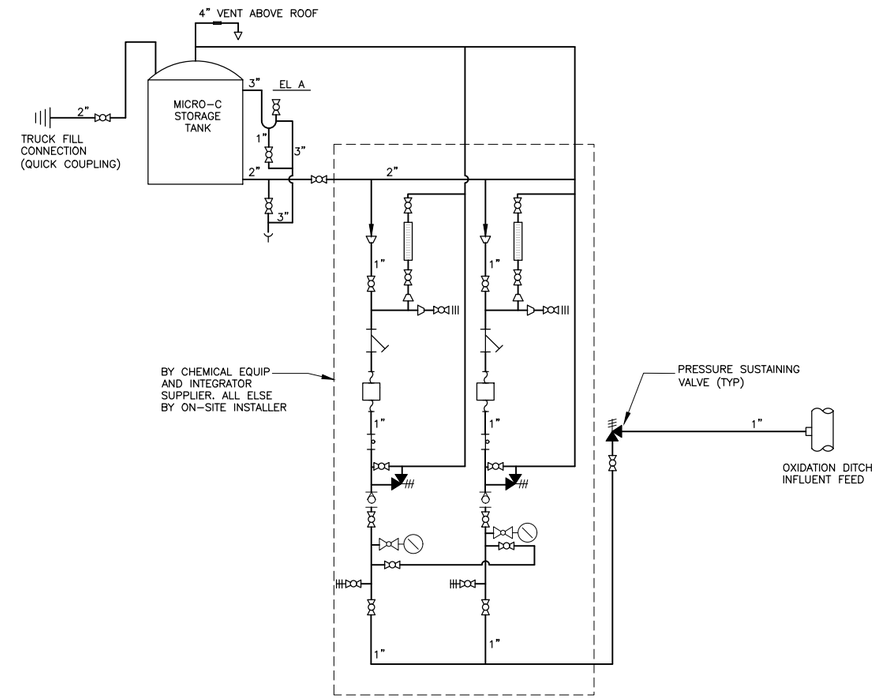
HYDRAULIC PROFILE

SHEET NO.
G.12

Xrefs: xgt-1-dh01; XP-D-HYD



1 FERRIC CHLORIDE FEED SYSTEM SCHEMATIC
NTS



2 MICRO-C FEED SYSTEM SCHEMATIC
NTS

PRELIMINARY
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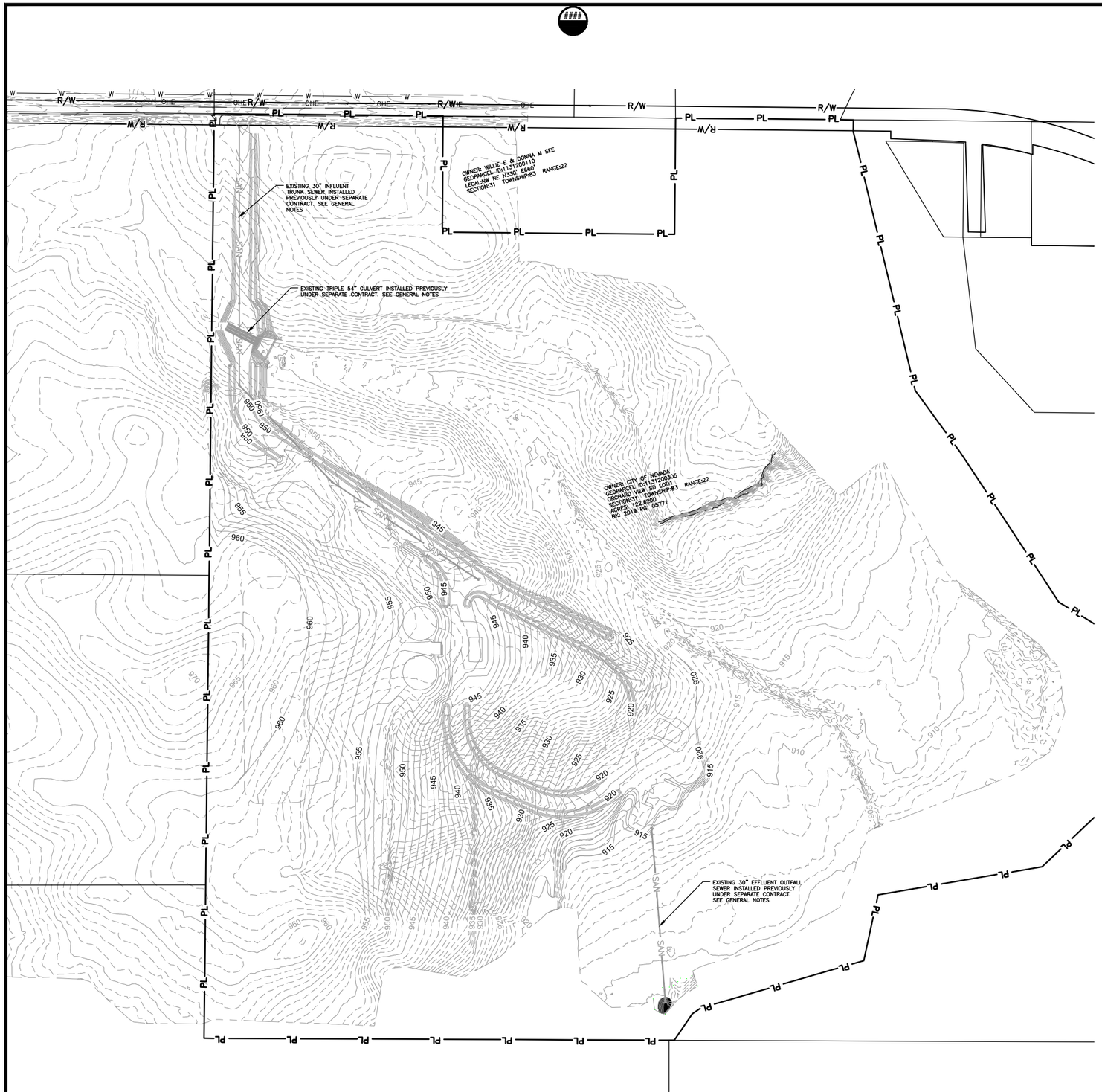
GENERAL
CHEMICAL FEED SCHEMATICS

SHEET NO.
G.13

Xrefs: xgt-1-dh01; XP-00- CHEMICAL FEED SCHEMATICS



1 SITEWORK
EXISTING CONDITIONS
SCALE: 100

NORTH

PRELIMINARY
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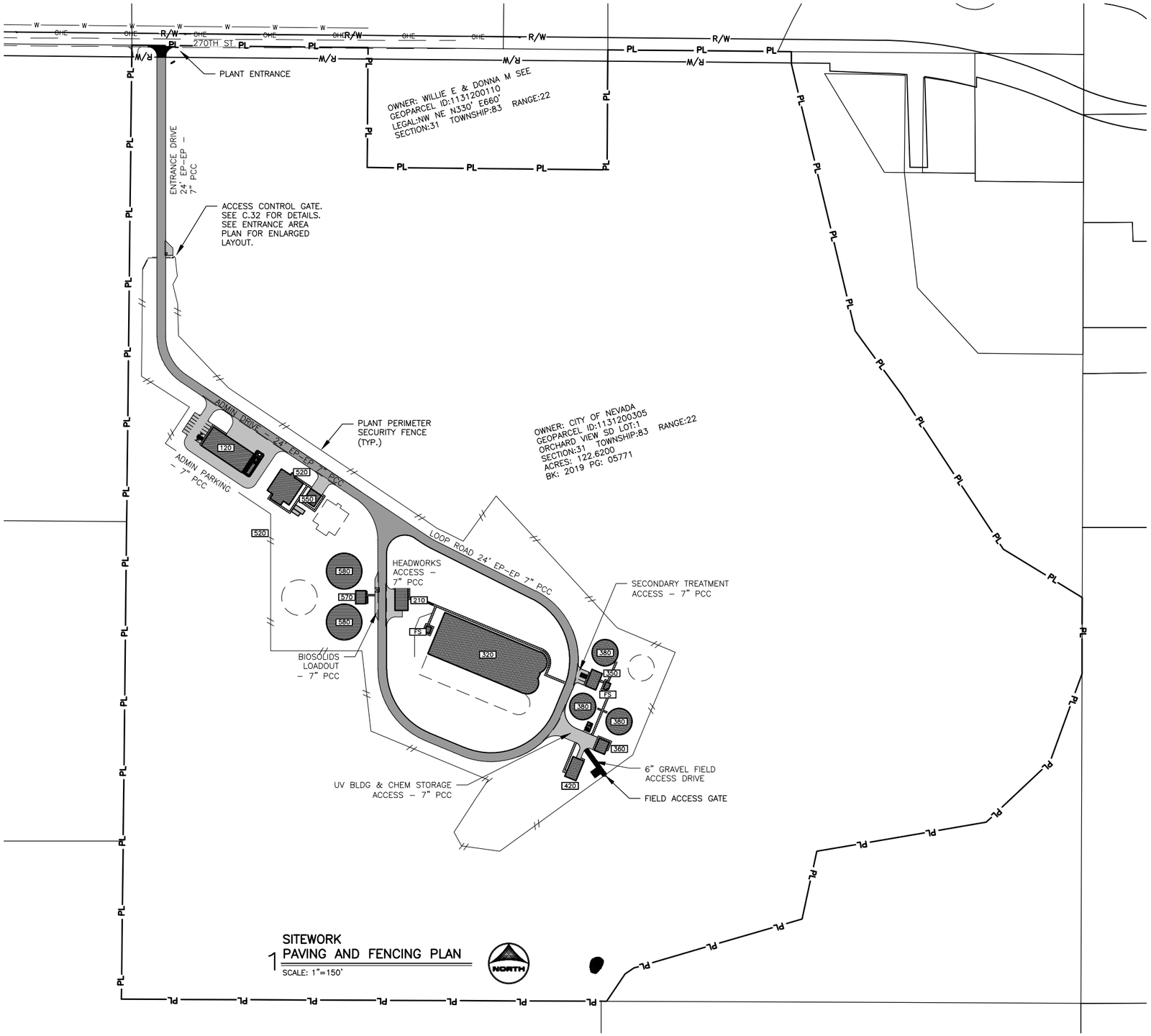
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
EXISTING CONDITIONS

SHEET NO.
C.01

Xrefs: xgt-1-dh01; XCS-BASE; XCS-PARCELS; XCS-ROW; XCG-CONT-FG; XCP-PATT; XCU-SAN; XCU-STRM; XVG-CONT-EG; XLS-DSGN; XLS-PATT



1 SITEWORK
PAVING AND FENCING PLAN
SCALE: 1"=150'

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

PRELIMINARY
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APPROVED: MAR JOB NUMBER: 160473
CAD DATE: 8/2/2020 12:00:56 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.02 PAVING AND FENCING PLAN.dwg

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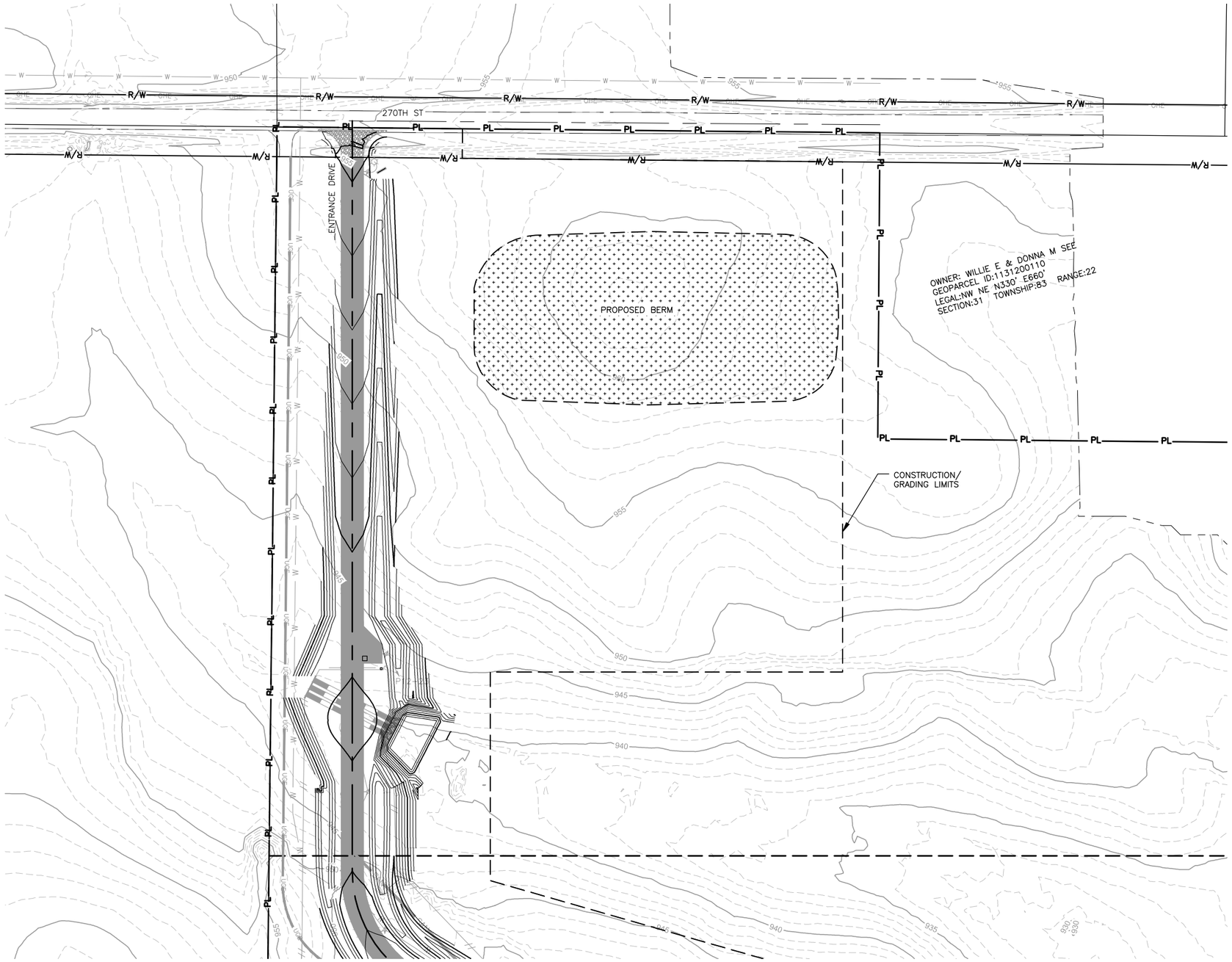
SITE WORK
PAVING AND FENCING PLAN

SHEET NO.
C.02

Xrefs: xgt-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-INDEX; XCP-PATT

GENERAL NOTES:

1. REFER TO C.04 PLANT GRADING PLAN FOR GENERAL NOTES REGARDING SITE GRADING REQUIREMENTS.



1 SITEWORK
ENTRANCE GRADING PLAN
SCALE: 1"=60'

NORTH

PRELIMINARY
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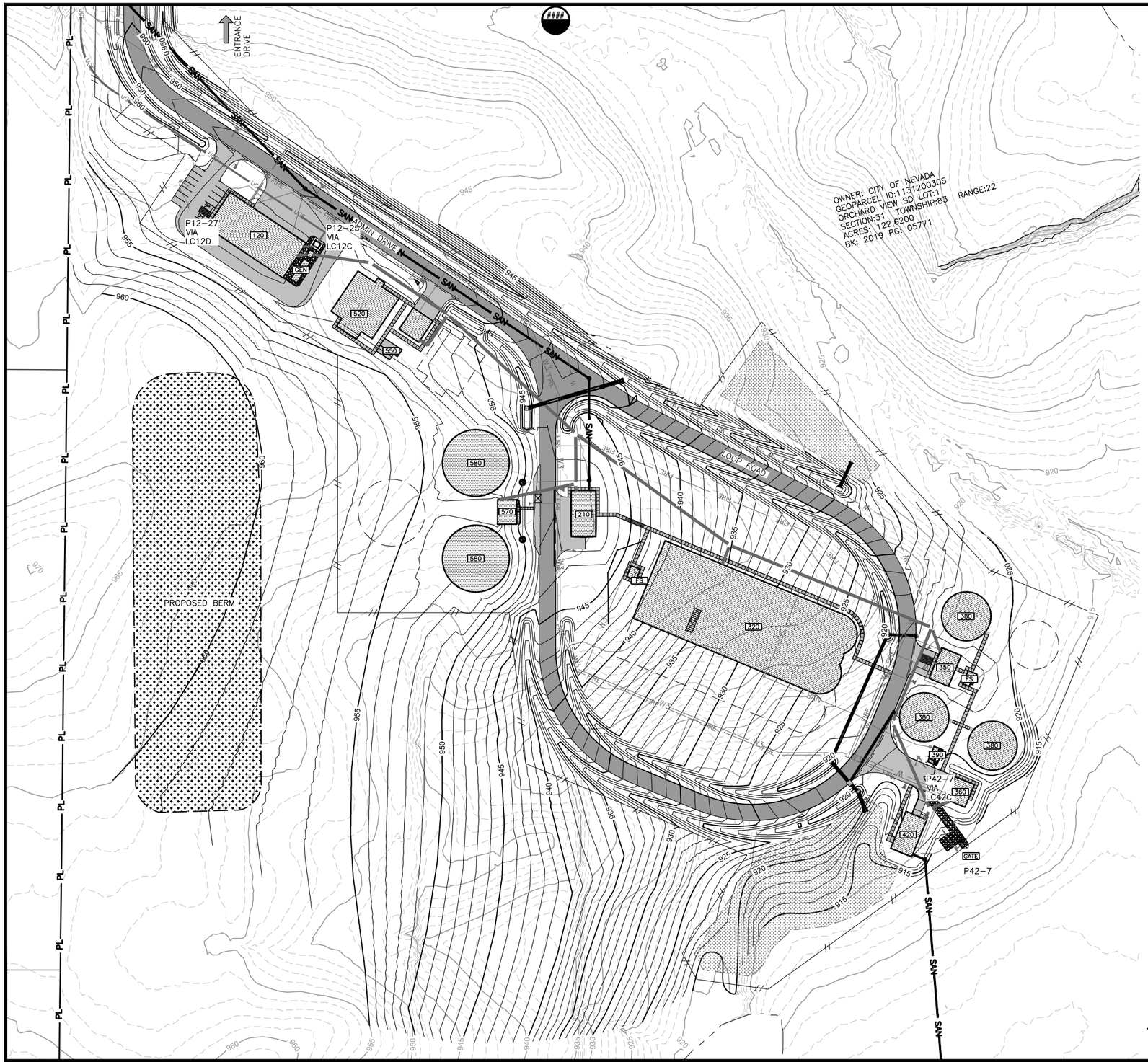
SITE WORK
ENTRANCE GRADING PLAN

SHEET NO.
C.03

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-VIEWFRAME; XCU-ELEC; XCP-PATT; XCU-WATR; XCU-SANI; XCU-STRM; XCT-ALIGNMENT; XVG-CONT-EG; XCG-CONSTRUCTION-LIMITS; XLS-PATT; XLS-DSGN; XCG-CONT-FG



GENERAL NOTES:

1. SEE SHEET X.XX FOR GEOTECHNICAL REQUIREMENTS AROUND BUILDINGS AND TANKS.
2. CONTRACTOR SHALL COMPLY WITH SPECIFICATION SECTION XX XXXX FOR SUPPORTS AND PROTECTION.
3. CONTRACTOR SHALL COMPLY WITH ALL SPECIFICATIONS FOR DEWATERING, GRADING, EXCAVATION, FILL AND BACKFILL, AND TRENCHING. SEE GEOTECHNICAL INVESTIGATION REPORT FOR EARTHWORK RECOMMENDATIONS. INSTALL EARTHWORK ACCORDING TO SPECIFICATION AND RECOMMENDATIONS OF GEOTECHNICAL INVESTIGATION REPORT.
4. WATER LEVELS WERE OBSERVED WITHIN THE DEPTHS OF PLANNED EXCAVATION FOR THE PROPOSED STRUCTURES. DEWATERING WILL BE REQUIRED WHERE SEEPAGE IS ENCOUNTERED. GROUNDWATER LEVELS SHOULD BE MAINTAINED AT LEAST TWO FEET BELOW BOTTOM OF EXCAVATION UNTIL FOUNDATION SLABS ARE COMPLETED. THE CONTRACTOR IS RESPONSIBLE FOR EMPLOYING APPROPRIATE DEWATERING METHODS TO CONTROL SEEPAGE INTO THE EXCAVATION. SEE GEOTECHNICAL REPORT FOR MORE INFORMATION ON DEWATERING.
5. IN AREAS TO ACCEPT FILL, THE TOP 12 INCHES OF THE GROUND SURFACE SHALL BE SCARIFIED AND COMPACTED TO ELIMINATE A PLANE OF WEAKNESS ALONG THE CONTACT SURFACE. EACH LIFT PLACED ABOVE THE FOUNDATION LEVEL SHOULD BE COMPACT TO AT LEAST 95 PERCENT OF THE SOIL'S STANDARD PROCTOR DRY DENSITY (ASTM D698). THE MOISTURE CONTENT OF THE COHESIVE SOILS SHOULD BE MAINTAINED WITHIN A RANGE OF 0 PERCENT BELOW TO 4 PERCENT ABOVE THE MATERIAL'S STANDARD PROCTOR OPTIMUM MOISTURE CONTENT. GENERAL FILL MATERIAL TO COMPLY WITH SPECIFICATIONS AND SHALL BE FREE OF FOREIGN SUBSTANCE, DEBRIS, LARGE STONES, ROCKS, ROOTS, ORGANIC OR FROZEN MATERIAL, EXPANSIVE MATERIAL AND OTHER DELETERIOUS MATERIALS. UNSUITABLE SHALL BE DISPOSED OF BY THE CONTRACTOR.
6. FILL SHOULD NOT BE FROZEN AND SHOULD NOT BE PLACED ON A FROZEN SURFACE. ALL COHESIVE SOILS USED AS FILL AT THIS SITE SHOULD HAVE A MAXIMUM LIQUID LIMIT OF 45 AND A MAXIMUM PLASTICITY INDEX OF 20.
7. ENSURE THAT PREVIOUSLY COMPACTED LIFTS ARE SCARIFIED 2 INCHES DEEP PRIOR TO COMPACTING THE NEXT LIFT.
8. USE EXISTING TOPSOIL STOCKPILE PLACED UNDER PRIOR CONTRACT TO PLACE 8" TOPSOIL TO MATCH FINAL GRADE ELEVATIONS AS SHOWN ON PLANS, EXCEPT IN AREAS TO BE SURFACED WITH GRAVEL, PAVEMENT, RIPRAP, OR OTHER DESIGNATED MATERIALS. REMOVE, STOCKPILE, AND REPLACE NATIVE MATERIAL 8 INCHES (TOPSOIL) BELOW EXISTING SURFACE FOR ALL AREAS DISTURBED (NOT SURFACED WITH GRAVEL, RIPRAP, OR OTHER DESIGNATED MATERIALS) WITHIN THE LIMITS OF CONSTRUCTION. NO ADDITIONAL PAYMENT WILL BE MADE FOR TOPSOIL OR MATERIAL THAT THE CONTRACTOR NEEDS TO IMPORT FROM OFFSITE.
9. SITE GRADING SHALL PROVIDE FOR POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES AND FOUNDATIONS UNLESS NOTED OTHERWISE.
10. CONTRACTOR SHALL CLEAR AND GRUB AREAS OF THE SITE AS NECESSARY TO PERFORM WORK. CLEARING AND GRUBBING SHALL BE PER SPECIFICATIONS.

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

1 SITEWORK
PLANT GRADING PLAN
SCALE: 1" = 80'

NORTH

PRELIMINARY
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DRAWN BY: CMB, JST
APPROVED: MAR
CAD DATE: 8/1/2020 2:42:24 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.04 PLANT GRADING PLAN.dwg
JOB DATE: 2020
JOB NUMBER: 160473

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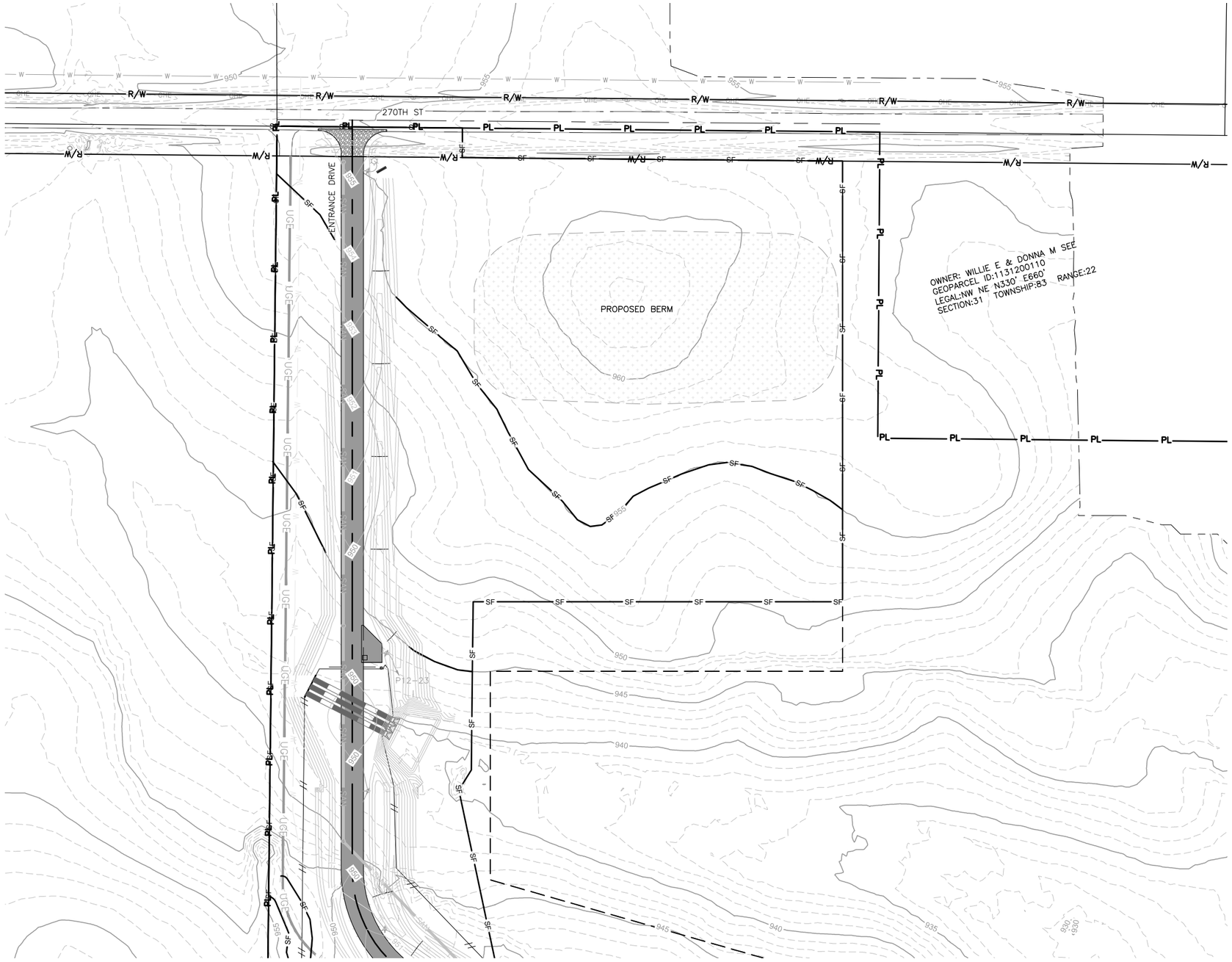
SITE WORK
PLANT GRADING PLAN

SHEET NO.
C.04

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-INDEX; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XVG-CONT-EG; XLS-DSGN; XLS-PATT



1 SITEWORK
ENTRANCE EROSION CONTROL PLAN
SCALE: 1"=60'

NORTH

PRELIMINARY
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SITE WORK
ENTRANCE EROSION CONTROL PLAN

SHEET NO.
C.05

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-VIEWFRAME; XCG-CONT-FG; XCU-ELEC; XCP-PATT; XCU-WATR; XCU-SANI; XCT-ALIGNMENT; XVG-CONT-EG; XCG-CONSTRUCTION-LIMITS; XLS-PATT; XLS-DSGN; XCU-STRM; XCG-EROS-PHASE02

1 SITEWORK
PLANT EROSION CONTROL PLAN
SCALE: 1"=100'

NORTH

NOTES:

1. REFERENCE SWPPP FOR MORE INFORMATION REGARDING EROSION AND SEDIMENT CONTROL.
2. HIGH-FLOW TYPE INLET PROTECTION TO BE PROVIDED FOR ALL EXISTING AND PROPOSED INTAKES. EXISTING INTAKES ARE TO BE PROTECTED UNTIL REMOVAL OR FINAL STABILIZATION. PROPOSED INTAKES ARE TO BE PROTECTED IMMEDIATELY FOLLOWING INSTALLATION UNTIL FINAL STABILIZATION. REPLACE ANY DAMAGED OR NON-FUNCTIONING INLET PROTECTION IMMEDIATELY.
3. ALL FOREIGN MATERIAL MUST BE PREVENTED FROM ENTERING EXISTING AND PROPOSED STORM SEWER INLETS OR DRAINAGE WAYS.
4. THE SPREAD OF TRACK OUT IS TO BE MITIGATED DAILY. EXISTING PAVEMENT ADJACENT ENTRANCE/EXIT TO MUST BE SWEPT DAILY AND CLEARED OF DIRT AND OTHER DEBRIS.
5. TRASH MUST BE PICKED UP DAILY.

EROSION AND SEDIMENT CONTROL
GOOD HOUSEKEEPING PRACTICES:

DEMOLITION AND GRADING PHASE

1. PERIMETER EROSION CONTROLS MUST BE IN PLACE AND FUNCTIONING PRIOR TO LAND-DISTURBING ACTIVITIES.
2. STOCKPILES SHOULD BE SURROUNDED WITH SILT FENCE WHERE POSSIBLE. WHERE NOT FEASIBLE (I.E. ON PAVEMENT) USE EROSION SOCK. COVER STOCKPILES OVER NIGHT AND OVER WEEKENDS WHEN RAIN IS POSSIBLE

FINISHED PAVEMENT AND STRUCTURES PHASE

1. HIGH FLOW INLET PROTECTION MUST REMAIN IN PLACE UNTIL ENTIRE UPHILL AREA IS FINAL STABILIZED.
2. INSTALL AND MAINTAIN 12 INCH DIAMETER FILTER SOCKS AT THE TOE OF FRESH SLOPES AND BACK-OF-CURB ADJACENT TO DISTURBED SOILS.

DO NOT ALLOW ANYTHING OTHER THAN CLEAN, CLEAR WATER INTO THE EXISTING CULVERTS, STORM INLETS NEWLY INSTALLED ON THE PROJECT SITE, OR THE DRAINAGE WAYS. ANYTHING ELSE MAY RESULT IN AN ILLICIT DISCHARGE CITATION.

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NEVADA, IOWA

SITE WORK
PLANT EROSION CONTROL PLAN

SHEET NO.
C.06

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-VIEWFRAME; XCS-BLDG-INDEX; XCO-CONT-FG; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XVG-CONT-EG; XVG-EROS-PHASE02

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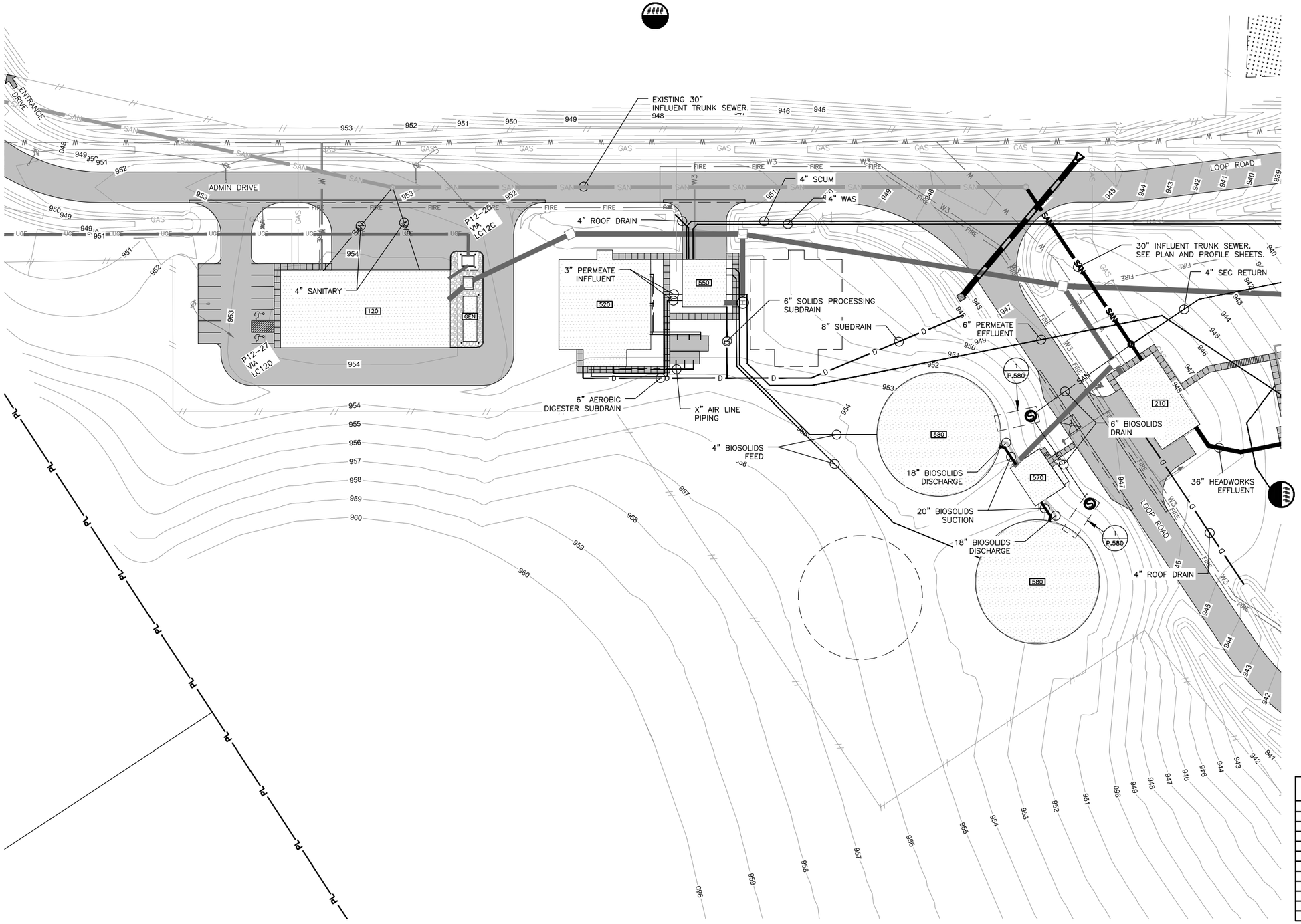
SITE WORK
EROSION CONTROL NOTES

SHEET NO.
C.07

Xrefs: xgl-1-dh01



GENERAL NOTES:

1. THIS SHEET ONLY CONTAINS INFORMATION FOR YARD PROCESS, SANITARY, AND STORM PIPING.
2. REFER TO AREA PLANS FOR PROCESS PIPE FITTING AND STRUCTURE LOCATIONS AND INVERT ELEVATIONS.
3. REFER TO AREA PLANS FOR SANITARY SEWER FITTING AND STRUCTURE LOCATIONS AND INVERT ELEVATIONS.
4. REFER TO C.19 FOR INFLUENT TRUNK SEWER PLAN AND PROFILE
5. REFER TO C.23 FOR STORM PIPING AND STRUCTURE SCHEDULES.
6. REFER TO SPECIFICATION SECTION 016300 FOR PIPELINE SCHEDULE AND MATERIAL SPECIFICATIONS.
7. REFER TO C.10 FOR UTILITY PIPING PLAN CONTAINING GAS, POTABLE WATER, PLANT EFFLUENT WATER, AND FIRE WATER PIPING.
8. LOADING CONDITIONS ON THE PIPES ARE CRITICAL. THE CONTRACTOR SHALL LIMIT THE EXCAVATION OF THE PIPE ENVELOPE PER SPECIFICATIONS. IF THE CONTRACTOR'S METHODS OF EXCAVATION AND/OR PIPE INSTALLATION RESULTS IN A PIPE ENVELOPE WIDER THAN THE MAXIMUM SPECIFIED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONCRETE BEDDING AND/OR CONCRETE ENCASEMENT OR OTHER MEANS NECESSARY TO PROVIDE FOR STRUCTURAL INTEGRITY OF THE PIPE CONSISTENT WITH THE DESIGN LOADING.
9. PROCESS PIPING TO MAINTAIN STEADY SLOPE BETWEEN FITTINGS AND/OR CONNECTIONS. IF NO ELEVATION IS PROVIDED FOR A SPECIFIED FITTING, CONTRACTOR TO MAINTAIN CONSTANT SLOPE TO NEAREST ELEVATION PROVIDED.
10. CONTRACTORS TO DEFLECT PIPING AT JOINTS AS NECESSARY IN ORDER TO CONNECT SPECIFIED FITTINGS. MAXIMUM DEFLECTION OF 1 DEGREE EACH JOINT FOR PROCESS PIPING OR AS RECOMMENDED BY MANUFACTURER, WHICHEVER IS LESS.
11. FITTING BENDS MAY BE ROTATED ABOUT THE PIPE AXIS TO PRODUCE A SIMULTANEOUS HORIZONTAL/VERTICAL ALIGNMENT CHANGE.

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

NORTH

1 SITEWORK
WEST YARD PIPING PLAN
SCALE: 1" = 40'

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APPROVED: MAR JOB NUMBER: 160473
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CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.08 WEST YARD PIPING PLAN.dwg

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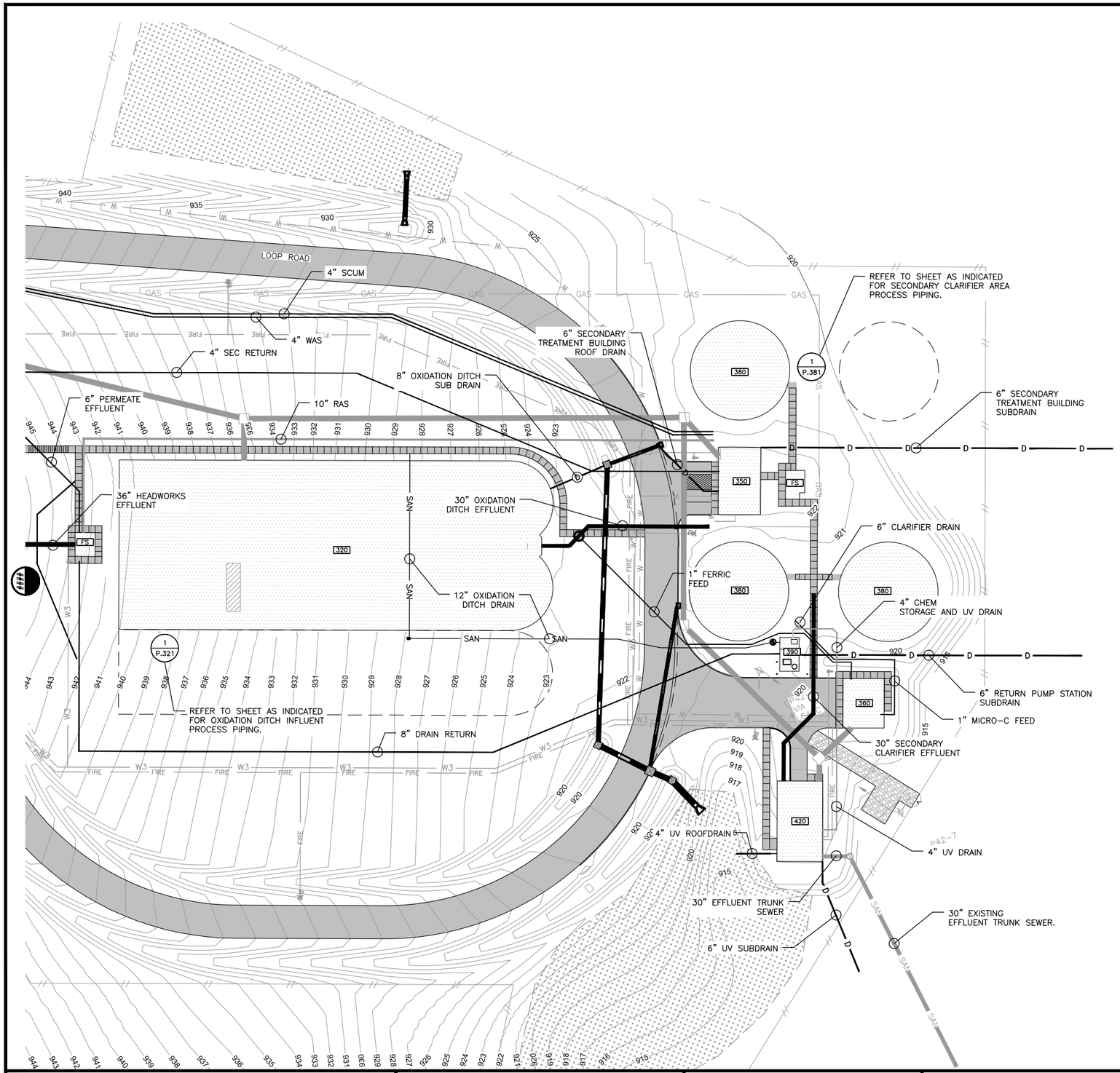
SITE WORK
WEST YARD PIPING PLAN

SHEET NO.
C.08

Xrefs: xgt-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-INDEX; XCT-ALIGNMENT; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-WATR; XVG-CONT-EG; XCU-PROC; XCS-380-P01; XP-380-CLARIFER-COMPLEX; XCU-SUBDRAIN; XCU-GAS; XCU-STRM; XCU-SANI

GENERAL NOTES:

1. THIS SHEET ONLY CONTAINS INFORMATION FOR YARD PROCESS, SANITARY, AND STORM PIPING.
2. ALL GENERAL NOTES FROM C.07 WEST YARD PIPING PLAN APPLY TO THIS SHEET.



1 SITEWORK
EAST YARD PIPING PLAN
SCALE: 1" = 40'

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: MAR
CAD DATE: 8/3/2020 7:08:21 PM
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JOB DATE: 2020
JOB NUMBER: 160473

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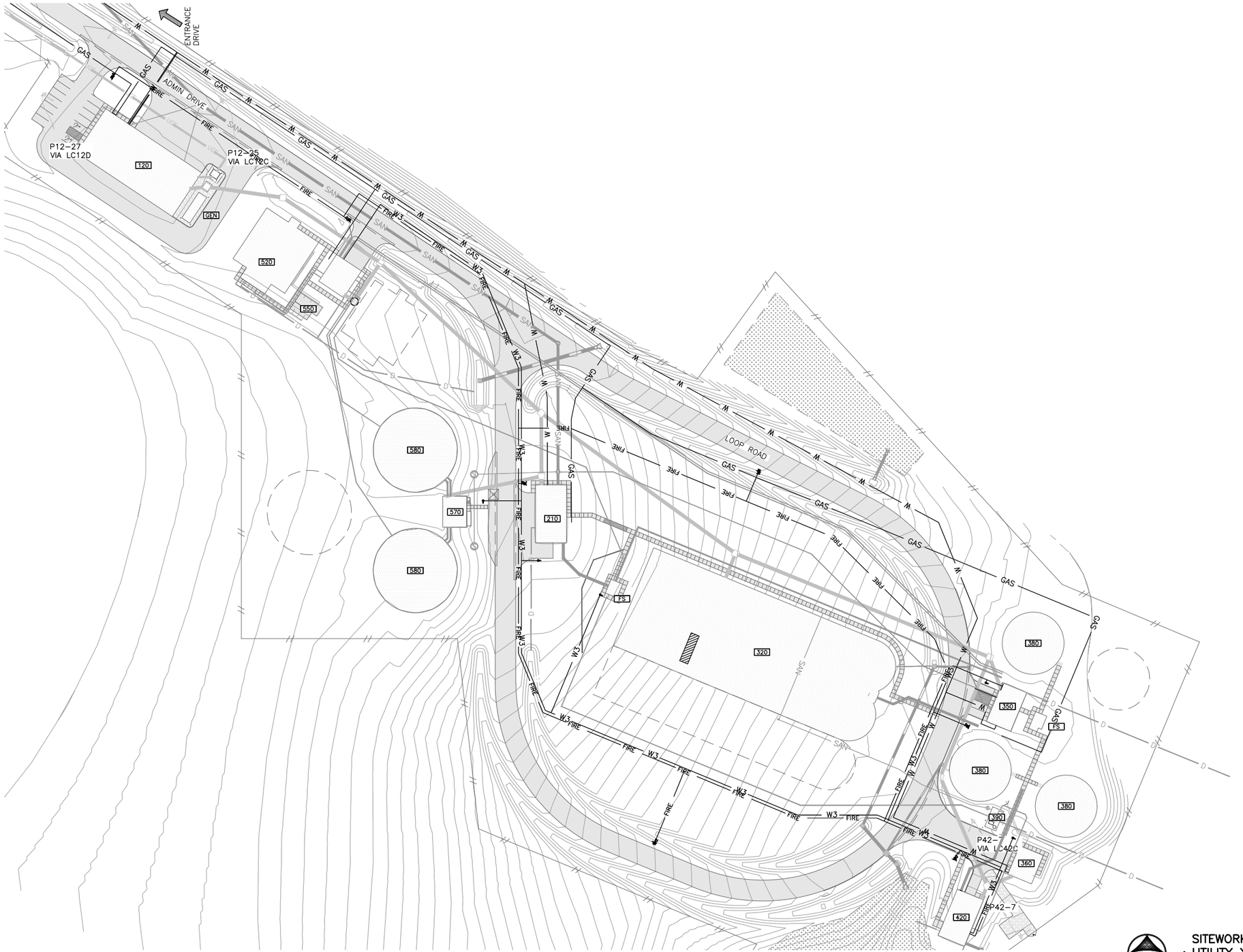
SITE WORK
EAST YARD PIPING PLAN

SHEET NO.
C.09

Xrefs: xgt-1-db01; XCS-BASE; XCS-DSGN; XCS-BLDG-INDEX; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-STRM; XCU-WATR; XCU-PROC; XCU-SAN; XCS-320-P01; XS-320-P01; XS-320-GRID; XP-320-P01; XCS-VIEWFRAME; XVG-CONT-EG; XCU-GAS; XCU-SUBDRAIN



GENERAL NOTES:

1. THIS SHEET ONLY CONTAINS INFORMATION FOR UTILITY PIPING CONSISTING OF GAS, PLANT EFFLUENT WATER, FIRE WATER, AND POTABLE WATER PIPING.
2. REFER TO C.11 ENTRANCE AREA PLAN FOR UTILITY PIPING LOCATIONS ALONG ENTRANCE DRIVE. ALL GENERAL NOTES FROM THIS PAGE APPLY TO UTILITY PIPING SHOWN ON SHEET C.11.
3. REFER TO C.08 AND C.09 FOR YARD PIPING PLANS PROVIDING INFORMATION FOR ALL PROCESS, SANITARY, AND STORM PIPING.
4. REFER TO SPECIFICATION SECTION XXXXXX FOR POTABLE WATER, FIRE WATER, AND PLANT EFFLUENT WATER MATERIAL SPECIFICATIONS.
5. REFER TO SPECIFICATION SECTION XXXXXX FOR GAS PIPING MATERIAL SPECIFICATIONS.
6. LOADING CONDITIONS ON THE PIPES ARE CRITICAL. THE CONTRACTOR SHALL LIMIT THE EXCAVATION OF THE PIPE ENVELOPE PER DETAIL XXXX/C.XX. IF THE CONTRACTOR'S METHODS OF EXCAVATION AND/OR PIPE INSTALLATION RESULTS IN A PIPE ENVELOPE WIDER THAN THE MAXIMUM SPECIFIED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONCRETE BEDDING AND/OR CONCRETE ENCASEMENT OR OTHER MEANS NECESSARY TO PROVIDE FOR STRUCTURAL INTEGRITY OF THE PIPE CONSISTENT WITH THE DESIGN LOADING.
7. THE PLANT EFFLUENT WATER, FIRE WATER, POTABLE WATER, AND GAS MAINS SHALL BE INSTALLED TO A MINIMUM COVER OF FIVE (5) FEET, UNLESS OTHERWISE NOTED. POTABLE, FIRE, AND PLANT EFFLUENT WATER PIPING MAY REQUIRE DEEPER BURY IN LOCATIONS NECESSARY TO CROSS UNDER OTHER UTILITY LINES OR STRUCTURES. SUCH CROSSINGS SHALL BE MADE USING NORMAL PIPE DEFLECTION WITHOUT USING FITTINGS IF POSSIBLE. THE INSTALLED VERTICAL PROFILE OF THE POTABLE, FIRE, OR EFFLUENT WATER MAINS SHALL NOT RESULT IN ANY ADDITIONAL HIGH POINTS OTHER THAN THOSE INDICATED IN AREA PLANS BY HYDRANTS OR AIR RELEASE STATIONS. CONTRACTOR SHALL PERIODICALLY CHECK VERTICAL AND HORIZONTAL ALIGNMENT.
8. ONLY KEY LOCATIONS AND DIMENSIONS ARE PROVIDED IN THE UTILITY PIPING PLAN. CONTRACTOR SHALL FOLLOW GENERAL LAYOUT AS SHOWN IN THE UTILITY PIPING PLAN IN ORDER TO CONNECT TO BUILDINGS, STRUCTURES, AND EQUIPMENT AS SHOWN IN THE MECHANICAL SHEETS.
9. CONTRACTORS TO DEFLECT PIPING AT JOINTS AS NECESSARY TO CONNECT SPECIFIED FITTINGS. MAXIMUM DEFLECTION OF UP TO 1 DEGREE LESS THAN WHAT IS RECOMMENDED BY THE MANUFACTURER.
10. CONTRACTOR TO ASSUME PRESSURE PIPE TRENCH EXCAVATION AND BEDDING FOR ALL UTILITY PIPING. SEE TRENCH EXCAVATION AND BEDDING DETAILS ON SHEET C.XX.
11. CONTRACTOR IS RESPONSIBLE TO ENSURE POTABLE WATER AND FIRE WATER PIPING FOLLOWS ALL IOWA DNR REGULATIONS IN RELATION TO POTABLE WATER INSTALLATION.

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

NORTH

1 SITEWORK
UTILITY YARD PIPING PLAN
SCALE: 1"=60'

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DRAWN BY: CMB, JST JOB DATE: 2020
APPROVED: MAR JOB NUMBER: 160473
CAD DATE: 8/3/2020 9:17:48 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.10 UTILITY YARD PIPING PLAN.dwg

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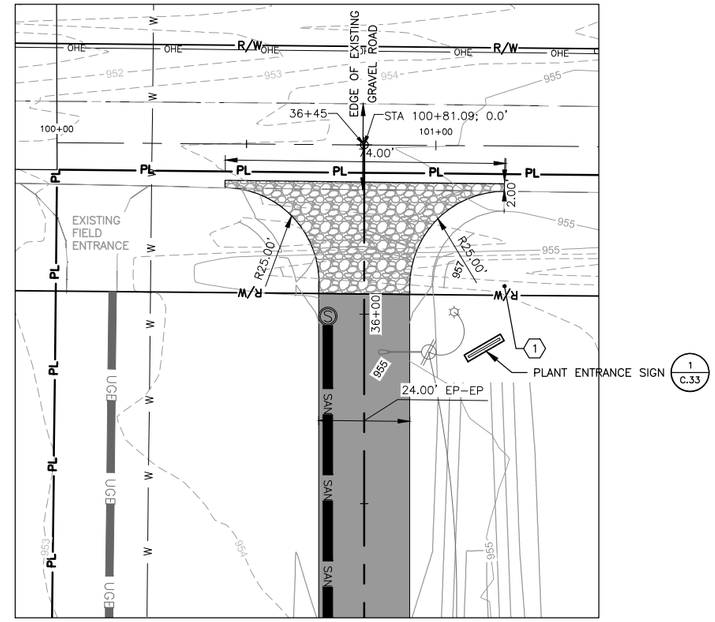
SITE WORK
UTILITY YARD PIPING PLAN

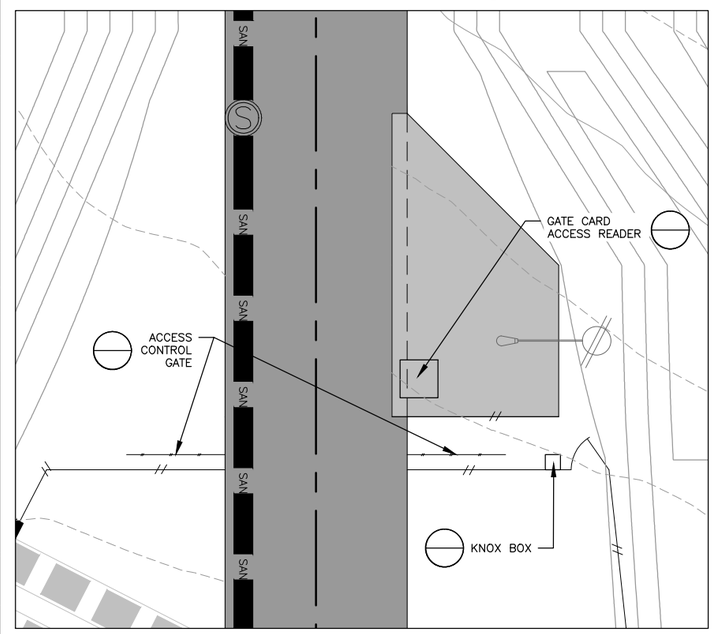
SHEET NO.
C.10

Xrefs: xgl-1-dh01; XCS-DISCN; XCS-ROW; XCS-BLDG-INDEX; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XCU-PROC; XCU-GAS; XCG-CONT-FG; XCU-SUBDRAIN

1 SITEWORK
ENTRANCE AREA PLAN
SCALE: 1"=50'



2 SITEWORK
ENLARGED ENTRANCE DRIVE
SCALE: 1"=20'



3 SITEWORK
ENLARGED ENTRANCE GATE
SCALE: 1"=20'

GENERAL NOTES:

1. ENTRANCE AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, UTILITY PIPING, ENTRANCE GATE, AND PROCESS AND SANITARY SEWER FITTINGS.
2. ENTRANCE AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
4. REFER TO C.10 UTILITY PIPING PLAN FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE UTILITY PIPING AS SHOWN ON THE ENTRANCE AREA PLAN.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
12. SEE C.23 FOR STORM SEWER SCHEDULE.
13. SEE C.23–C.34 FOR CIVIL DETAILS.
14. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3450181.91	4933810.70	0.00

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APPROVED: MAR	JOB NUMBER: 160473		
CAD DATE: 8/3/2020 7:03:12 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.11 ENTRANCE AREA PLAN.dwg			

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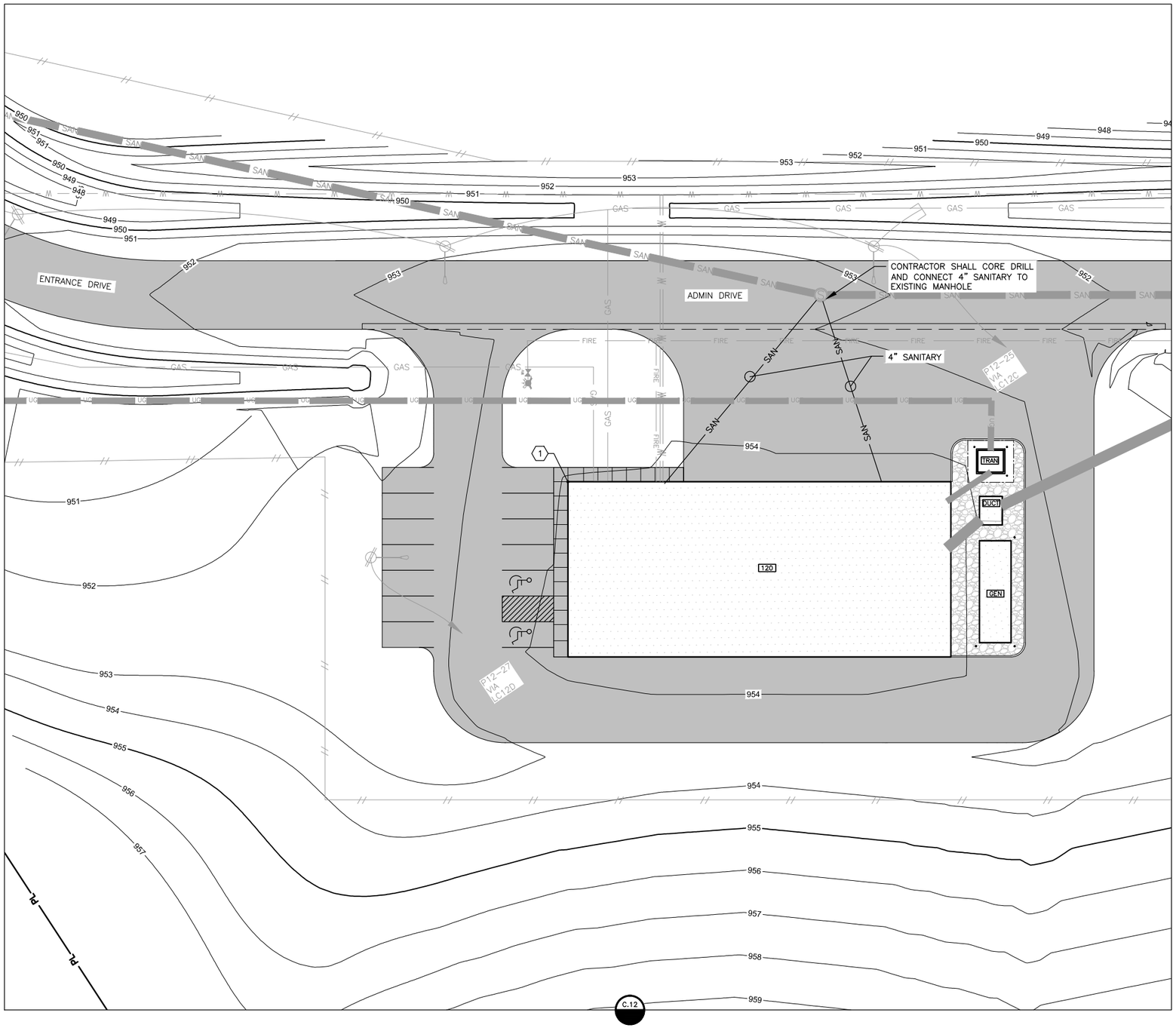
SITE WORK
ENTRANCE AREA PLAN

SHEET NO.
C.11

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XCG-CONT-FG; XCU-ELEC; XCP-PATT; XCU-WATR; XCU-SAN; XCU-STRM; XVG-CONT-EG



1 SITEWORK
ADMINISTRATION AREA PLAN
SCALE: 1"=20'

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3449162.24	4933917.21	0.00

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APPROVED: XXX JOB NUMBER: 160473
CAD DATE: 8/3/2020 4:14:09 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.12 ADMINISTRATION AREA PLAN.dwg

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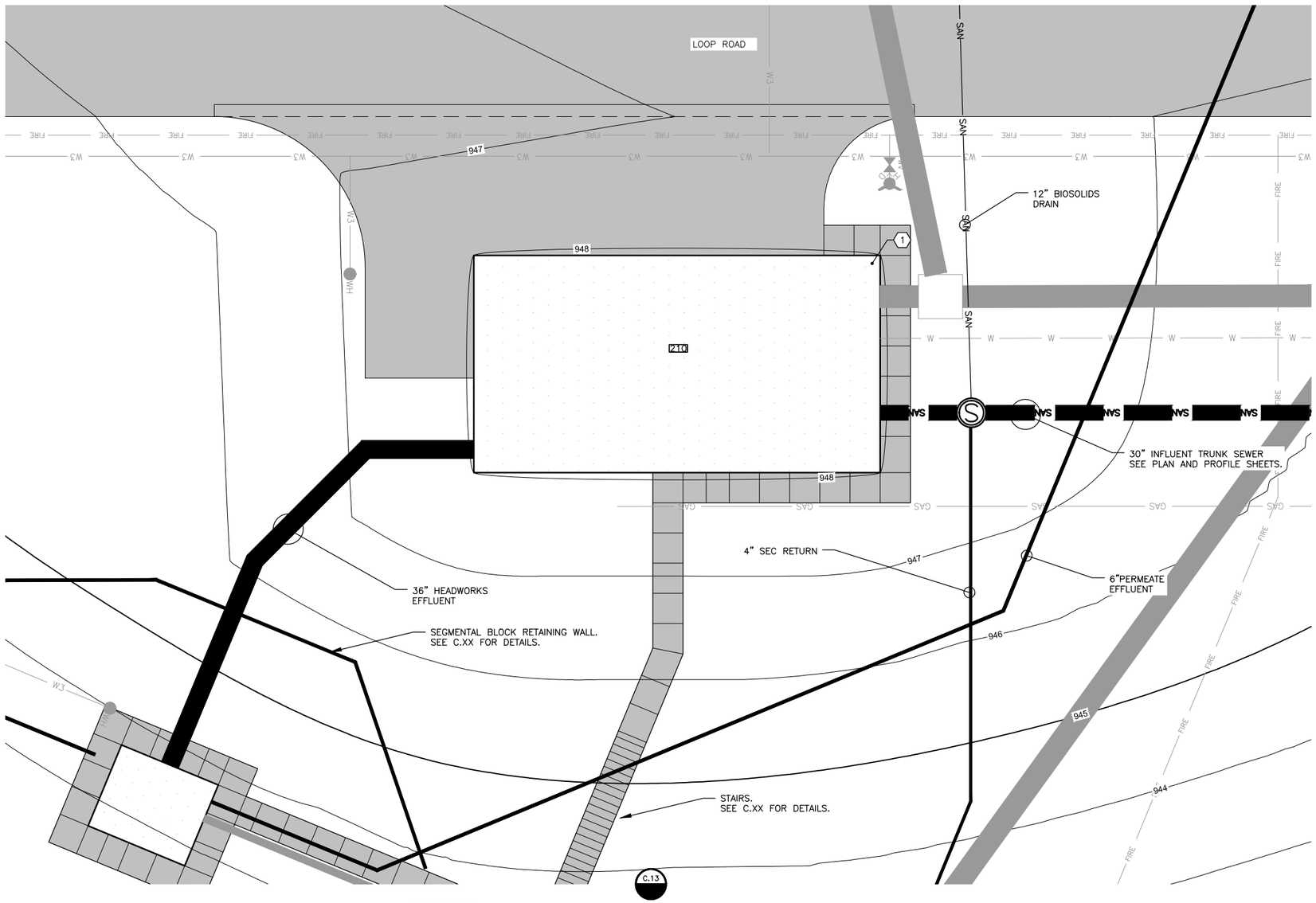
SITE WORK
ADMINISTRATION AREA PLAN

SHEET NO.
C.12

Xrefs: vgt-1-dh01; XCS-BASE; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XCT-ALIGNMENT; XCG-CONT-FG; XCU-ELEC; XCU-SANI; XCU-STRM; XCU-WATR; XCP-PATT; XVG-CONT-EG; XCS-120-P01; XA-120-P01; XS-120-GRID; XEP-120-P01; XEL-120-P01; XCS-DSGN; XCU-GAS



1 SITEWORK
HEADWORKS AREA PLAN
SCALE: 1"=10'

NORTH

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3448723.69	4934418.09	0.00

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APPROVED: MAR	JOB NUMBER: 160473		
CAD DATE: 8/3/2020 6:25:43 PM			
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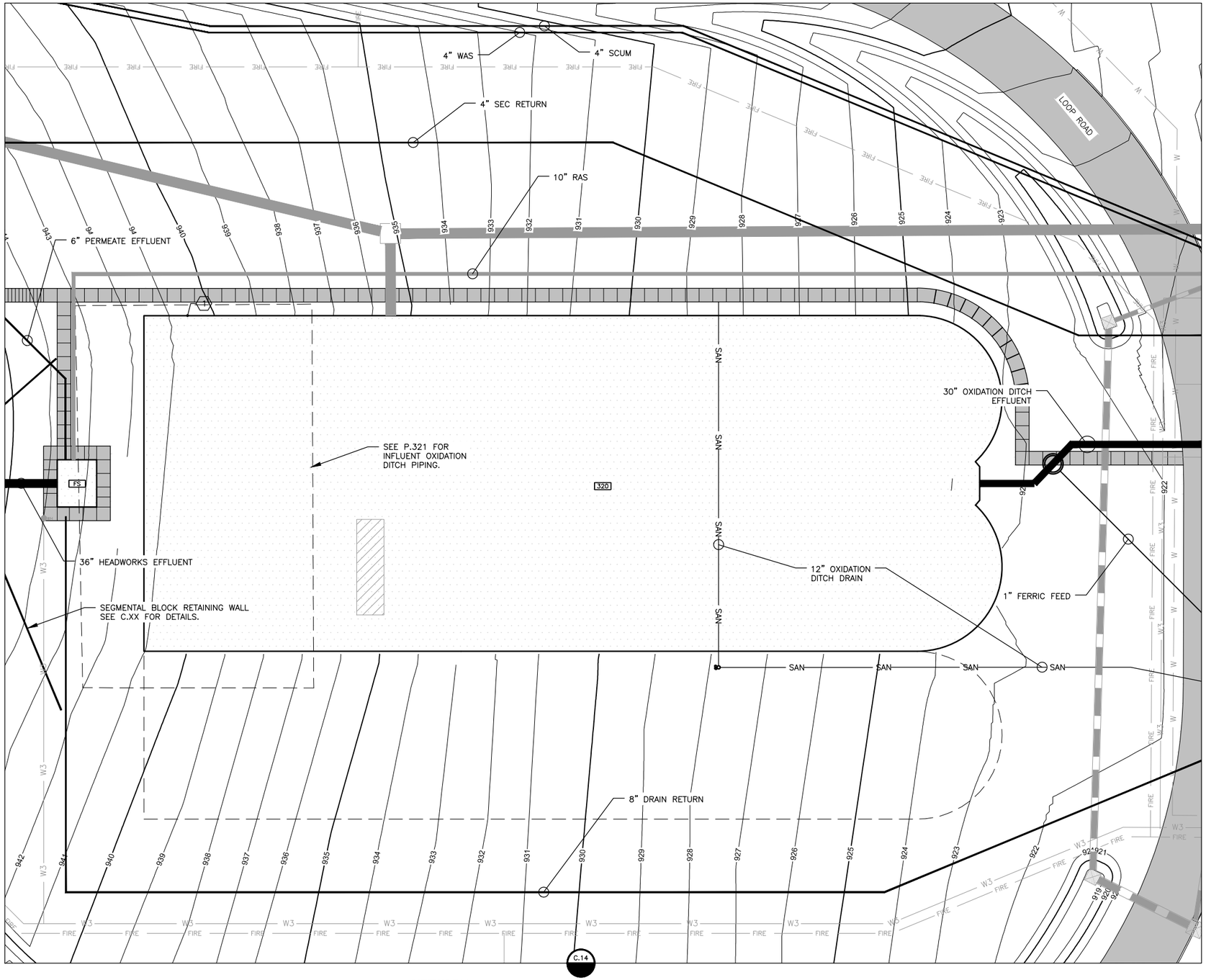
SITE WORK
HEADWORKS AREA PLAN

SHEET NO.
C.13

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XCT-ALIGNMENT; XVG-CONT-EG; XCG-CONT-FG; XCU-ELEC; XCP-PATT; XCU-WATR; XCU-SAN; XCU-STRM; XCS-210-P01; XA-210-P01; XEP-210-P01; XP-210-P01; XS-210-GRID; XS-210-P00; XCU-PROC; XCU-GAS; XCU-SUBDRAIN



1 SITEWORK
OXIDATION DITCHES AREA PLAN
SCALE: 1"=20'

NORTH

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3448645.90	4934568.94	0.00

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APPROVED: MAR	JOB NUMBER: 160473		
CAD DATE: 8/3/2020 6:30:25 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.14 OXIDATION DITCHES AREA PLAN.dwg			

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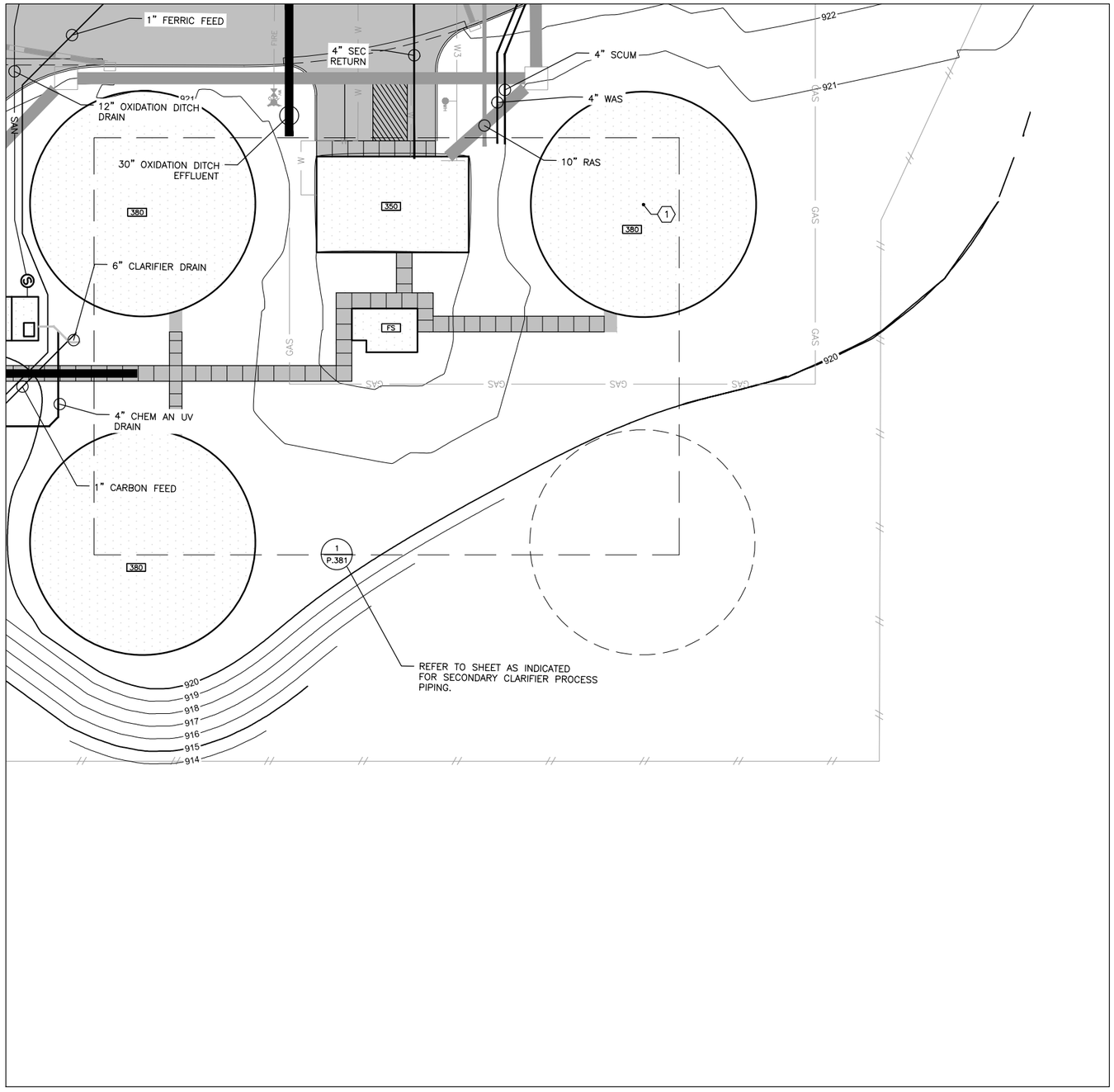
SITE WORK
OXIDATION DITCHES AREA PLAN

SHEET NO.
C.14

Xrefs: xgt-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XA-120-P01; XCG-CONT-FG; XVG-CONT-FG; XCP-PATT; XCU-WATR; XCU-ELEC; XCU-SAN; XCU-STRM; XCS-320-P01; XS-320-P01; XS-320-GRID; XP-320-P01; XCU-PROC; XCU-SUBDRAIN; XCU-GAS



1 SITEWORK
SECONDARY CLARIFIERS AREA PLAN
SCALE: 1"=20'

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE
210 – HEADWORKS
230 – GRIT REMOVAL
320 – OXIDATION DITCHES
350 – SECONDARY TREATMENT
380 – CLARIFIERS
420 – UV TREATMENT
520 – AEROBIC DIGESTION
550 – BIOSOLIDS PROCESSING
570 – BIOSOLIDS PUMPING
580 – BIOSOLIDS STORAGE

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3448541.02	4934994.92	0.00

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APPROVED: MAR JOB NUMBER: 160473
CAD DATE: 8/3/2020 6:33:19 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\C\C.15 SECONDARY CLARIFIERS AREA PLAN.dwg

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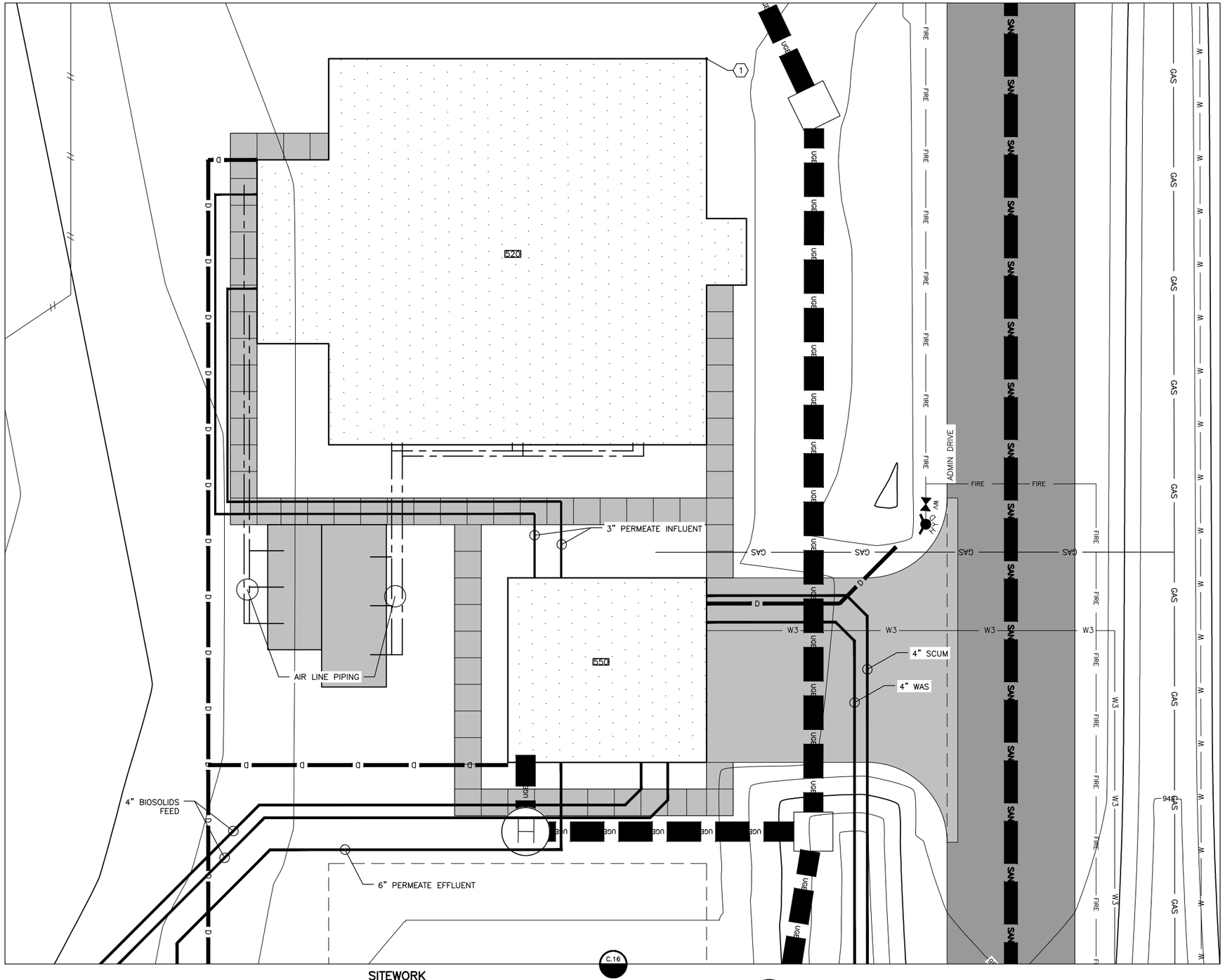
SITE WORK
SECONDARY CLARIFIERS AREA PLAN

SHEET NO.
C.15

Xrefs: rgt-1-dh01; XGS-BASE; XGS-DSGN; XGS-PARCELS; XGS-ROW; XGS-VIEWFRAME; XGS-BLDG-AREA-NOTES; XVG-CONT-EQ; XGS-CONT-EQ; XGU-HVTR; XGU-ELEC; XGU-SANN; XGU-STRM; XGP-PATT; XGS-350-P01; XEL-350-P01; XEL-350-P00; XEP-350-P00; XEP-350-P01; XA-350-P01; XGU-SUBDRAN; XGU-GAS; XGU-PROC



1 SITEWORK
AEROBIC DIGESTERS AREA PLAN
SCALE: 1"=10'

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3449046.94	4934104.46	0.00

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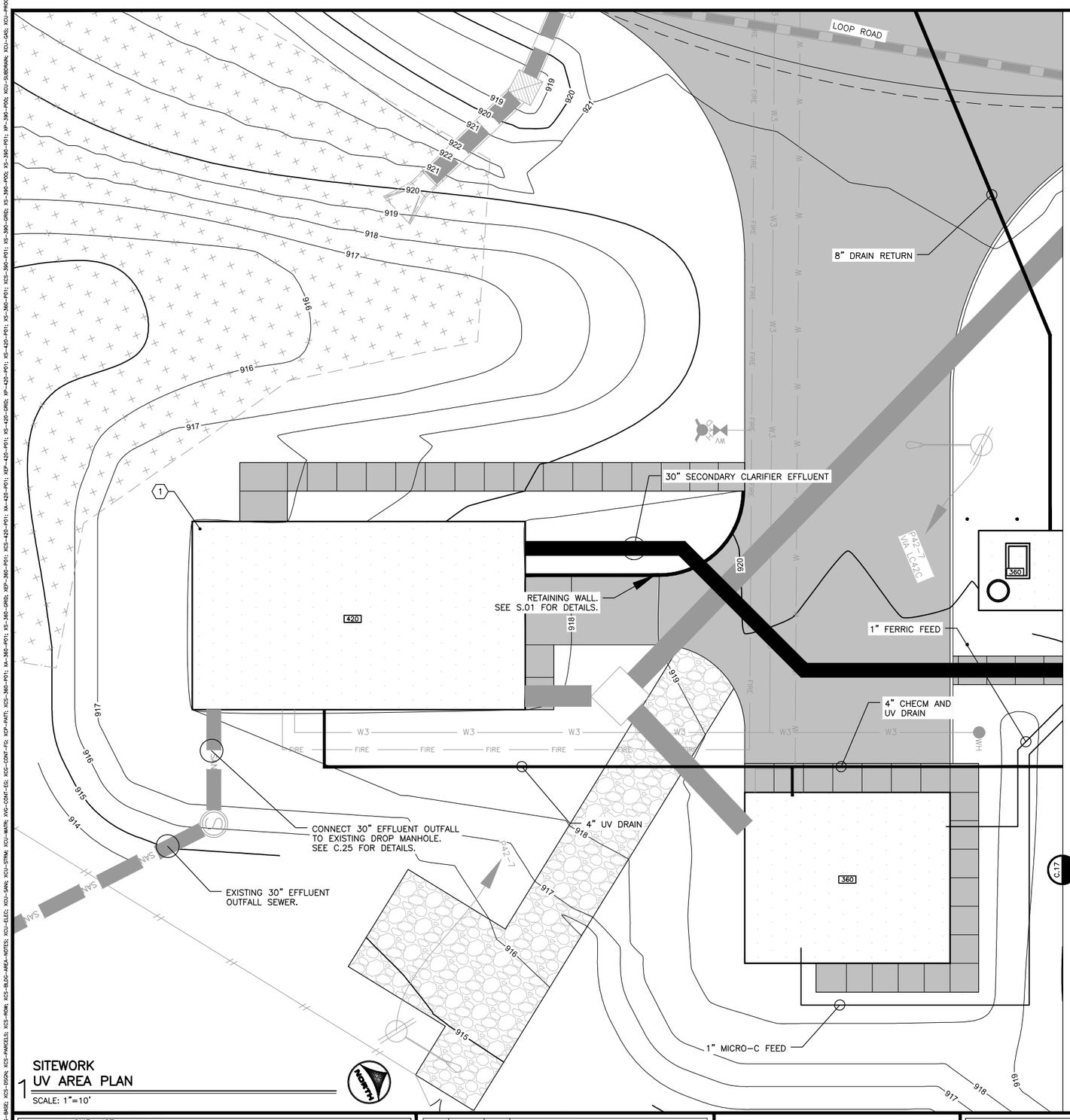
SITE WORK
AEROBIC DIGESTERS AREA PLAN

SHEET NO.
C.16

Xrefs: xgl-1-dh01; XCS-BASE; XCS-DSGN; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XVG-CONT-EG; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XCU-PROC; XCU-SUBDRAIN; XCU-GAS



1 SITEWORK UV AREA PLAN

SCALE: 1"=10'

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
2. AREA PLAN DOES NOT PROVIDE INFORMATION REGARDING SITE ELECTRIC, FENCING, ENTRANCE AND LOOP ROAD PAVEMENT, UTILITY PIPING, AND STORM PIPING. SITE ELEMENTS WITH NO INFORMATION PROVIDED OR SHOWN IN OTHER PLANS ARE SHOWN AS "SCREENED" (LIGHT) DELINEATION ON AREA PLAN. REFER TO RESPECTIVE CIVIL AND ELECTRIC DRAWINGS FOR INFORMATION.
3. REFER TO YARD PIPING PLANS (C.08–C.09) FOR ADDITIONAL GENERAL NOTES REGARDING CONSTRUCTION OF SITE PROCESS, SANITARY, AND STORM PIPING.
9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3448202.29	4934886.25	0.00

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: MAR	JOB NUMBER: 160473		
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NO.	DATE	BY	REVISION DESCRIPTION

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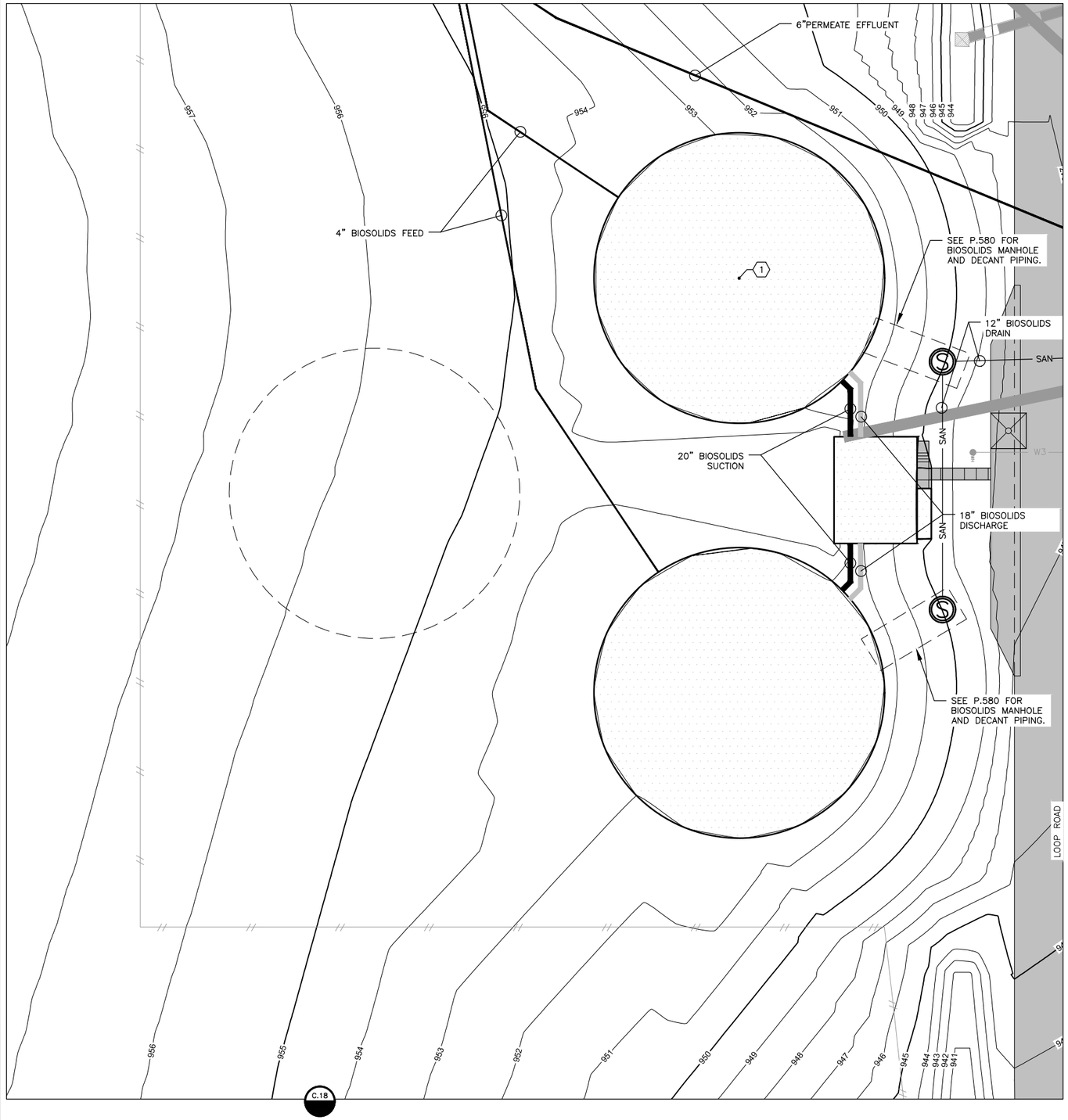
NEVADA, IOWA

SITE WORK
UV AREA PLAN

SHEET NO.
C.17

XREF: xpl-1-ph01; XCS-BASE; XCS-PROP; XCS-PARCELS; XCS-POWR; XCS-BLDG-ARCA-WATER; XCU-ELEC; XCU-SANI; XCU-STRM; XCU-WATR; XVC-CONT-FG; XDS-CONT-FG; XDP-PWT1; XCS-SAB-PH1; XA-SAB-PH1; XS-SAB-DRN; XCF-SAB-PH1; XS-SAB-PH1; XP-SAB-PROC; XCU-SUBDRAIN; XCU-GAS; XCU-PROC
XS-SAB-PH1; XA-420-PH1; XCS-420-PH1; XCF-420-PH1; XS-420-DRN; XP-420-PH1; XS-420-PH1; XS-380-PH1; XCS-380-PH1; XS-380-DRN; XS-380-PROC; XS-380-PH1; XP-380-PROC; XCU-GAS; XCU-PROC



1 SITEWORK
BIOSOLIDS TANK AREA PLAN
SCALE: 1"=20'

NORTH

BUILDING KEY

120 – ADMINISTRATION VEHICLE STORAGE	420 – UV TREATMENT
210 – HEADWORKS	520 – AEROBIC DIGESTION
230 – GRIT REMOVAL	550 – BIOSOLIDS PROCESSING
320 – OXIDATION DITCHES	570 – BIOSOLIDS PUMPING
350 – SECONDARY TREATMENT	580 – BIOSOLIDS STORAGE
380 – CLARIFIERS	

GENERAL NOTES:

1. AREA PLAN IS INTENDED TO SHOW LOCATIONS AND ELEVATIONS FOR SITE ELEMENTS INCLUDING: STRUCTURES, SIDEWALKS, MISCELLANEOUS PAVEMENT, MISCELLANEOUS SITE ELEMENTS, KEY GRADE LOCATES, AND PROCESS AND SANITARY SEWER FITTINGS.
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9. SEE C.02 FOR PAVING AND FENCING PLAN.
10. SEE C.03–C.04 FOR COMPLETE SITE GRADING PLAN.
11. SEE C.05–C.07 FOR EROSION CONTROL. EROSION CONTROL ELEMENTS NOT SHOWN ON AREA PLAN.
6. SEE C.10 FOR UTILITY PIPING PLAN.
7. SEE C.23 FOR STORM SEWER SCHEDULE.
8. SEE C.23–C.34 FOR CIVIL DETAILS.
9. SEE E.01–E.06 FOR ELECTRICAL SITE PLANS.

KEY NOTES:

KEY NOTE TABLE

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	KEY LOCATION	3448765.46	4934276.93	0.00

PRELIMINARY
NOT FOR CONSTRUCTION

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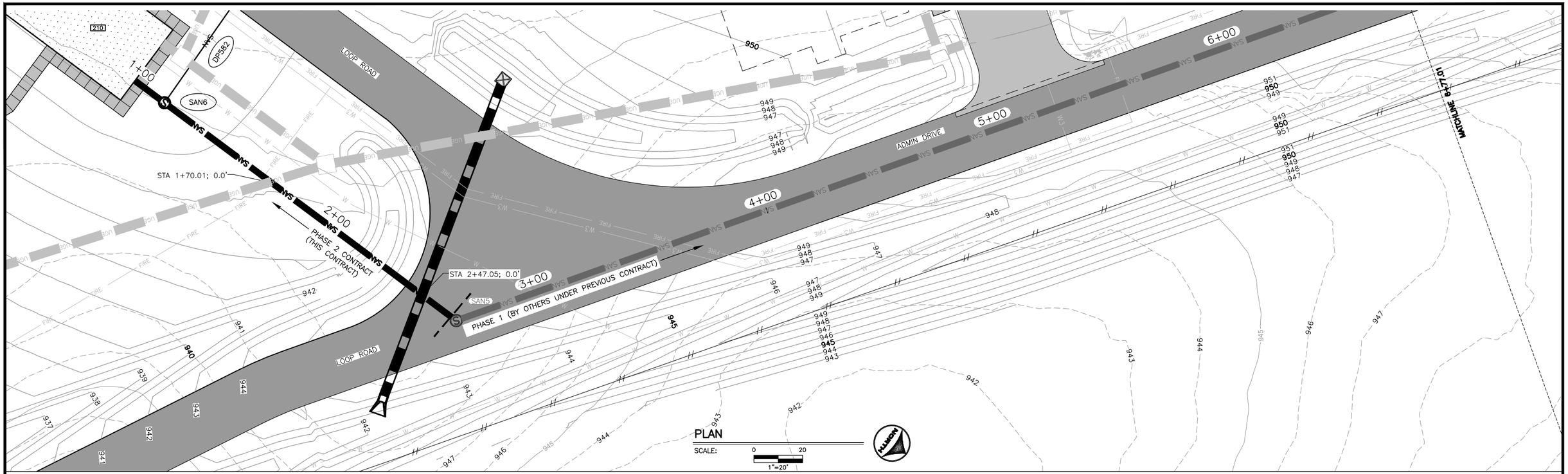
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
BIOSOLIDS TANK AREA PLAN

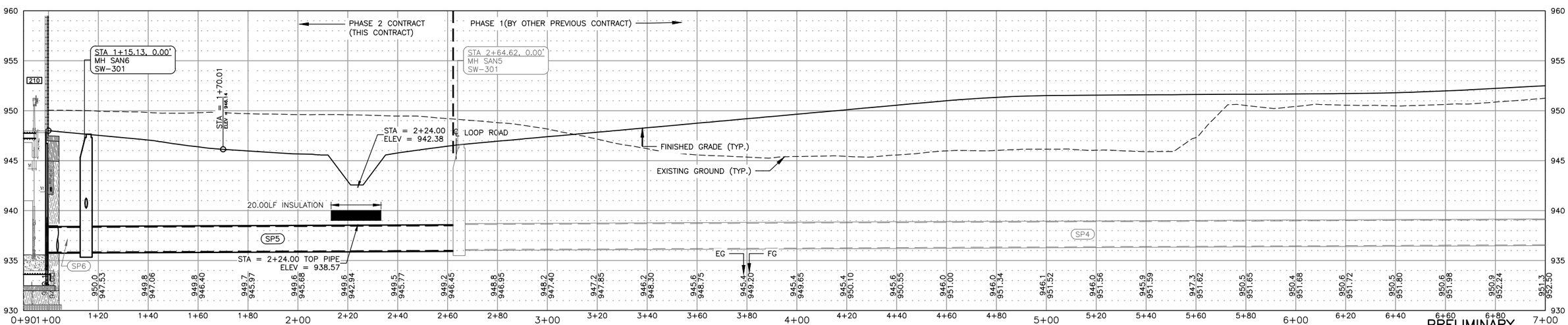
SHEET NO.
C.18

Xrefs: xgi-1-gh01; XCS-BASE; XCS-DISON; XCS-PARCELS; XCS-ROW; XCS-BLDG-AREA-NOTES; XYG-CONT-EG; XCG-CONT-FG; XCP-PATT; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-WATR; XCS-580-P01; XP-580-P00; XS-580-P00; XCU-PROC; XCU-SUBDRAIN; XCU-GAS



PLAN

SCALE: 1"=20'



PROFILE

SCALE: H:1"=20' V:1"=5'

PRELIMINARY
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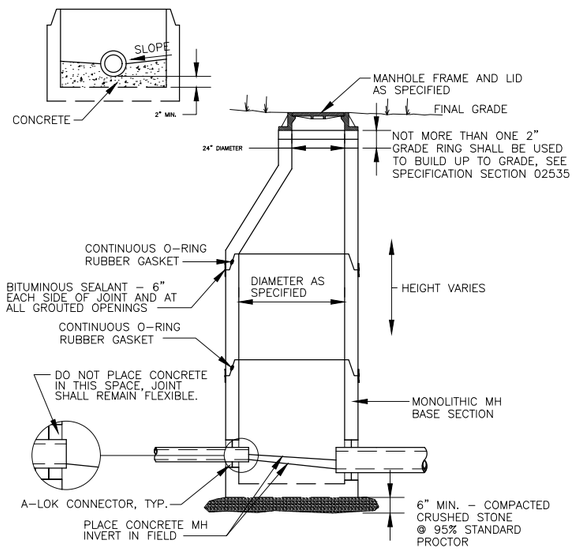
NEVADA, IOWA

SITE WORK

INFLUENT TRUNK SEWER PLAN AND PROFILE

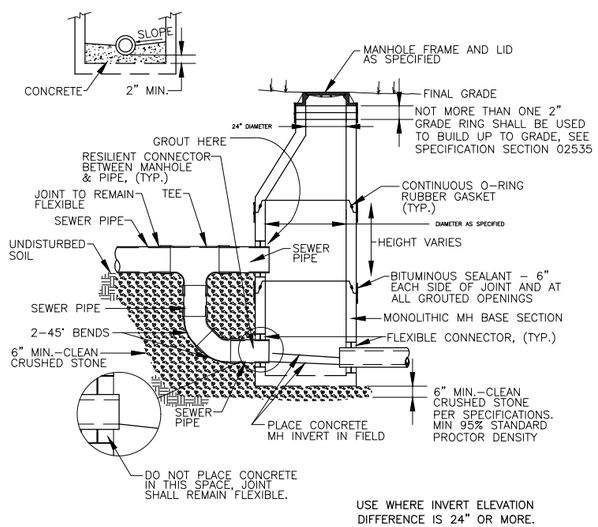
SHEET NO.
C.19

Xrefs: xgt-1-dh01; XCS-DSGN; XCS-BASE; XVG-CONT-EG; XCG-CONT-FG; XCP-PATT; XCT-ALIGNMENT; XCU-ELEC; XCU-STRM; XCU-WATR; XCS-210-P01; XA-210-P01; XEP-210-P01; XEP-210-P01; XP-210-P01; XS-210-GRID; XS-210-P00; XS-210-S01; XCU-SANI



1 TYPICAL MANHOLE DETAIL

NTS



USE WHERE INVERT ELEVATION DIFFERENCE IS 24" OR MORE.

2 TYPICAL DROP MANHOLE DETAIL

NTS

PRELIMINARY
NOT FOR CONSTRUCTION

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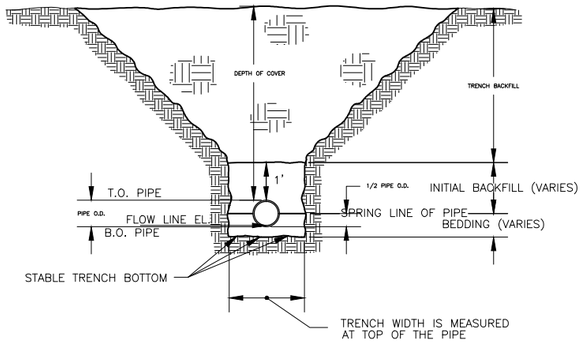
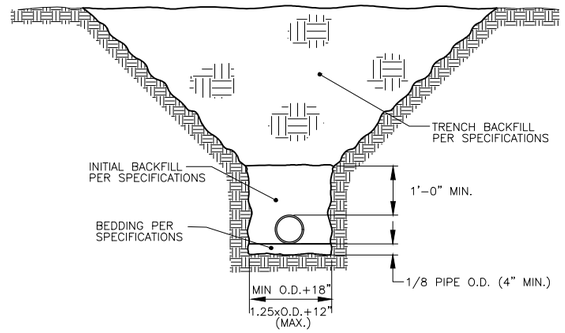
SITE WORK
SANITARY STRUCTURE DETAILS

SHEET NO.
C.25

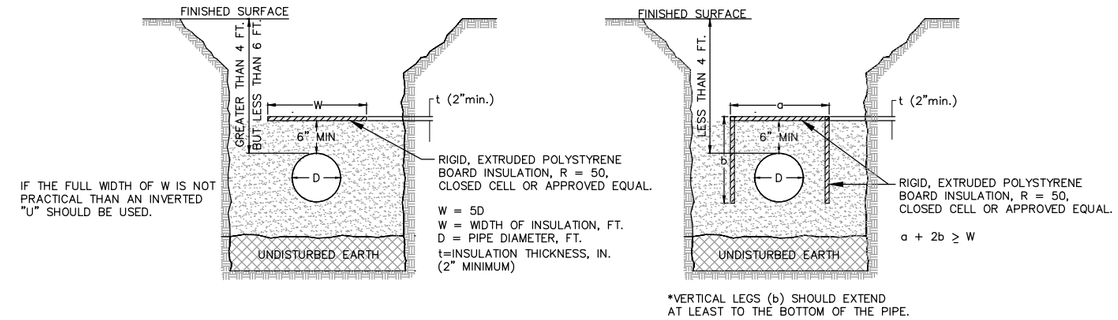
Xrefs: xgl-1-dh01; XC-0-D03



1 TYPICAL DETAIL
TRENCH TERMINOLOGY
NTS



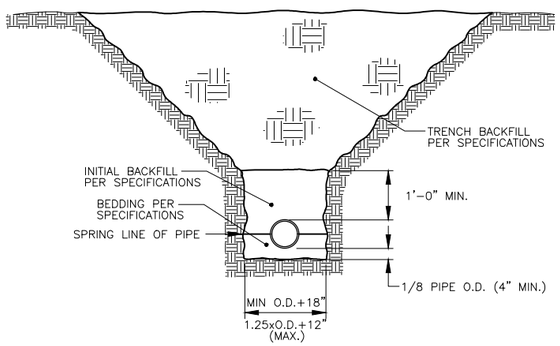
4 TYPICAL DETAIL
PRESSURE LINES (EARTH EXCAVATION)
NTS



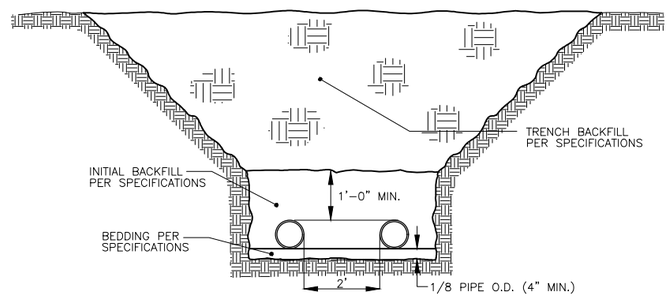
HORIZONTAL INSULATION

INVERTED "U" INSULATION

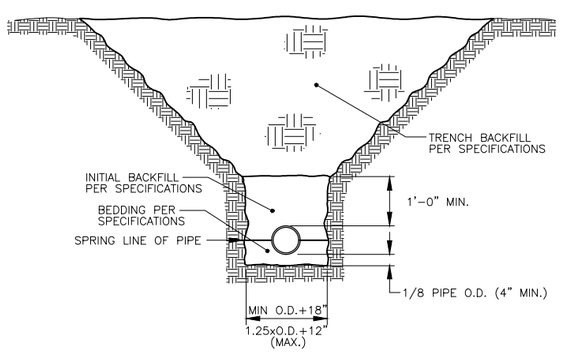
6 TYPICAL DETAIL
PIPE INSULATION



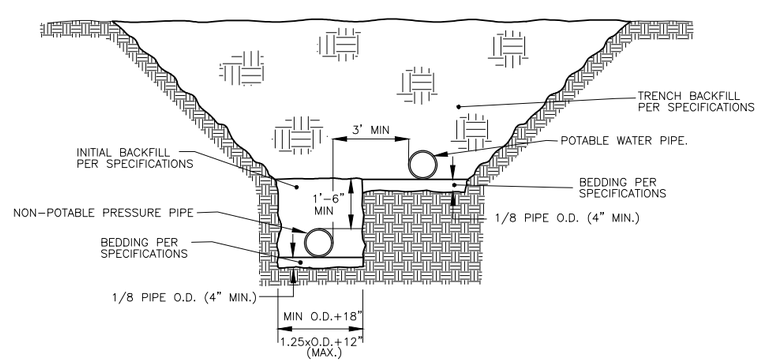
2 TYPICAL DETAIL
RIGID GRAVITY LINES (EARTH EXCAVATION)
NTS



5 TYPICAL DETAIL
PARALLEL PIPING TRENCH LAYOUT (EARTH EXCAVATION)
NTS



3 TYPICAL DETAIL
FLEXIBLE GRAVITY LINES (EARTH EXCAVATION)
NTS



6 TYPICAL DETAIL
POTABLE WATER PARALLEL PIPING TRENCH LAYOUT (EARTH EXCAVATION)
NTS

PRELIMINARY
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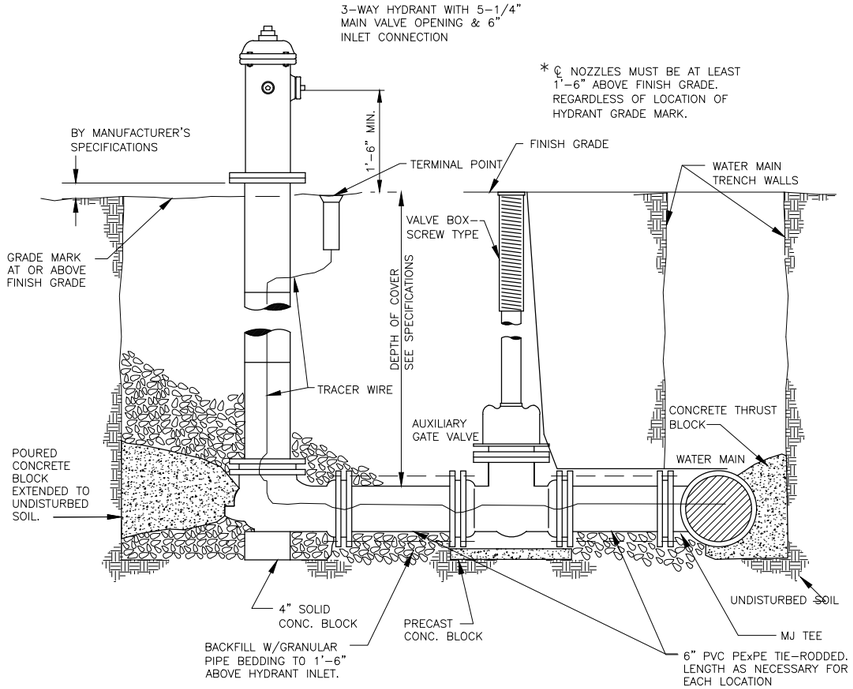
SITE WORK
DETAILS

SHEET NO.
C.26

Xrefs: xgt-1-dh01; XC-0-D03

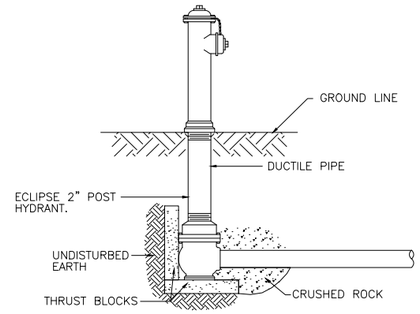


NOTES:

1. 3 MIL POLYETHYLENE SHEET OVER GRANULAR MATERIAL. DO NOT ALLOW SHEET UNDER GRANULAR MATERIAL.
2. USE RESTRAINT RODS BETWEEN HYDRANTS, SHUTOFF VALVES, AND WATER MAIN.
3. MINIMUM OF 1/3 CUBIC YARD CLEAN GRANULAR BEDDING UNDER HYDRANT.
4. TRACER WIRE SHALL BE RAN FROM END OF NEW WATER MAIN AND TERMINATE AT NEW HYDRANT.

1 TYPICAL DETAIL FIRE HYDRANT

NTS

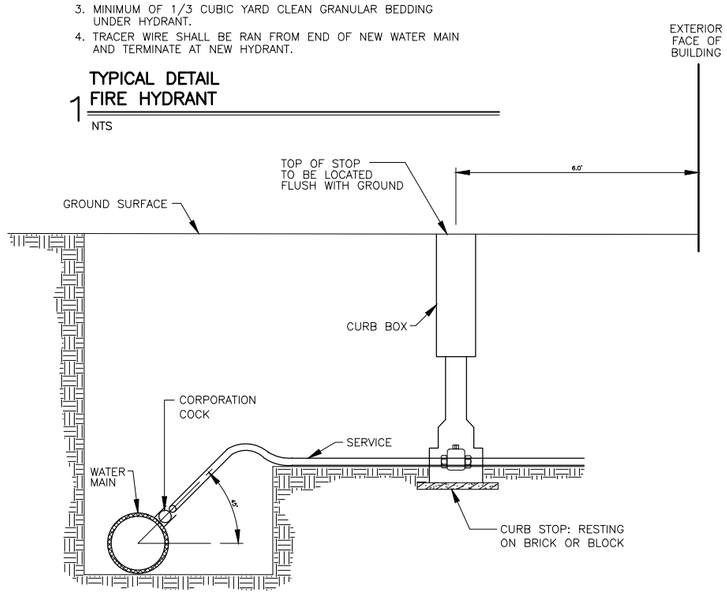


HYDRANTS SHALL BE SELF-DRAINING, NONFREEZING, COMPRESSION TYPE WITH 2-3/16" MAIN VALVE OPENING. INLET CONNECTION SHALL BE 2" IP. OUTLET SHALL BE 2-1/2" NST.

HYDRANTS SHALL HAVE A 3" DUCTILE IRON PIPE RISER WITH A CAST IRON STOCK TOP, AND NON-TURNING OPERATING ROD. PRINCIPAL INTERIOR OPERATING PARTS SHALL BE BRASS AND REMOVABLE FROM THE HYDRANT FOR SERVICING WITHOUT EXCAVATING THE HYDRANT. HYDRANTS SHALL BE SET IN 4 CUBIC FEET OF CRUSHED STONE TO ALLOW FOR PROPER DRAINAGE OF THE HYDRANT. RECOMMENDATIONS OF THE AWWA SHOULD BE FOLLOWED WHEN INSTALLING THE HYDRANTS.

POST HYDRANTS SHALL BE ECLIPSE NO. 2 POST HYDRANTS AS MANUFACTURED BY JOHN C. KUPFERLE FOUNDRY COMPANY, ST. LOUIS MO.

2 TYPICAL DETAIL 2" YARD HYDRANT



2 TYPICAL DETAIL WATER SERVICE CONNECTION

NTS

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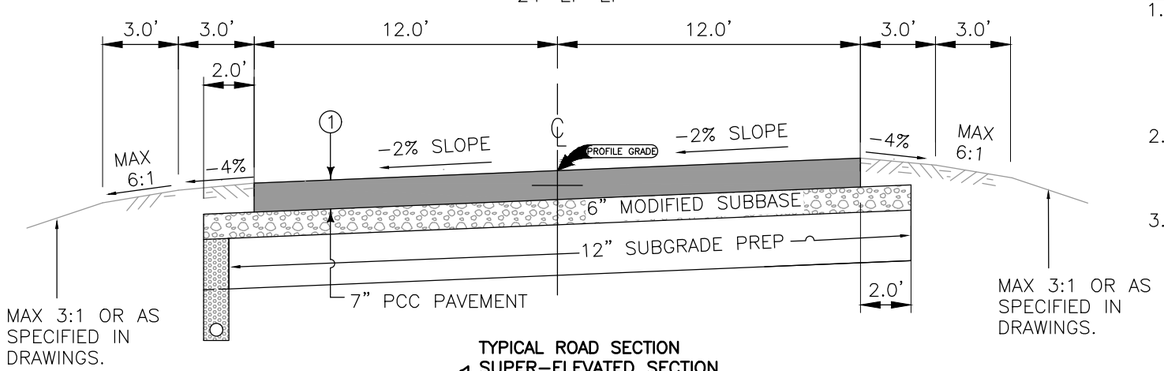
NEVADA, IOWA

SITE WORK
DETAILS

SHEET NO.
C.27

Xrefs: xgl-1-dh01; XC-0-003

A–A PCC PAVEMENT
24' EP–EP

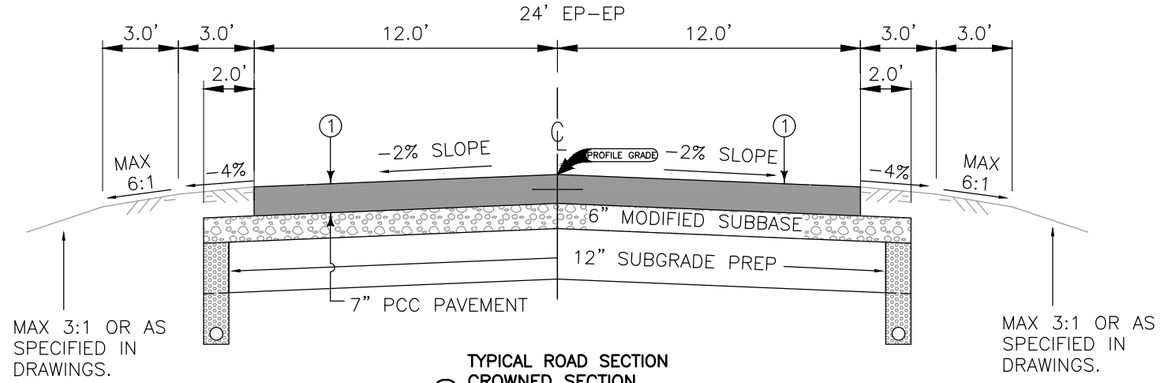


TYPICAL ROAD SECTION
SUPER–ELEVATED SECTION
1 SCALE: NTS

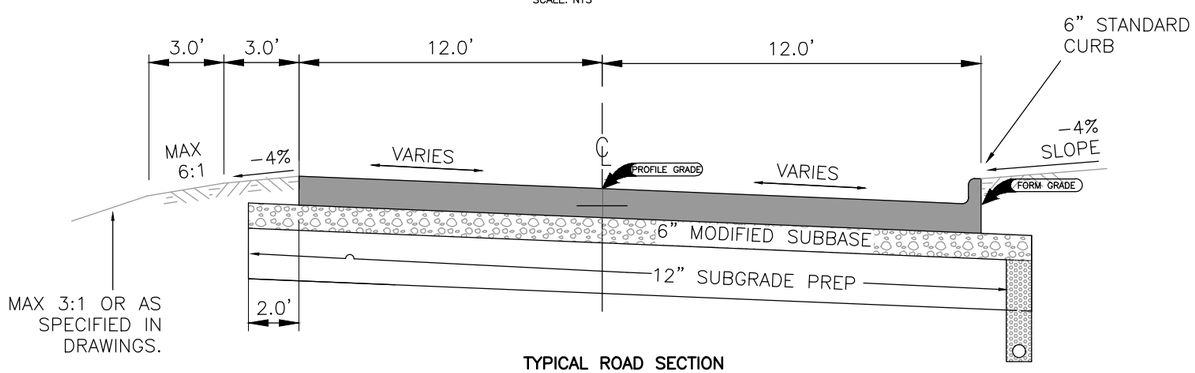
GENERAL NOTE:

1. 7" PCC PAVEMENT W/ 6" MODIFIED SUBASE & 12" SUBGRADE PREP AS SHOWN IN DETAILS SHALL APPLY TO ALL DRIVES & PARKING LOTS. GRADE AS SHOWN IN DRAWINGS IF NOT TYPICAL SECTION
2. CONTRACTOR SHALL TRANSITION BETWEEN CROWNED AND SUPER–ELEVATED SECTIONS AS SHOWN IN DRAWINGS.
3. CONTRACTOR SHALL INSTALL CURB AND GUTTER AS SHOWN IN DETAIL 3 WHERE SPECIFIED IN DRAWINGS.

B–B PCC PAVEMENT
24' EP–EP



TYPICAL ROAD SECTION
CROWNED SECTION
2 SCALE: NTS



TYPICAL ROAD SECTION
CURB AND GUTTER
3 SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

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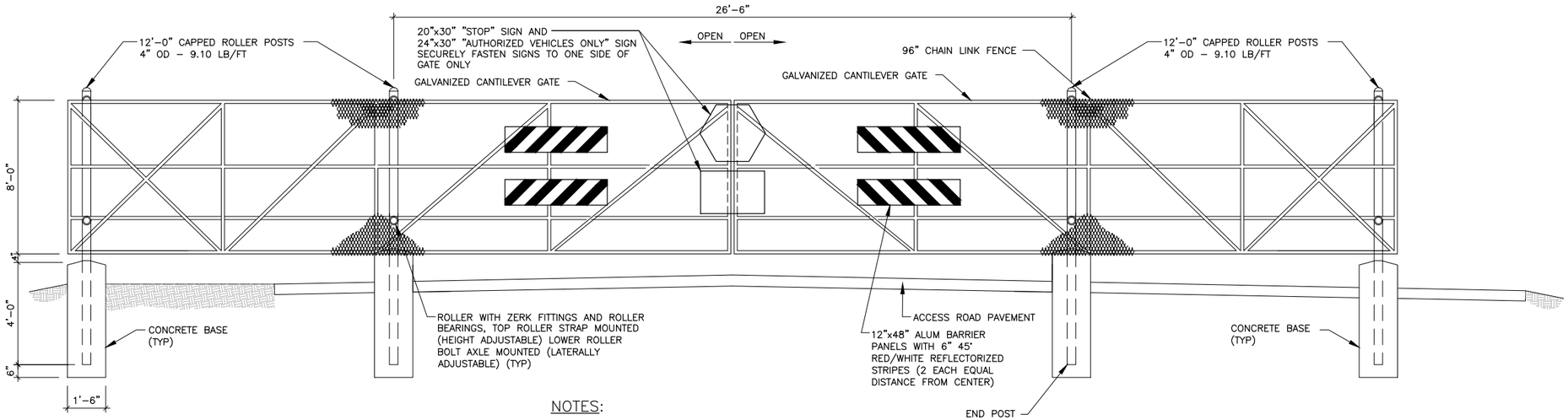
NEVADA, IOWA

SITE WORK
DETAILS TYPICAL ROAD SECTIONS

SHEET NO.
C.28

Xrefs: xgl-1-dh01; XC-D-S01

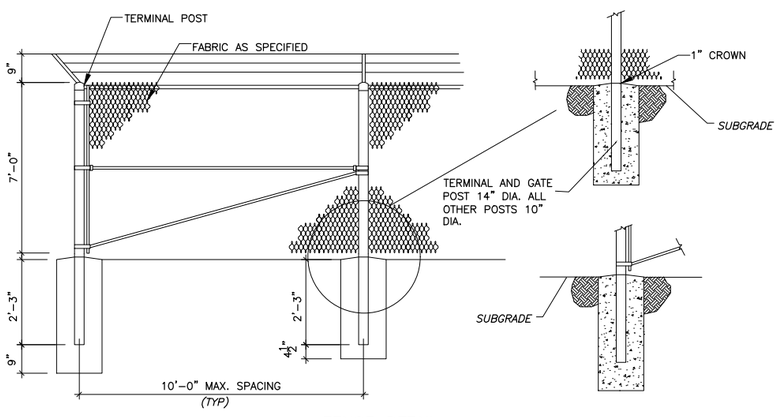


NOTES:

1. VERIFY ALL DIMENSIONS WITH GATE OPERATOR MANUFACTURER. REFERENCE SPECIFICATIONS FOR GATE CONTROL.

1 AUTOMATIC GATE DETAIL

SCALE: 3/8"=1'-0"



2 FENCE DETAIL

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

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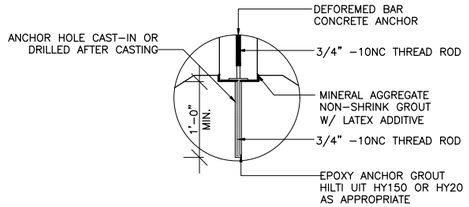
NEVADA, IOWA

SITE WORK
DETAILS - GATE AND FENCING

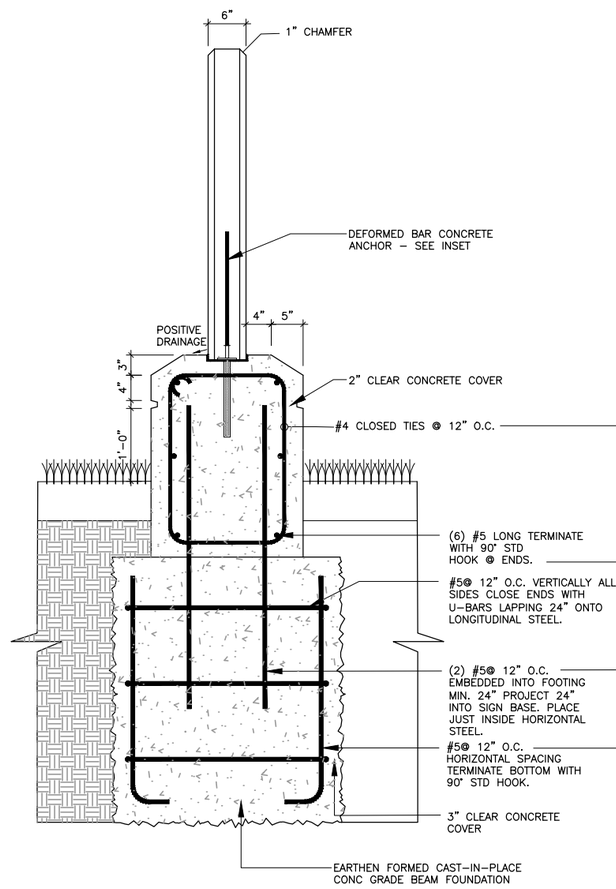
SHEET NO.
C.32

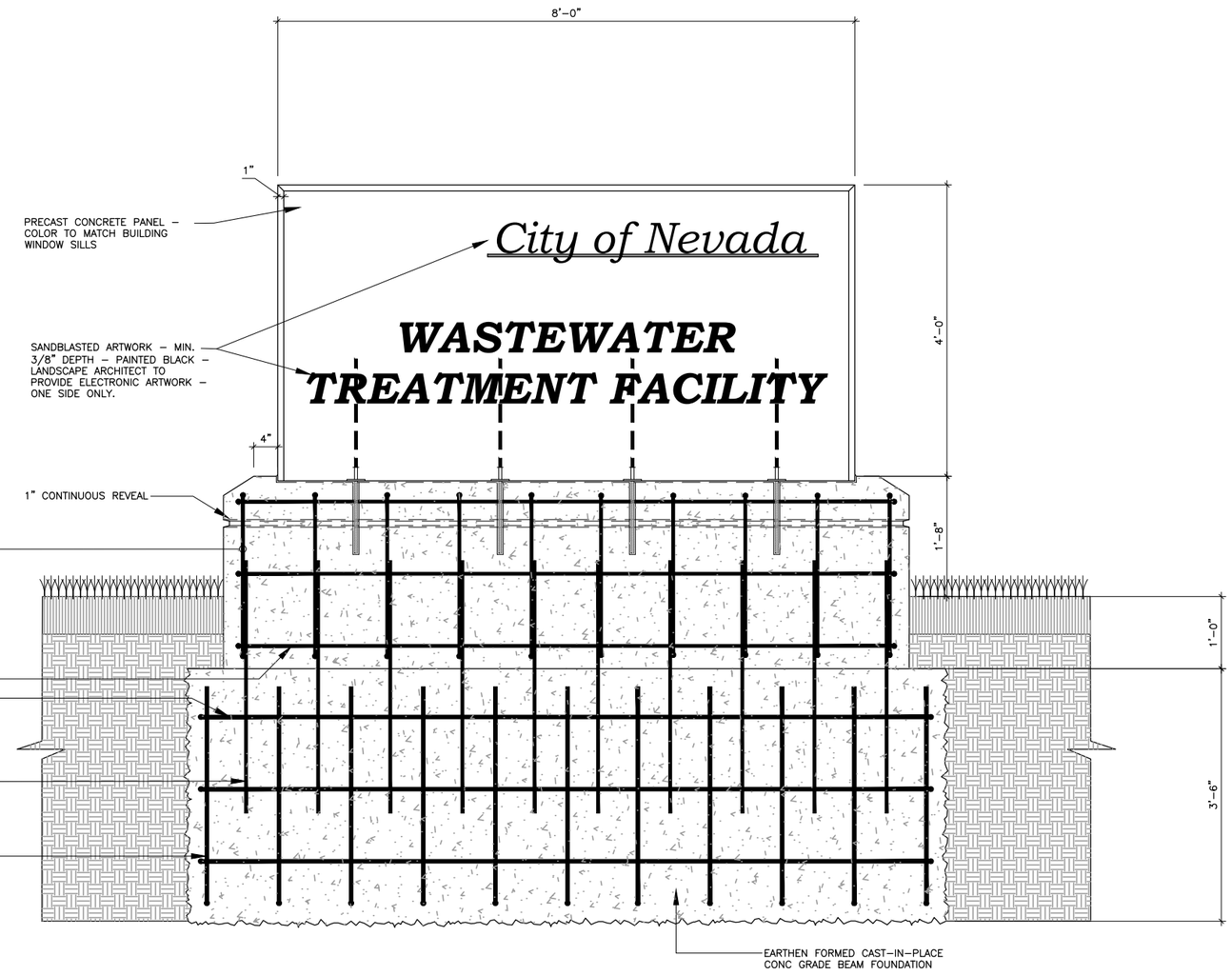
Xrefs: xgt-1-dh01; XC-0-D03



NOTES:

1) PRECAST CONCRETE MANUFACTURER TO PROVIDE SHOP DRAWINGS SIGNED BY A REGISTERED ENGINEER DETAILING REINFORCEMENT.
2) PROVIDE MIN. 6" X 6" PRECAST CONCRETE SAMPLE SHOWING COLOR AND FINISH FOR APPROVAL PRIOR TO CONSTRUCTION.
3) ALL ABOVE GRADE FORM WORK SHALL BE SMOOTH AND DEVOID OF JOINTS AND IMPERFECTIONS.
4) SEE ENTRANCE AREA PLAN FOR LOCATION.
5) SOD AROUND SIGN. 10' IN FRONT AND BACK OF SIGN AND 6' FROM THE OUTER EDGE OF THE SIGN.





PRELIMINARY
NOT FOR CONSTRUCTION

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NO.	DATE	BY	REVISION DESCRIPTION

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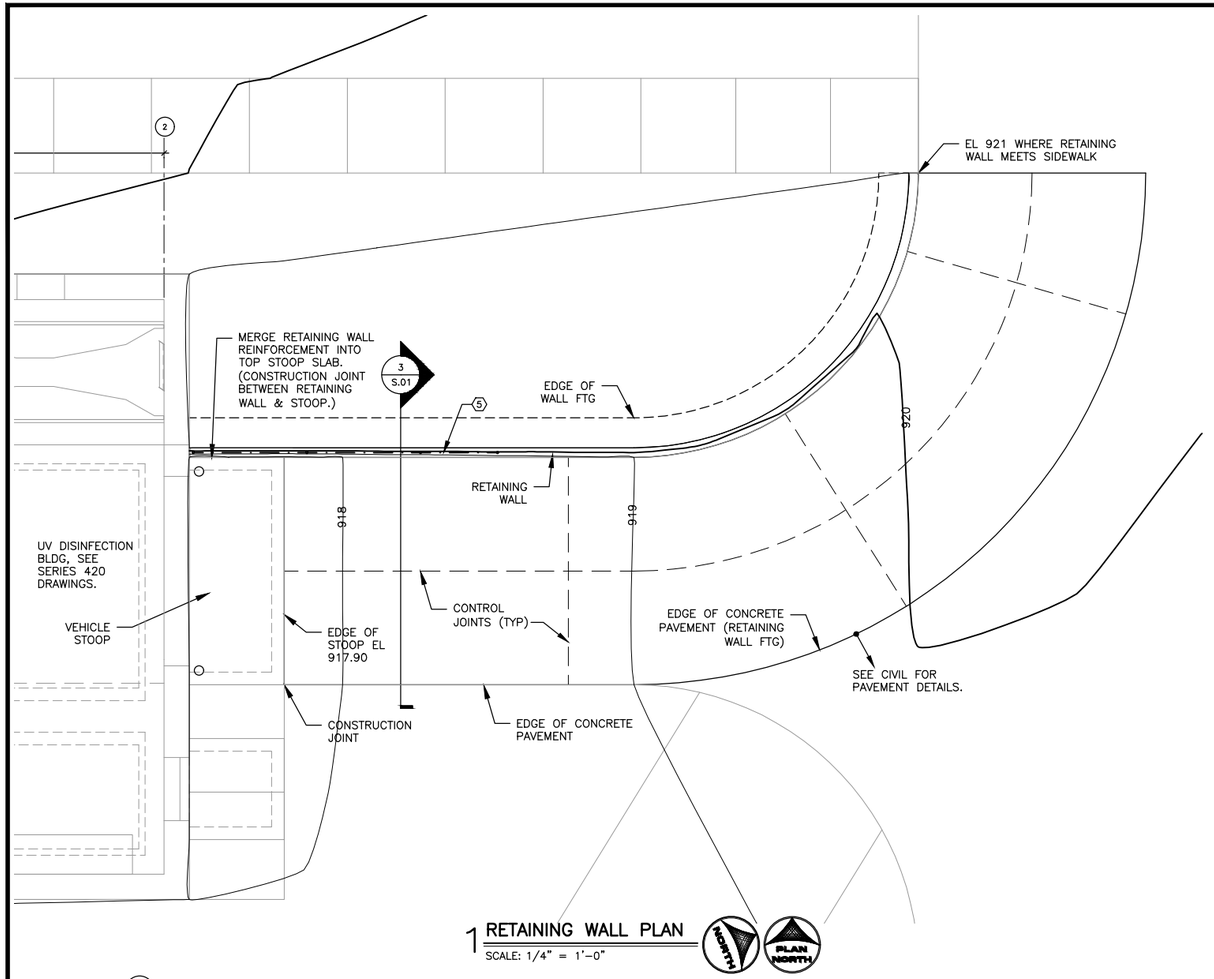
CITY OF NEVADA
NEVADA, IOWA

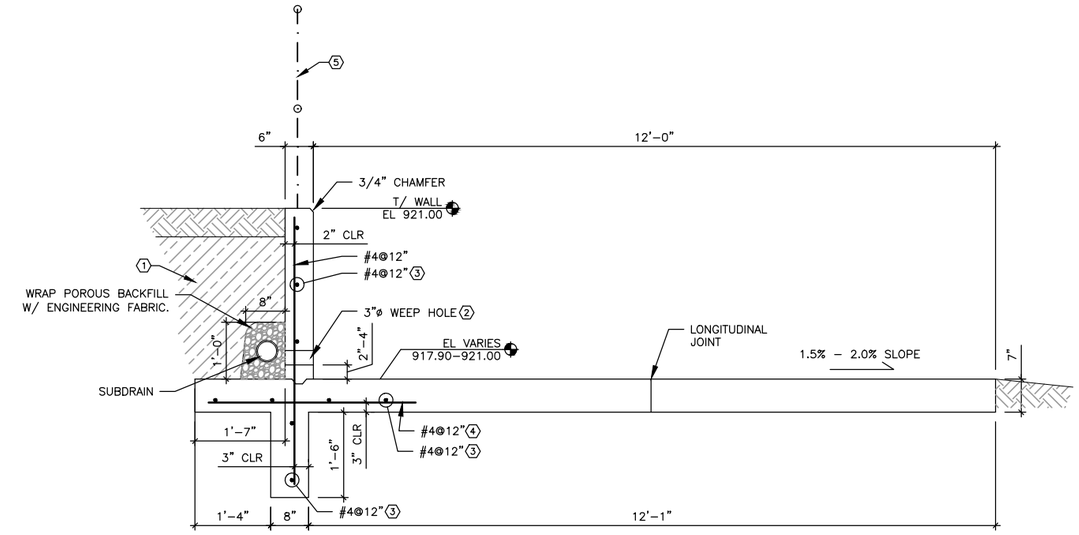
SITE WORK
PLANT ENTRANCE SIGN

SHEET NO.
C.33

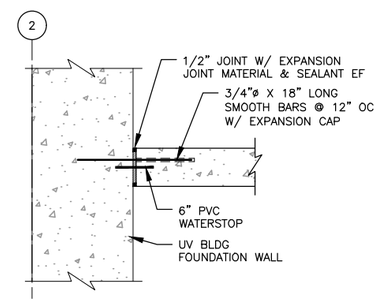
Xrefs: xgl-1-dh01; XC-0-D04



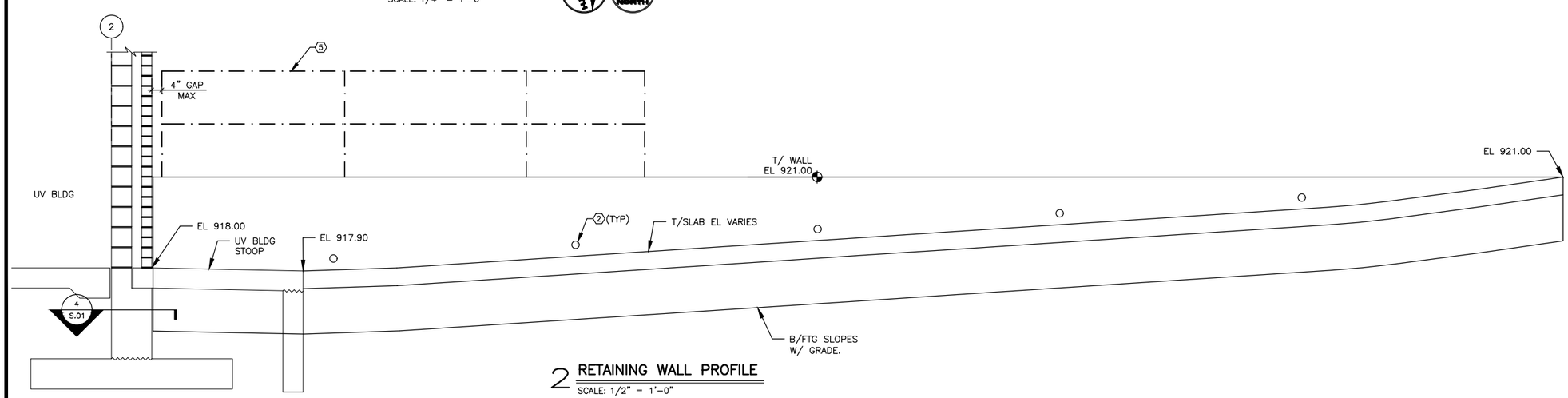
1 RETAINING WALL PLAN
SCALE: 1/4" = 1'-0"



3 RETAINING WALL SECTION
SCALE: 3/4" = 1'-0"



4 RETAINING WALL CONNECTION TO UV BLDG FOUNDATION WALL
SCALE: 1" = 1'-0"



2 RETAINING WALL PROFILE
SCALE: 1/2" = 1'-0"

GENERAL NOTES:
1. SEE AREA SITE PLAN C.21 AND SERIES 420 UV BLDG DRAWINGS.
2. PROVIDE A MINIMUM CONCRETE COVER TO NEAR REINFORCEMENT AS NOTED. PROVIDE 3" MINIMUM COVER AT ENDS OF BARS.

KEYNOTES:
1. EXCAVATE & PLACE POROUS FREE DRAINING GRADED GRANULAR BACKFILL MATERIAL AS NECESSARY.
2. PROVIDE 3"ø WEEP HOLES AT 8' INTERVALS. INSTALL RODENT GUARDS IN WEEP HOLES.
3. CONTINUOUS, WITH 24" LAP.
4. BAR LENGTH = LARGER OF 48" & WALL HEIGHT + 18"
5. PROVIDE GUARDRAIL WHERE HEIGHT OF WALL IS 2'-6" OR GREATER ABOVE PAVEMENT. SEE 12/S.604 & 4/S.605.

PRELIMINARY
NOT FOR CONSTRUCTION

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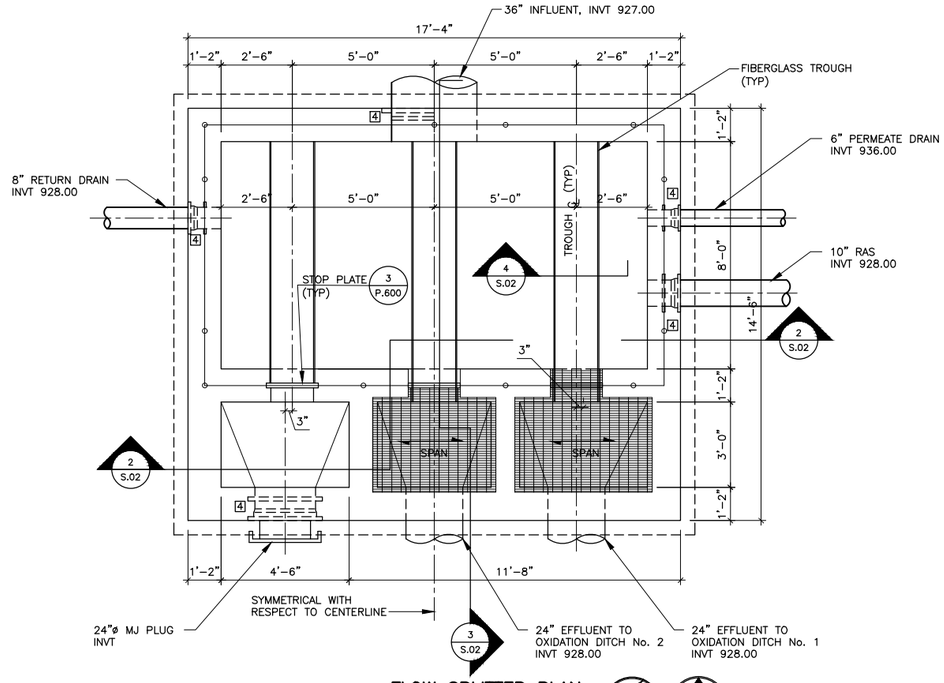
CITY OF NEVADA
NEVADA, IOWA

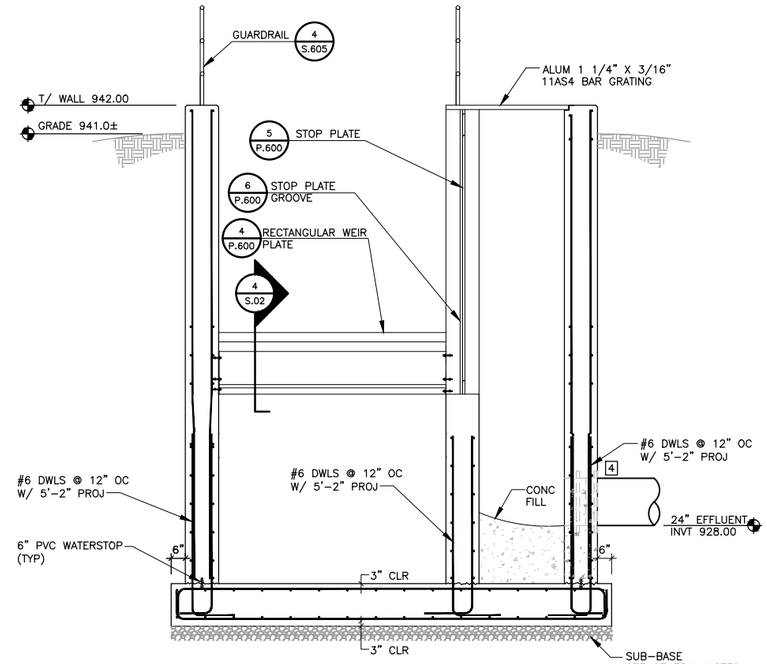
SITE WORK
RETAINING WALL DETAILS

SHEET NO.
S.01

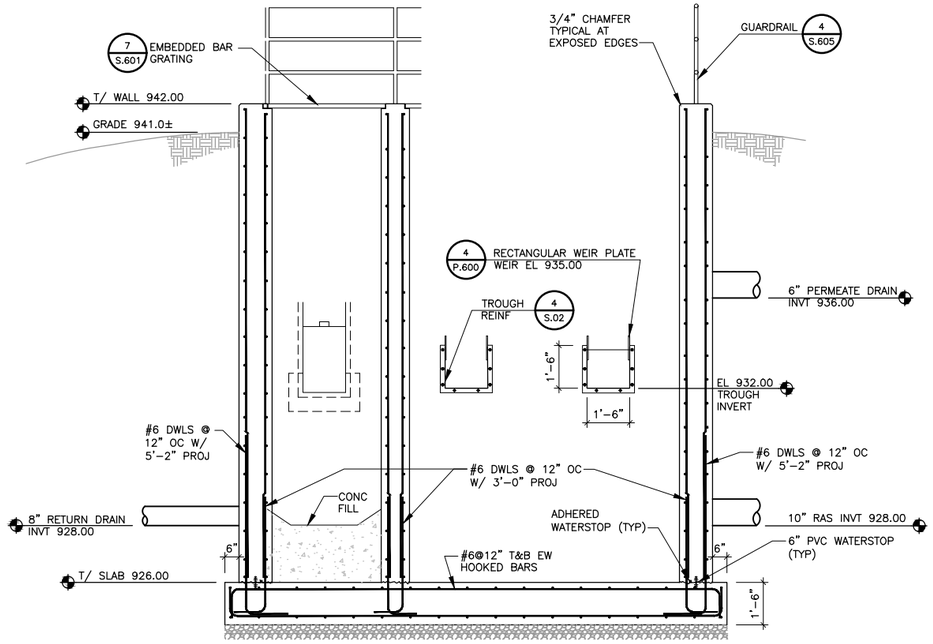
Xrefs: xgt-1-dh01; XS-1.1-D01; XS-420-P01; XS-420-GRID; XCS-DSGN; XCG-CONT-FG



1 FLOW SPLITTER PLAN
SCALE: 3/8"=1'-0"



3 FLOW SPLITTER PLAN
SCALE: 3/8"=1'-0"



2 FLOW SPLITTER PLAN
SCALE: 3/8"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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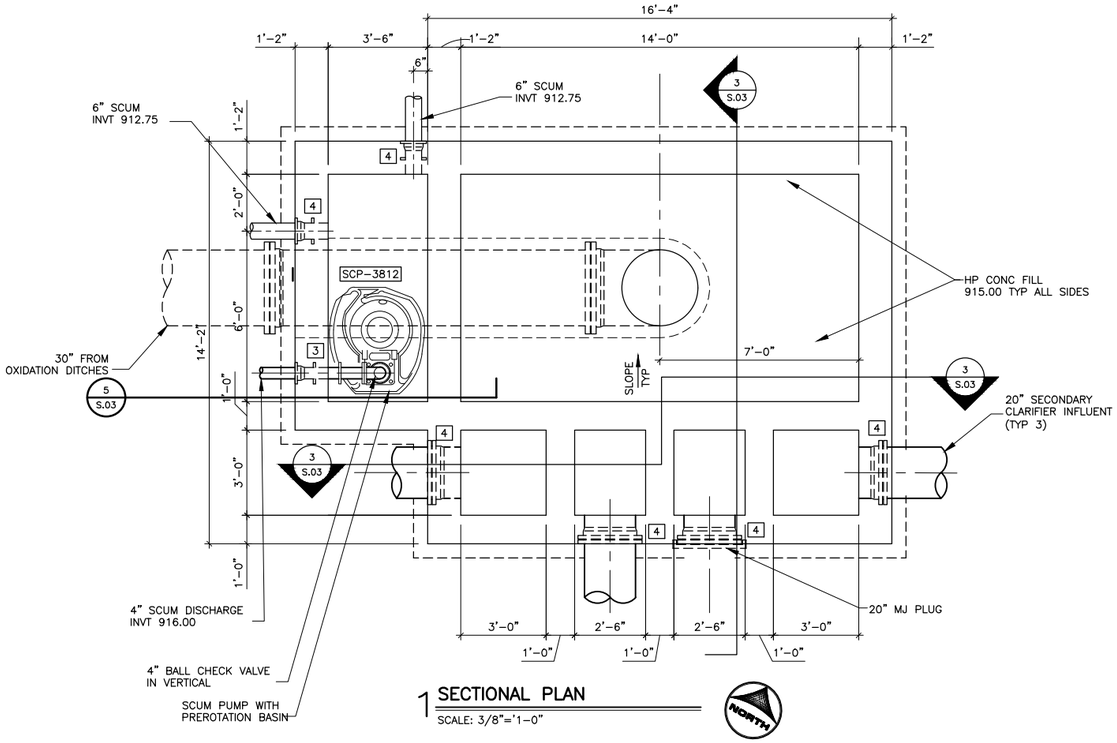
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
OXIDATION DITCH FLOW SPLITTER
STRUCTURAL

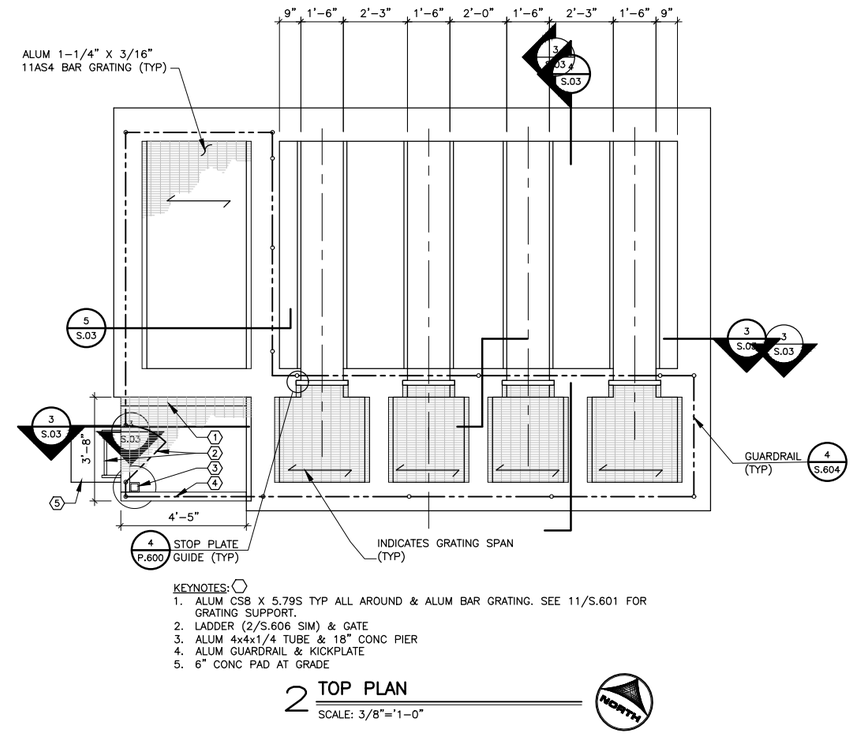
SHEET NO.
S.02

Xrefs: xgl-1-dh01; XS-1.2-S01; XS-1.2-P02; XS-1.2-P01



1 SECTIONAL PLAN

SCALE: 3/8"=1'-0"



KEYNOTES:

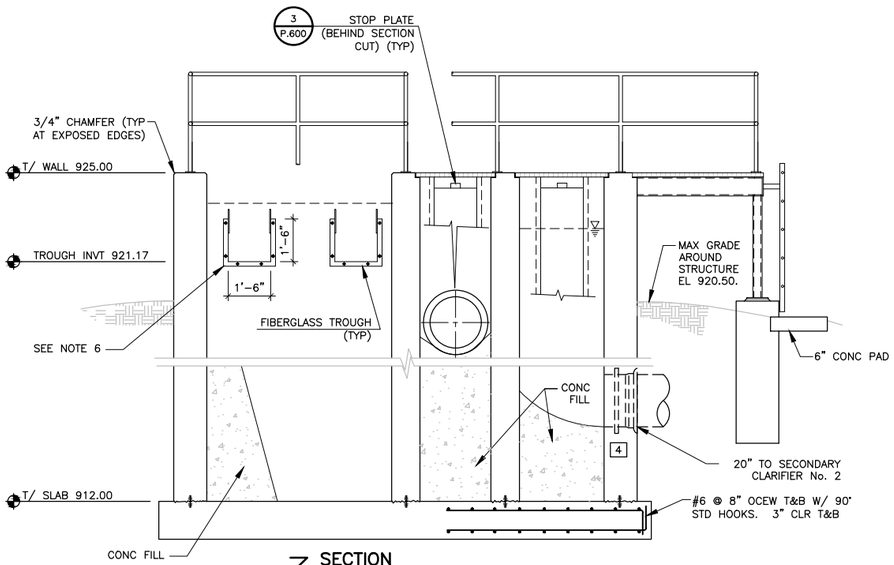
1. ALUM CS8 X 5.79S TYP ALL AROUND & ALUM BAR GRATING. SEE 11/S.601 FOR GRATING SUPPORT.
2. LADDER (2/S.606 SIM) & GATE
3. ALUM 4x4x1/4 TUBE & 18" CONC PIER
4. ALUM GUARDRAIL & KICKPLATE
5. 6" CONC PAD AT GRADE

2 TOP PLAN

SCALE: 3/8"=1'-0"

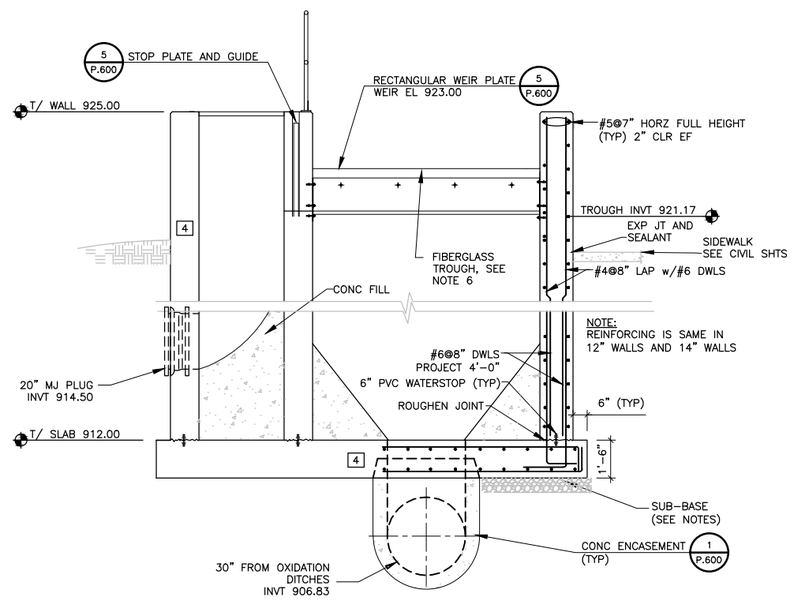
GENERAL NOTES:

1. SEE SHEET S.01 FOR GENERAL NOTES.
2. STRUCTURE DESIGNED FOR GRADE ELEVATION NO GREATER THAN EL 921.50.
3. SUB-DRAINS ARE NOT REQUIRED.
4. CONCRETE SHALL BE MIX-1 FOR STRUCTURE AND MIX-2 FOR CONCRETE FILL. NOT ALL CONCRETE FILL SHOWN.
5. ALUMINUM BAR GRATING SHALL BE 1-1/4"X3/16" 11AS4. PLATFORM AND GRATING LIVE LOAD 100 PSF.



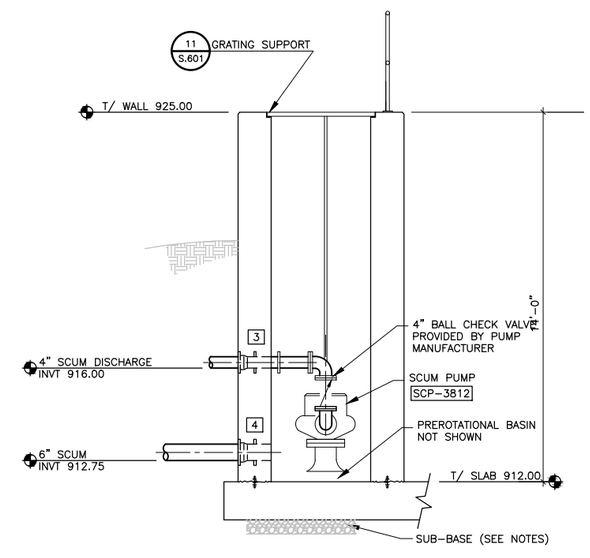
3 SECTION

SCALE: 3/8"=1'-0"



4 SECTION

SCALE: 3/8"=1'-0"



5 SECTION

SCALE: 3/8"=1'-0"

SECTION NOTE:
GROUT FILL SCUM BOX TO SLOPE ALL AREAS TO PREROTATION BASIN.

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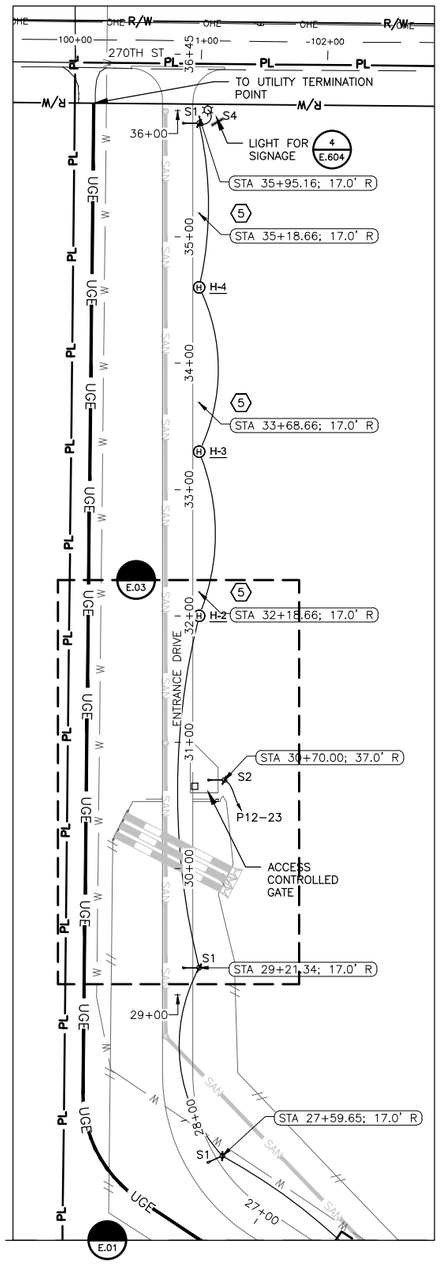
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
SECONDARY CLARIFIER FLOW SPLITTER
STRUCTURAL

SHEET NO.
S.03

Xrefs: xgl-1-dh01; XS-1.4-P01; XS-1.4-S01; XS-1.4-P02



1 SITE WORK
ELECTRICAL LIGHTING AND POWER (ENTRANCE DR)
SCALE: 1"=60'

ELECTRICAL STRUCTURE TABLE	
STRUCTURE NAME:	STRUCTURE RIM
EMH-1	951.32
EMH-2	948.90
EMH-3	946.44
EMH-4	947.77
EMH-5	940.59
EMH-6	921.07
EMH-7	921.14
EMH-8	918.64
EV-1	953.78
H-1	946.73
H-2	949.81
H-3	951.44
H-4	953.07

ELECTRICAL DUCT CONDUIT TABLE

DUCT	TOTAL	POWER	COM	SPARE
A	(22)	(18) 4"	(0)	(4) 4"
B	(23)	(18) 4"	(1) 4"	(4) 4"
C	(23)	(18) 4"	(1) 4"	(4) 4"
D	(6)	(4) 4"	(1) 3"	(1) 4"
E	(6)	(4) 4"	(1) 3"	(1) 4"
F	(19)	(14) 4"	(1) 4"	(4) 4"
G	(6)	(3) 4"	(3) 4"	(2) 4"
H	(4)	(2) 4"	(1) 3"	(1) 4"
I	(3)	(1) 4"	(1) 3"	(1) 4"
J	(17)	(11) 4"	(1) 4"	(4) 4"
K	(6)	(3) 4"	(1) 3"	(2) 4"
L	(9)	(5) 4"	(1) 4"	(3) 4"
M	(4)	(2) 4"	(1) 3"	(1) 4"
N	(6)	(3) 4"	(1) 4"	(2) 4"
O	(6)	(3) 4"	(1) 4"	(2) 4"
P	(7)	(4) 4"	(1) 4"	(2) 4"
Q	(3)	(1) 4"	(1) 3"	(1) 4"

7

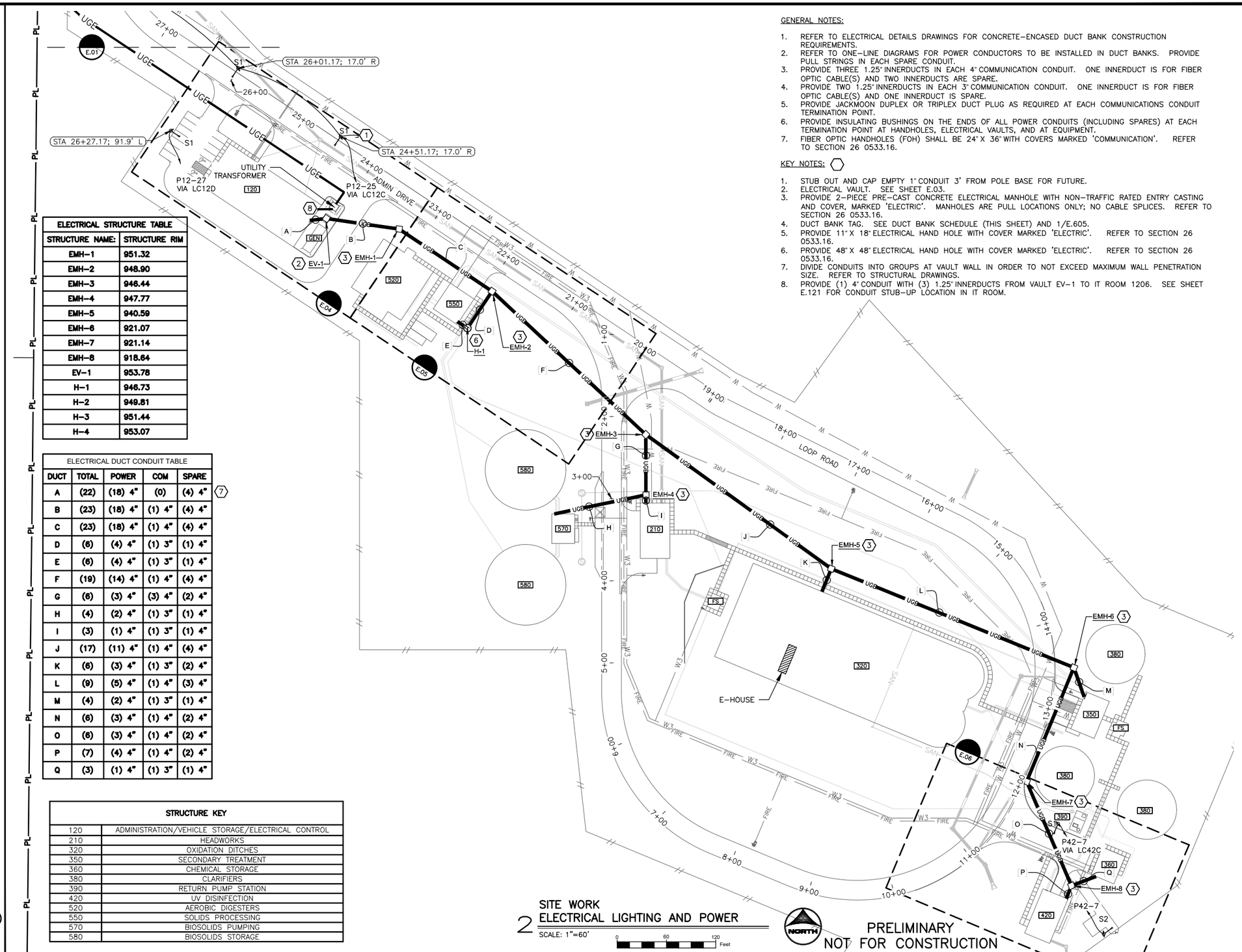
STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

GENERAL NOTES:

1. REFER TO ELECTRICAL DETAILS DRAWINGS FOR CONCRETE-ENCASED DUCT BANK CONSTRUCTION REQUIREMENTS.
2. REFER TO ONE-LINE DIAGRAMS FOR POWER CONDUCTORS TO BE INSTALLED IN DUCT BANKS. PROVIDE PULL STRINGS IN EACH SPARE CONDUIT.
3. PROVIDE THREE 1.25" INNERDUCTS IN EACH 4" COMMUNICATION CONDUIT. ONE INNERDUCT IS FOR FIBER OPTIC CABLE(S) AND TWO INNERDUCTS ARE SPARE.
4. PROVIDE TWO 1.25" INNERDUCTS IN EACH 3" COMMUNICATION CONDUIT. ONE INNERDUCT IS FOR FIBER OPTIC CABLE(S) AND ONE INNERDUCT IS SPARE.
5. PROVIDE JACKMOON DUPLEX OR TRIPLEX DUCT PLUG AS REQUIRED AT EACH COMMUNICATIONS CONDUIT TERMINATION POINT.
6. PROVIDE INSULATING BUSHINGS ON THE ENDS OF ALL POWER CONDUITS (INCLUDING SPARES) AT EACH TERMINATION POINT AT HANDHOLES, ELECTRICAL VAULTS, AND AT EQUIPMENT.
7. FIBER OPTIC HANDHOLES (FOH) SHALL BE 24" X 36" WITH COVERS MARKED 'COMMUNICATION'. REFER TO SECTION 26 0533.16.

KEY NOTES:

1. STUB OUT AND CAP EMPTY 1" CONDUIT 3' FROM POLE BASE FOR FUTURE.
2. ELECTRICAL VAULT. SEE SHEET E.03.
3. PROVIDE 2-PIECE PRE-CAST CONCRETE ELECTRICAL MANHOLE WITH NON-TRAFFIC RATED ENTRY CASTING AND COVER, MARKED 'ELECTRIC'. MANHOLES ARE PULL LOCATIONS ONLY; NO CABLE SPLICES. REFER TO SECTION 26 0533.16.
4. DUCT BANK TAG. SEE DUCT BANK SCHEDULE (THIS SHEET) AND 1/E.605.
5. PROVIDE 11" X 18" ELECTRICAL HAND HOLE WITH COVER MARKED 'ELECTRIC'. REFER TO SECTION 26 0533.16.
6. PROVIDE 48" X 48" ELECTRICAL HAND HOLE WITH COVER MARKED 'ELECTRIC'. REFER TO SECTION 26 0533.16.
7. DIVIDE CONDUITS INTO GROUPS AT VAULT WALL IN ORDER TO NOT EXCEED MAXIMUM WALL PENETRATION SIZE. REFER TO STRUCTURAL DRAWINGS.
8. PROVIDE (1) 4" CONDUIT WITH (3) 1.25" INNERDUCTS FROM VAULT EV-1 TO IT ROOM 1206. SEE SHEET E.121 FOR CONDUIT STUB-UP LOCATION IN IT ROOM.



2 SITE WORK
ELECTRICAL LIGHTING AND POWER
SCALE: 1"=60'

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST	JOB DATE: 2020		BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.
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NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
ELECTRICAL LIGHTING AND POWER

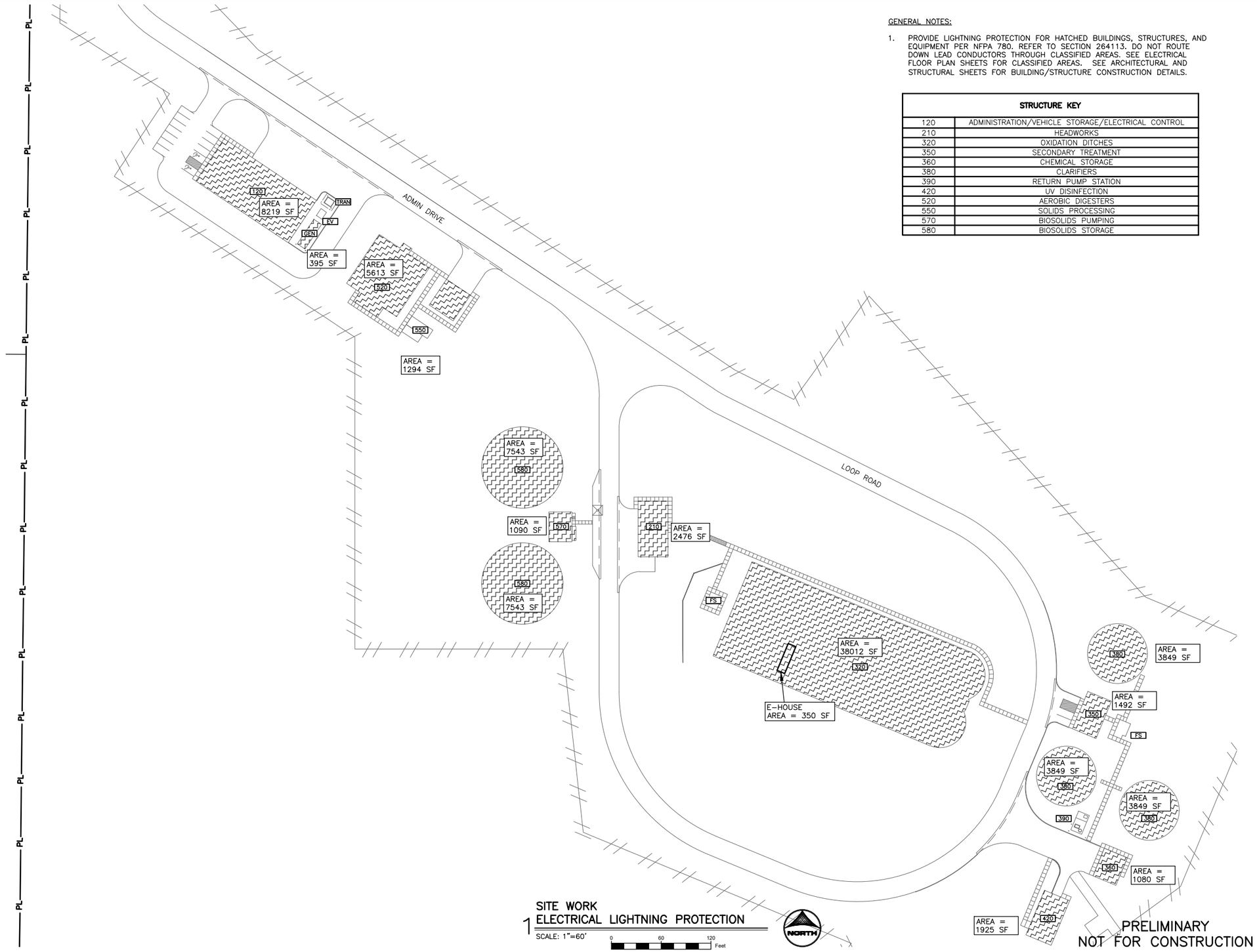
SHEET NO.
E.01

Xrefs: xgt-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCS-BLDG-INDEX; XCU-WATR; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-PROC

GENERAL NOTES:

1. PROVIDE LIGHTNING PROTECTION FOR HATCHED BUILDINGS, STRUCTURES, AND EQUIPMENT PER NFPA 780. REFER TO SECTION 264113. DO NOT ROUTE DOWN LEAD CONDUCTORS THROUGH CLASSIFIED AREAS. SEE ELECTRICAL FLOOR PLAN SHEETS FOR CLASSIFIED AREAS. SEE ARCHITECTURAL AND STRUCTURAL SHEETS FOR BUILDING/STRUCTURE CONSTRUCTION DETAILS.

STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE



1 SITE WORK
ELECTRICAL LIGHTNING PROTECTION
SCALE: 1"=60'

PRELIMINARY
NOT FOR CONSTRUCTION

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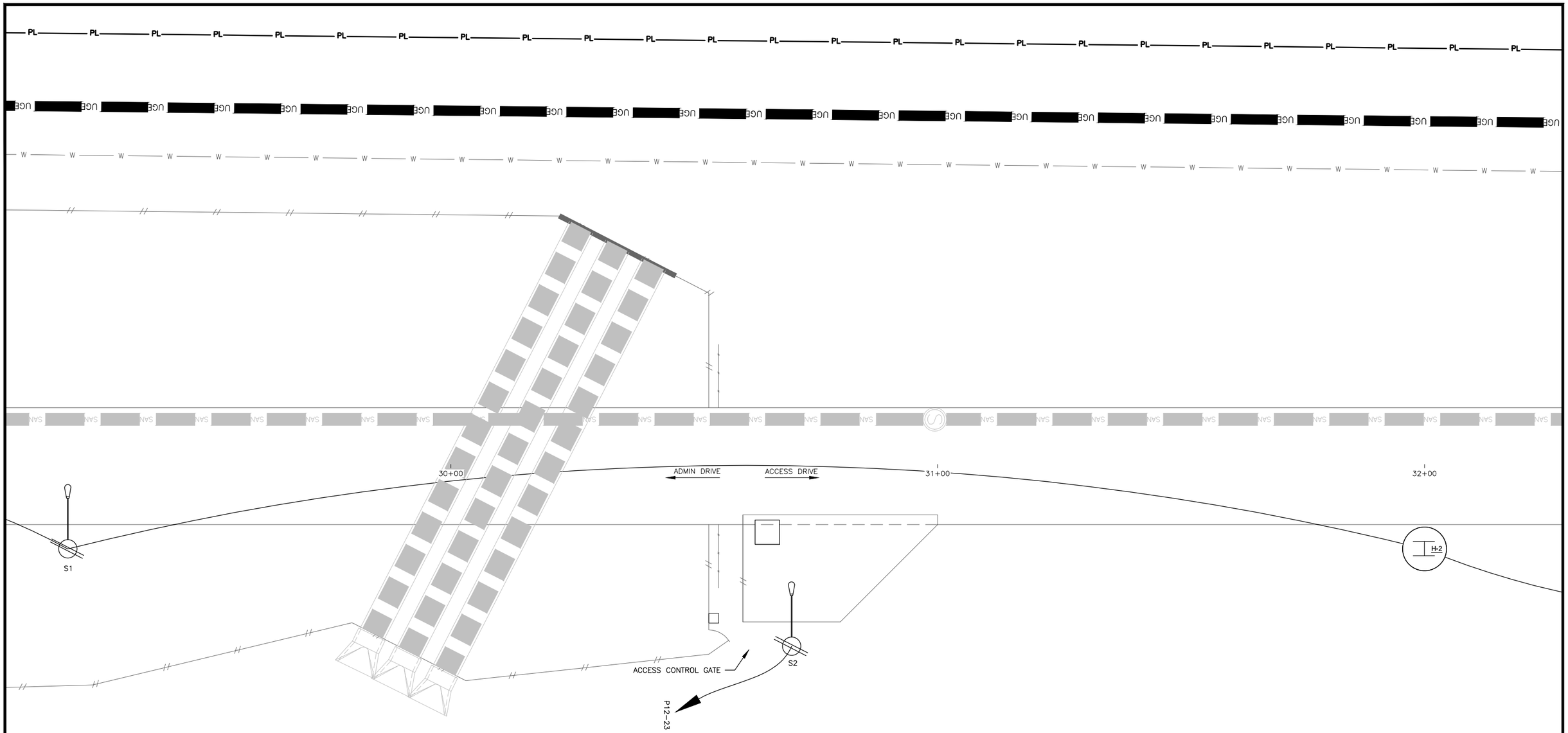
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
ELECTRICAL LIGHTNING PROTECTION

SHEET NO.
E.02

Xrefs: xgt-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCS-BLDG-INDEX; XCU-PATT



KEY NOTES:

1. PROVIDE ONE UNDERGROUND DEVICES, INC. MODEL CR48-B STANCHION WITH FOUR MODEL RA20 RACK ARMS FOR SUPPORTING POWER CABLES. PROVIDE ONE MODEL CR8-B STANCHION WITH ONE MODEL 3HDS RACK ARM DIRECTLY ABOVE THE POWER STANCHION FOR SUPPORTING FIBER OPTIC CABLES. PROVIDE STAINLESS STEEL HARDWARE AND DROP-IN ANCHORS PER MANUFACTURER'S RECOMMENDATIONS. REFER TO DETAIL 4/S.600 FOR ANCHOR EMBEDMENT REQUIREMENTS. PROVIDE HEAVY DUTY (EXTRA WIDE) NYLON TIE WRAPS FOR SECURING CABLES, AS REQUIRED.
2. OVERHEAD CABLE BUS FOR GENERATOR OUTPUT CONNECTION TO TRANSFER SWITCH. SEE SECTION 26 0536 AND ONE-LINE DIAGRAM. COORDINATE EXACT ROUTING WITH EQUIPMENT PROVIDED.

NORTH

1 SITE WORK
ELECTRICAL SITE PLAN – ACCESS CONTROL GATE AREA
SCALE: 1"=10'

0 10 20 Feet

PRELIMINARY
NOT FOR CONSTRUCTION

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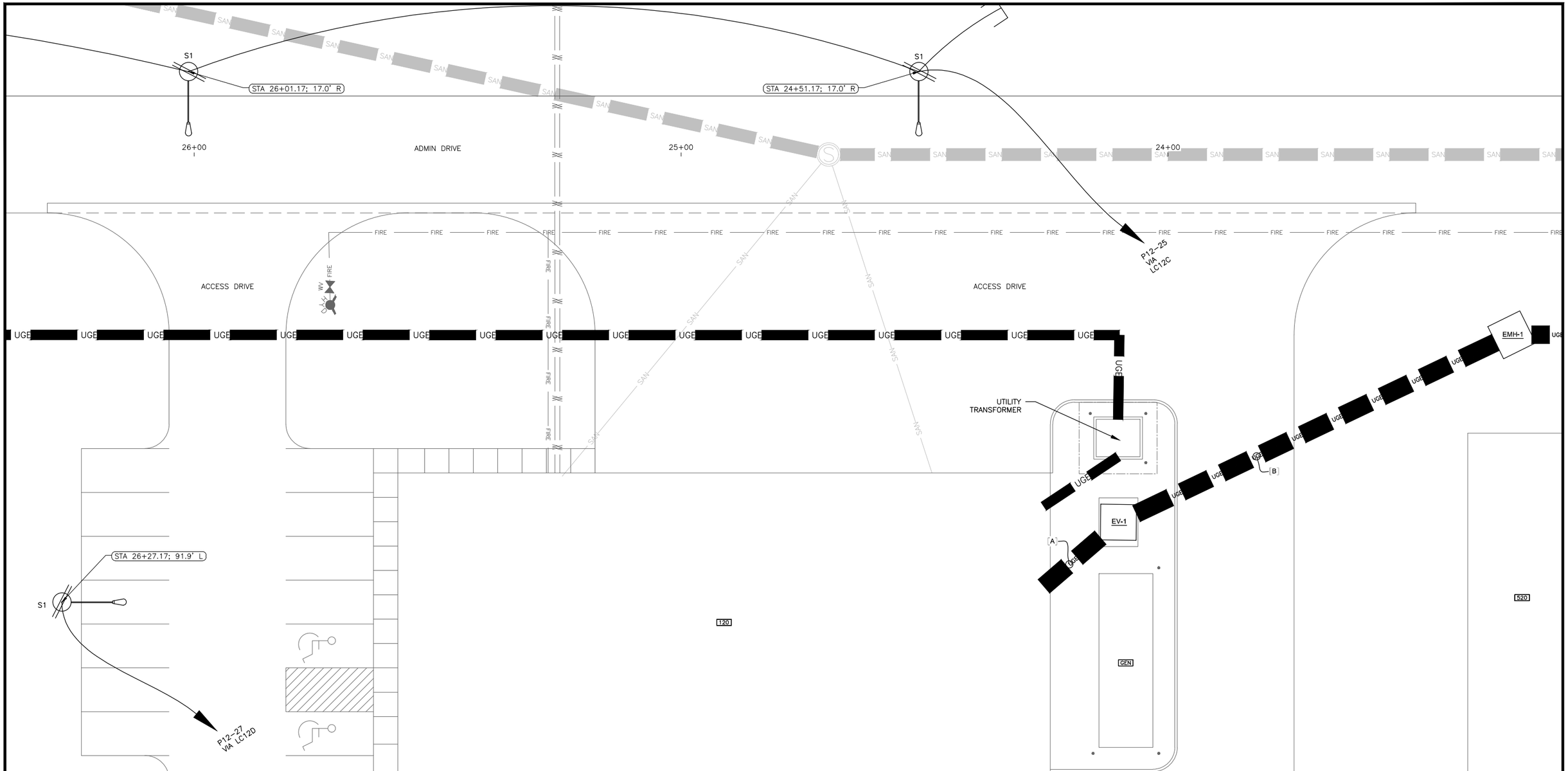
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
ELECTRICAL SITE PLAN – ACCESS CONTROL GATE AREA

SHEET NO.
E.03

Xrefs: xgl-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCU-WATR; XCU-ELEC; XCU-SANI; XCU-STRM; XCU-PROC



STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

KEY NOTES:

1. PROVIDE ONE UNDERGROUND DEVICES, INC. MODEL CR48-B STANCHION WITH FOUR MODEL RA20 RACK ARMS FOR SUPPORTING POWER CABLES. PROVIDE ONE MODEL CR8-B STANCHION WITH ONE MODEL 3HDS RACK ARM DIRECTLY ABOVE THE POWER STANCHION FOR SUPPORTING FIBER OPTIC CABLES. PROVIDE STAINLESS STEEL HARDWARE AND DROP-IN ANCHORS PER MANUFACTURER'S RECOMMENDATIONS. REFER TO DETAIL 4/S.600 FOR ANCHOR EMBEDMENT REQUIREMENTS. PROVIDE HEAVY DUTY (EXTRA WIDE) NYLON TIE WRAPS FOR SECURING CABLES, AS REQUIRED.
2. OVERHEAD CABLE BUS FOR GENERATOR OUTPUT CONNECTION TO TRANSFER SWITCH. SEE SECTION 26 0536 AND ONE-LINE DIAGRAM. COORDINATE EXACT ROUTING WITH EQUIPMENT PROVIDED.

1 SITE WORK
ELECTRICAL SITE PLAN – ADMIN
SCALE: 1"=10'

0 10 20 Feet

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD DATE: 8/3/2020 12:27:18 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\E\E.04 ELECTRICAL SITE PLAN – ADMIN.dwg			

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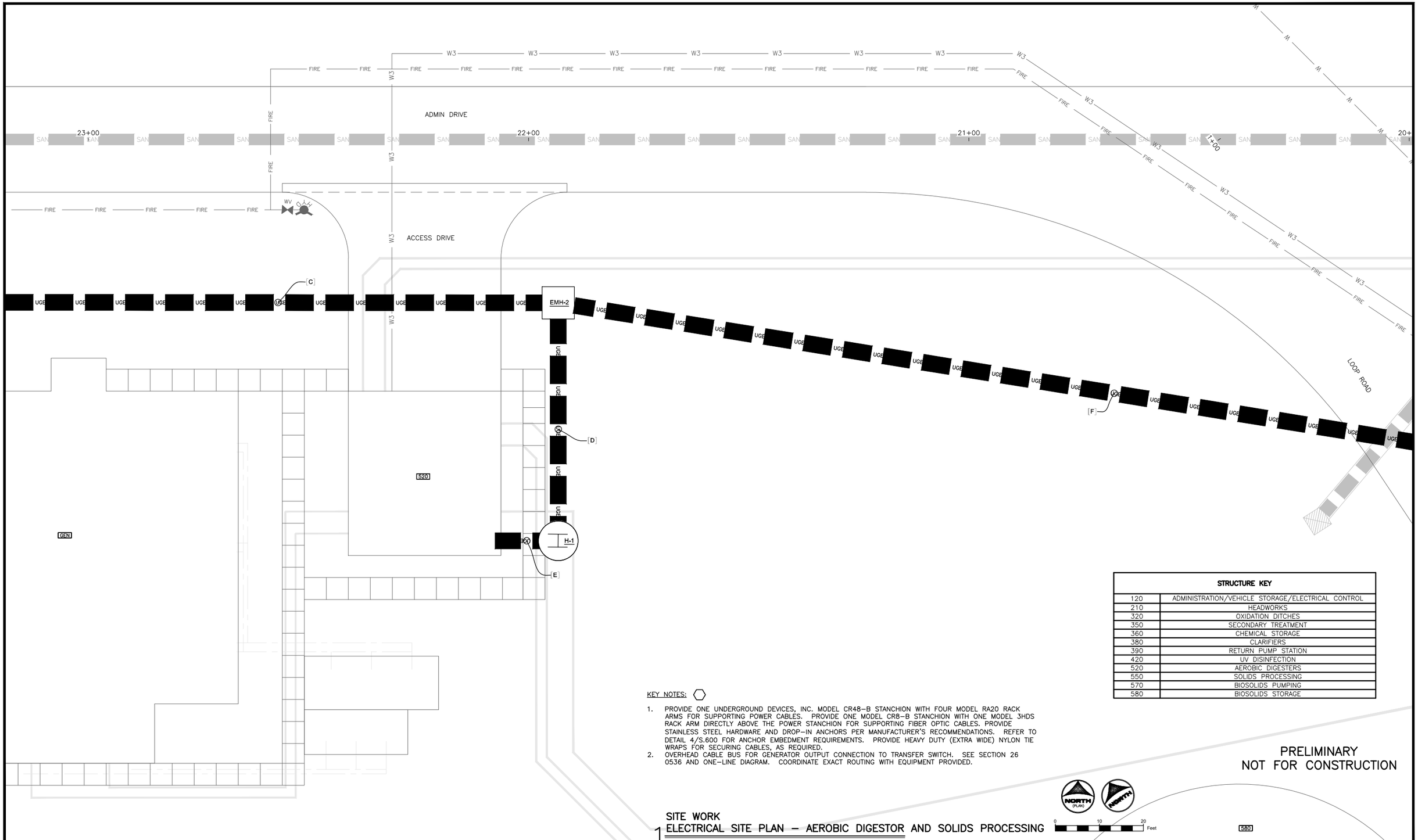
SITE WORK
ELECTRICAL SITE PLAN – ADMIN

SHEET NO.
E.04

Xrefs: xgt-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCS-BLDG-INDEX; XCU-WATR; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-PROC



STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

KEY NOTES:

1. PROVIDE ONE UNDERGROUND DEVICES, INC. MODEL CR48-B STANCHION WITH FOUR MODEL RA20 RACK ARMS FOR SUPPORTING POWER CABLES. PROVIDE ONE MODEL CR8-B STANCHION WITH ONE MODEL 3HDS RACK ARM DIRECTLY ABOVE THE POWER STANCHION FOR SUPPORTING FIBER OPTIC CABLES. PROVIDE STAINLESS STEEL HARDWARE AND DROP-IN ANCHORS PER MANUFACTURER'S RECOMMENDATIONS. REFER TO DETAIL 4/S.600 FOR ANCHOR EMBEDMENT REQUIREMENTS. PROVIDE HEAVY DUTY (EXTRA WIDE) NYLON TIE WRAPS FOR SECURING CABLES, AS REQUIRED.
2. OVERHEAD CABLE BUS FOR GENERATOR OUTPUT CONNECTION TO TRANSFER SWITCH. SEE SECTION 26 0536 AND ONE-LINE DIAGRAM. COORDINATE EXACT ROUTING WITH EQUIPMENT PROVIDED.

PRELIMINARY
NOT FOR CONSTRUCTION

1 SITE WORK
ELECTRICAL SITE PLAN – AEROBIC DIGESTOR AND SOLIDS PROCESSING
SCALE: 1"=10'

NORTH (PLAN) NORTH
0 10 20 Feet

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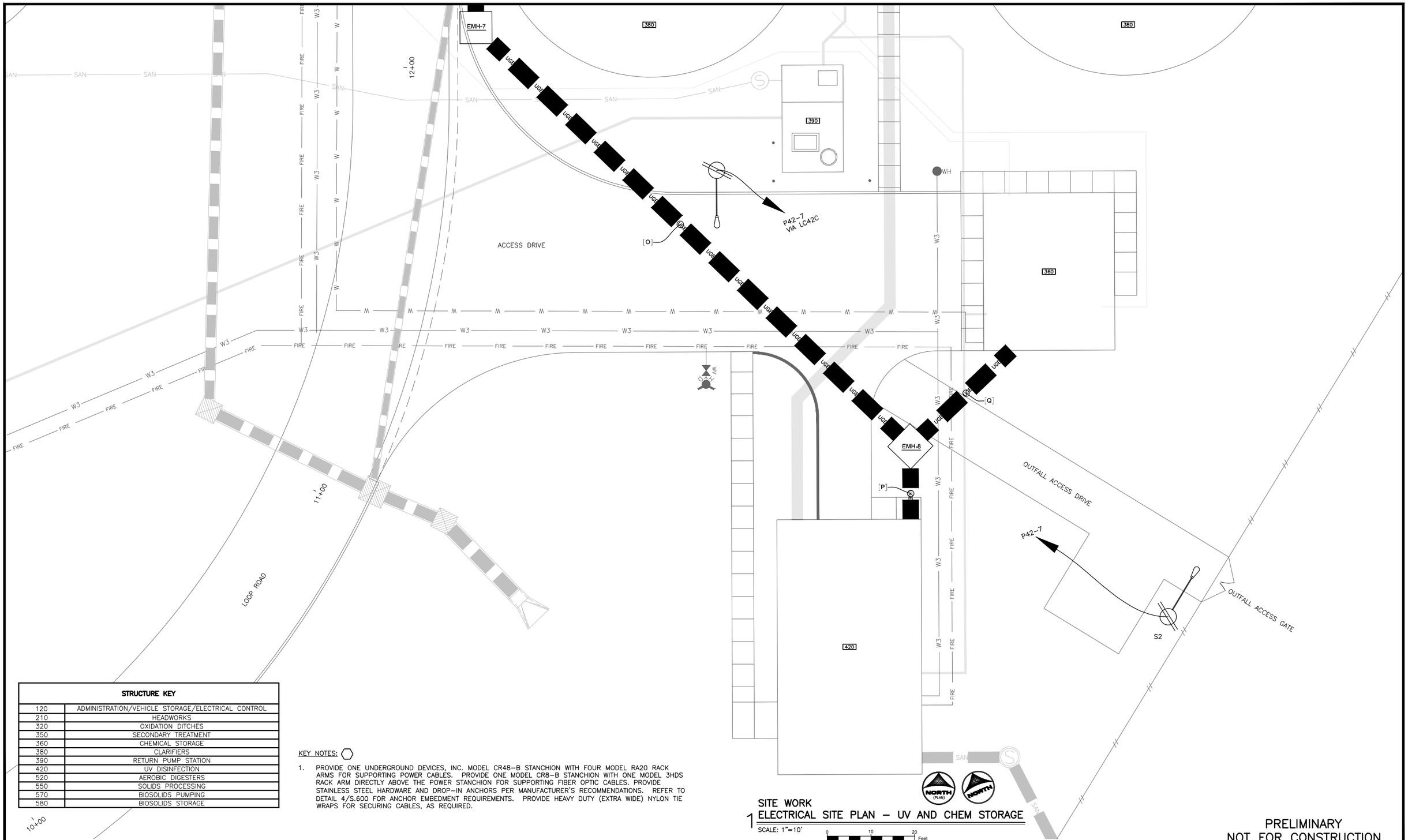
CITY OF NEVADA
NEVADA, IOWA

SITE WORK
ELECTRICAL SITE PLAN – AEROBIC DIGESTOR AND SOLIDS PROCESSING

SHEET NO.
E.05

Xrefs: xgl-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCS-BLDG-INDEX; XCU-WATR; XCU-ELEC; XCU-SAN1; XCU-STRM; XCU-PROC



STRUCTURE KEY	
120	ADMINISTRATION/VEHICLE STORAGE/ELECTRICAL CONTROL
210	HEADWORKS
320	OXIDATION DITCHES
350	SECONDARY TREATMENT
360	CHEMICAL STORAGE
380	CLARIFIERS
390	RETURN PUMP STATION
420	UV DISINFECTION
520	AEROBIC DIGESTERS
550	SOLIDS PROCESSING
570	BIOSOLIDS PUMPING
580	BIOSOLIDS STORAGE

KEY NOTES:

1. PROVIDE ONE UNDERGROUND DEVICES, INC. MODEL CR48-B STANCHION WITH FOUR MODEL RA20 RACK ARMS FOR SUPPORTING POWER CABLES. PROVIDE ONE MODEL CR8-B STANCHION WITH ONE MODEL 3HDS RACK ARM DIRECTLY ABOVE THE POWER STANCHION FOR SUPPORTING FIBER OPTIC CABLES. PROVIDE STAINLESS STEEL HARDWARE AND DROP-IN ANCHORS PER MANUFACTURER'S RECOMMENDATIONS. REFER TO DETAIL 4/S.600 FOR ANCHOR EMBEDMENT REQUIREMENTS. PROVIDE HEAVY DUTY (EXTRA WIDE) NYLON TIE WRAPS FOR SECURING CABLES, AS REQUIRED.

1 SITE WORK
ELECTRICAL SITE PLAN – UV AND CHEM STORAGE
SCALE: 1"=10'

0 10 20 Feet

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB, JST JOB DATE: 2020
APPROVED: MAR, ARV JOB NUMBER: 160473
CAD DATE: 8/3/2020 12:34:12 PM
CAD FILE: J:\2016\160473\CAD\Dwgs\E\E.06 ELECTRICAL SITE PLAN – UV AND CHEM STORAGE.dwg

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
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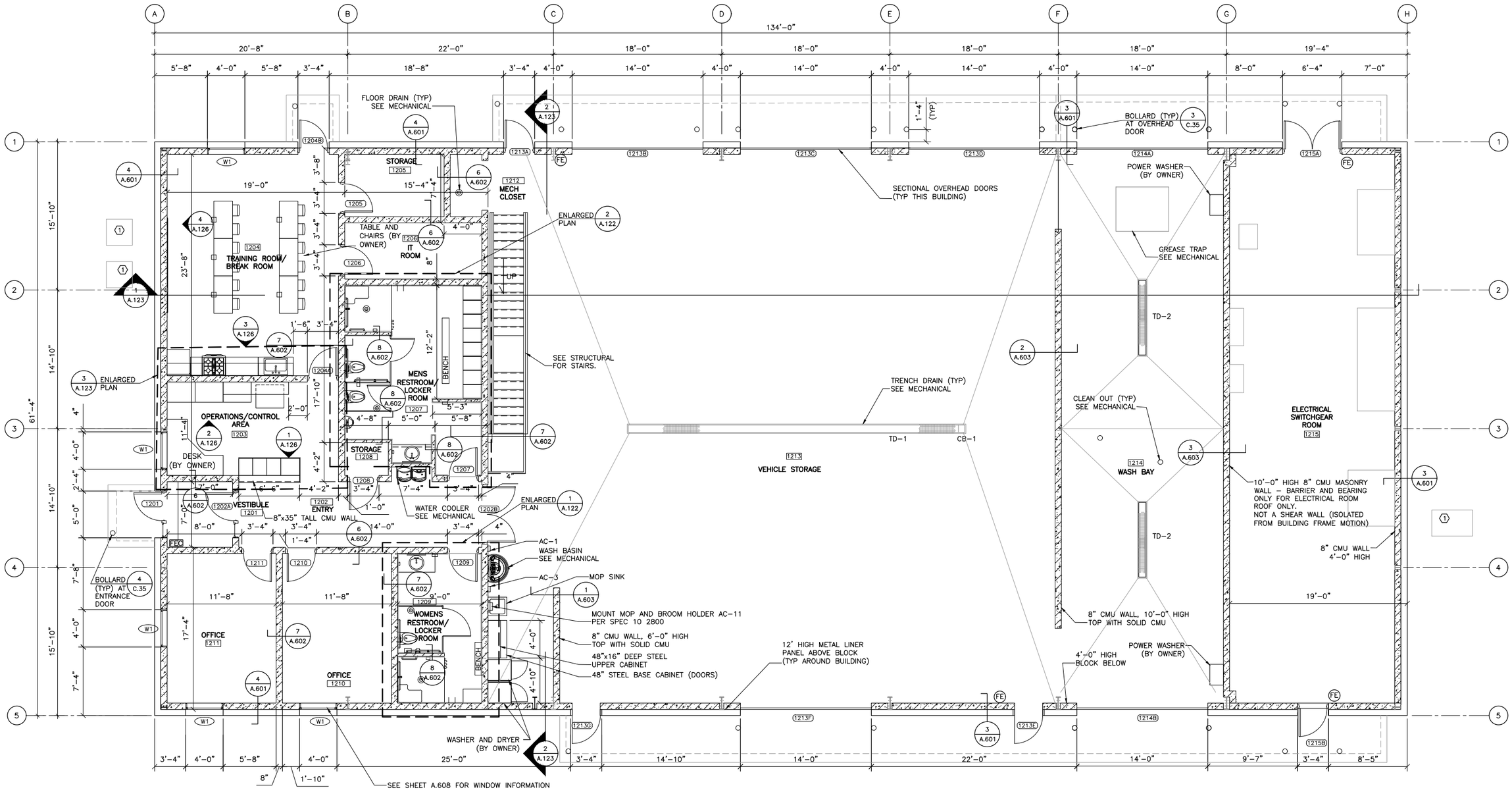
SITE WORK
ELECTRICAL SITE PLAN – UV AND CHEM STORAGE

SHEET NO.
E.06

Xrefs: xgt-1-dh01; XCS-DSGN; XCS-BASE; XCS-ROW; XCS-PARCELS; XCS-BLDG-INDEX; XCU-WATR; XCU-ELEC; XCU-SAN; XCU-STRM; XCU-PROC



1 OPERATING LEVEL PLAN

SCALE: 3/16"=1'-0"

NORTH PLAN NORTH

NOTES:
1. SEE A.600 SERIES SHEETS FOR ARCHITECTURAL DETAILS AND SCHEDULES.
2. SEE A.602 THRU A.604 FOR WALL DETAILS AND SCHEDULES.
3. REFER TO SPECIFICATION SECTION 10 2800 FOR SINK ACCESSORIES, SEE ACCESSORIES IN MAINTENANCE AREA ON A.122

KEYNOTES:
1. EQUIPMENT PAD; SEE STRUCTURAL AND MECHANICAL.

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: DJH	JOB NUMBER: 160473	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD DATE: 7/27/2020 6:59:21 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.120 OPERATING LEVEL PLAN.dwg			

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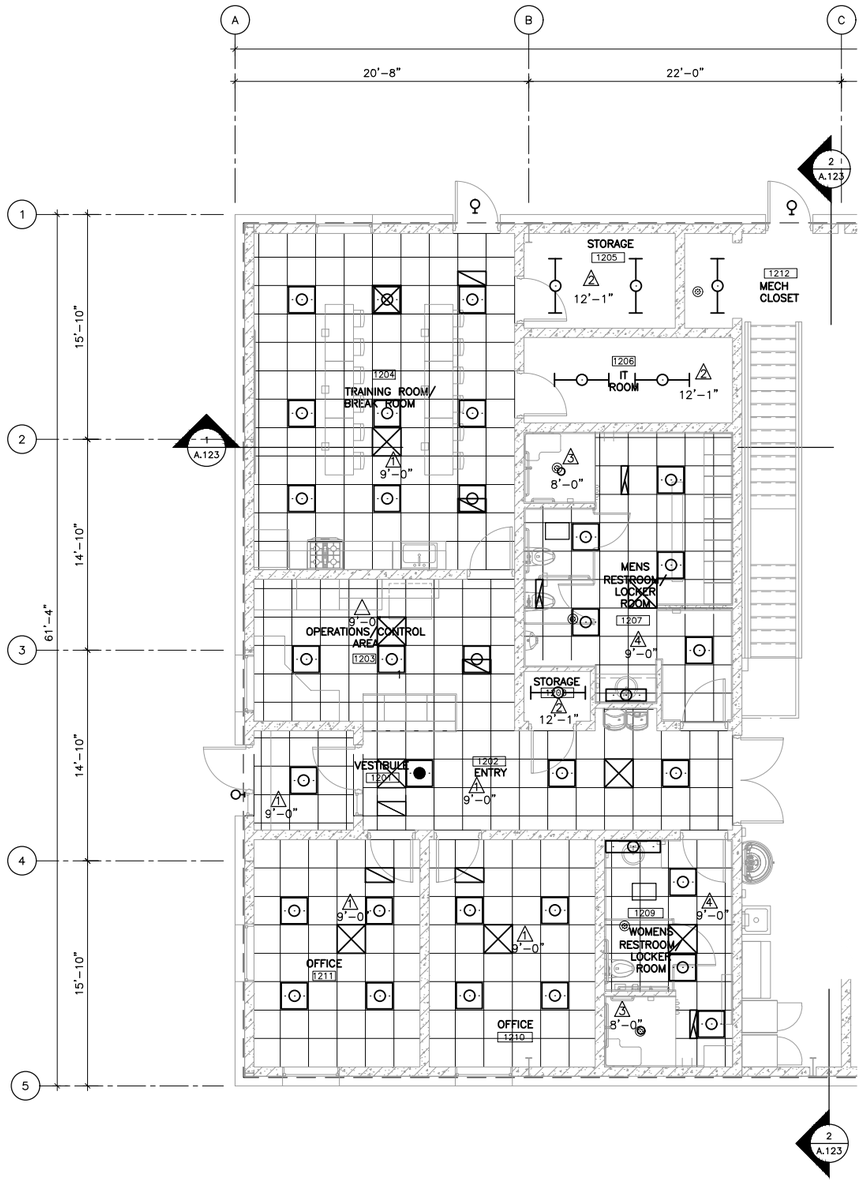
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
OPERATING LEVEL PLAN

SHEET NO.
A.120

Xrefs: xgt-1-dh01; XA-120-P01; XS-120-GRID; XS-120-P00



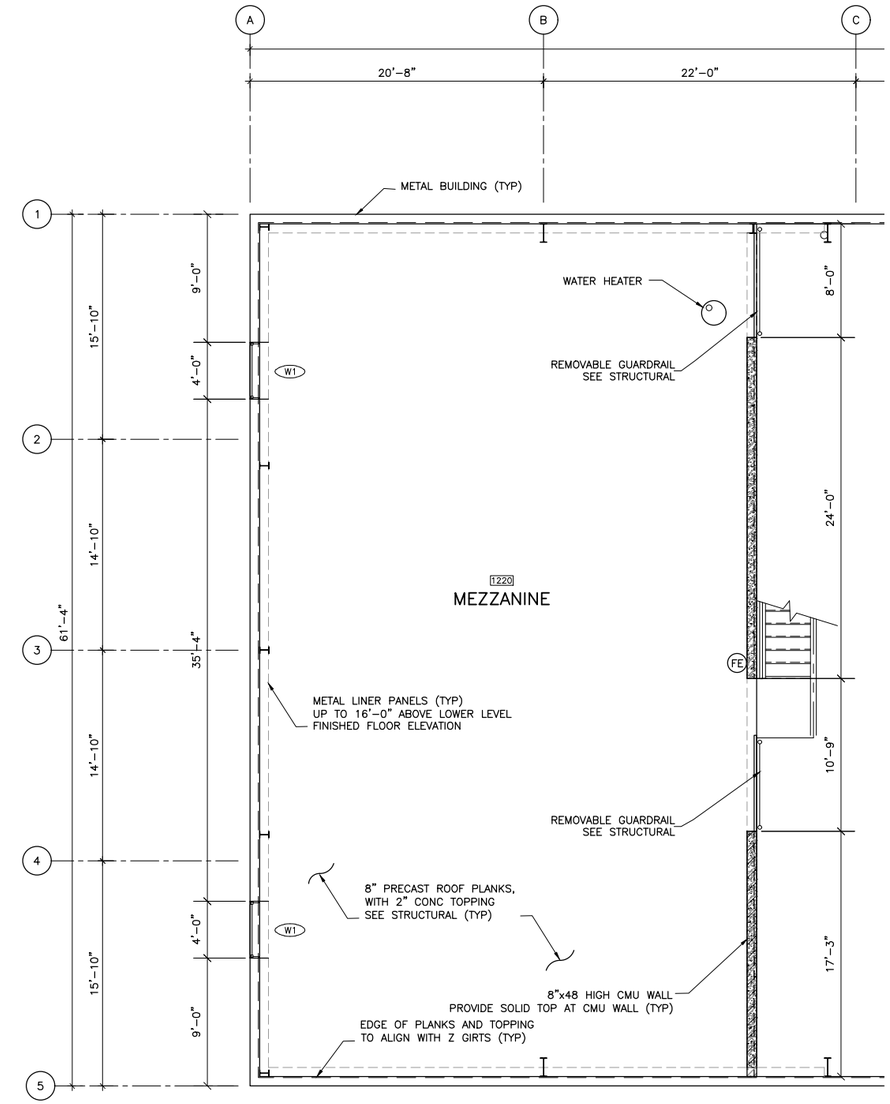
LEGEND:

1. ACT-1 AS SPECIFIED
2. EXPOSED STRUCTURE
3. MOISTURE RESISTANT GYPSUM BOARD PROVIDE BULKHEAD AT JUNCTION WITH ACT
4. ACT-2 AS SPECIFIED

1 REFLECTED CEILING PLAN

SCALE: 3/16"=1'-0"

NORTH PLAN NORTH



2 MEZZANINE LEVEL PLAN

SCALE: 3/16"=1'-0"

NORTH PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.121 MEZZANINE AND REFLECTED CEILING PLAN.dwg			

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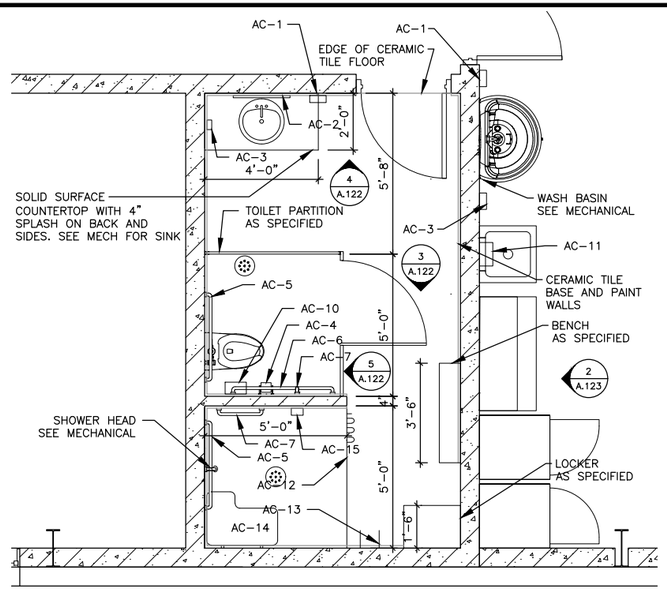
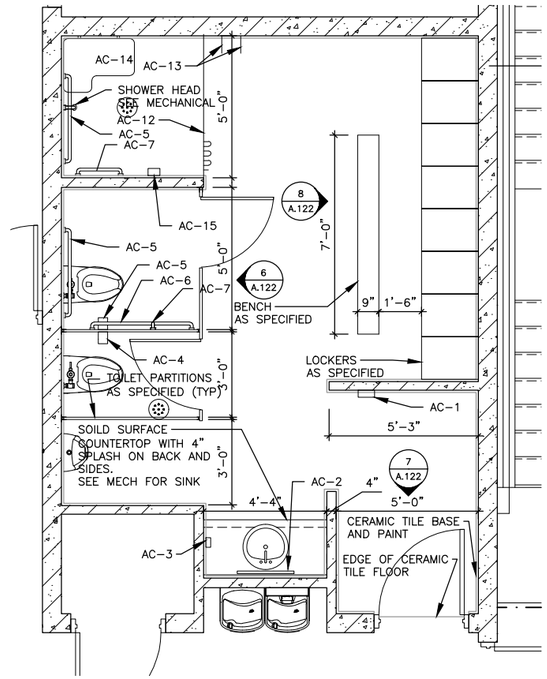
ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
MEZZANINE AND REFLECTED CEILING PLAN

SHEET NO.
A.121

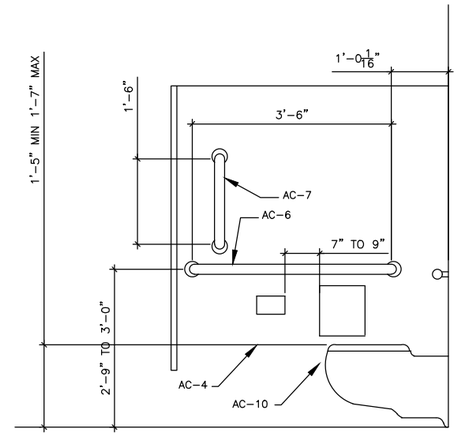
Xrefs: xgl-1-dh01; XS-120-GRID; XA-120-MEZZ; XA-120-P02 REF CLG PLAN; XA-120-P01; XS-120-P02; XEL-120-P02; XMH-120-P02; XEL-120-P01; XMH-120-P01



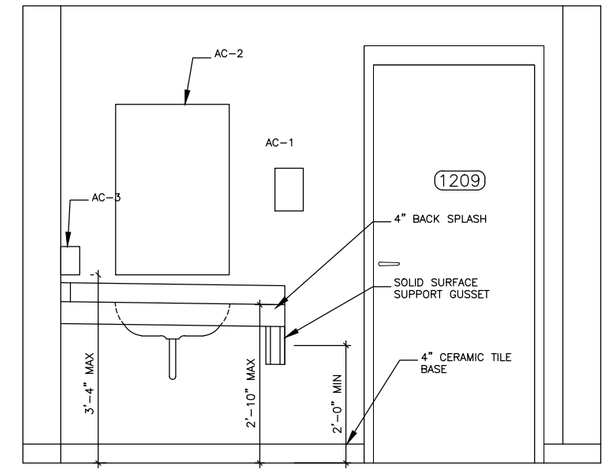
1 ENLARGED PLAN
WOMENS RESTROOM
SCALE: 3/8"=1'-0"



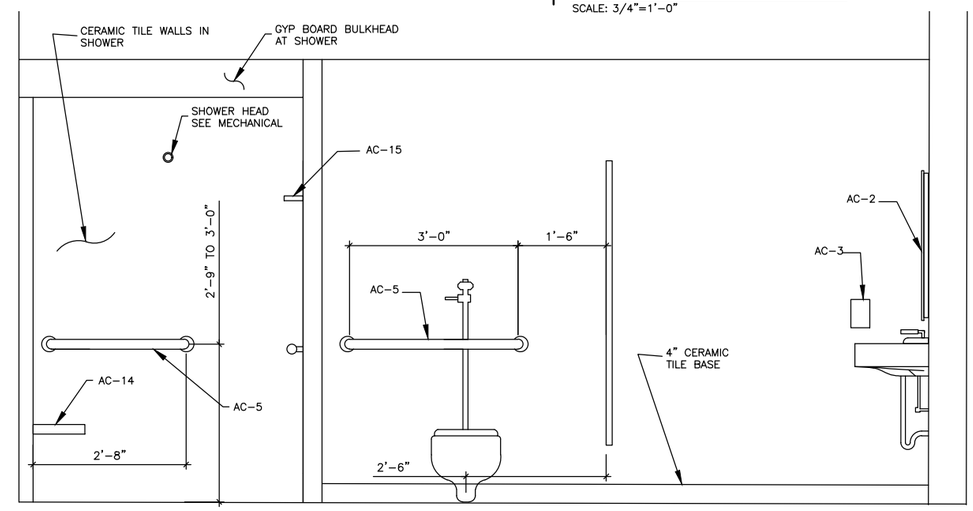
2 ENLARGED PLAN
MENS RESTROOM AND LOCKER ROOM
SCALE: 3/8"=1'-0"



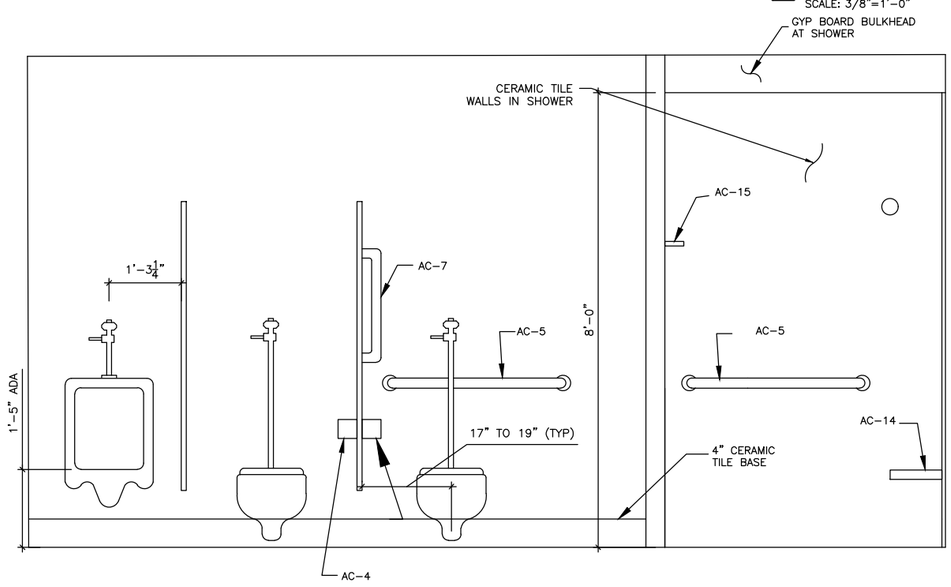
3 WOMENS RESTROOM SECTION
SCALE: 3/4"=1'-0"



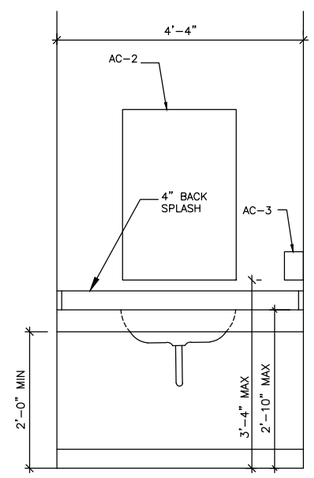
4 WOMENS RESTROOM SECTION
SCALE: 3/4"=1'-0"



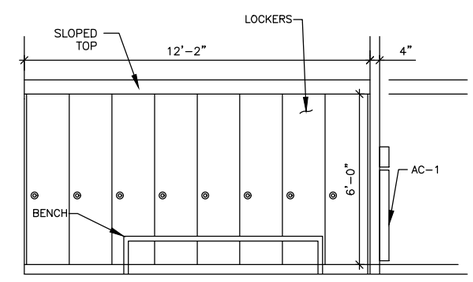
5 WOMENS RESTROOM SECTION
SCALE: 3/4"=1'-0"



6 MENS RESTROOM SECTION
SCALE: 3/4"=1'-0"



7 MENS RESTROOM SECTION
SCALE: 3/4"=1'-0"



8 MENS RESTROOM SECTION
SCALE: 3/8"=1'-0"

NOTES:
1. REFER TO SPECIFICATION SECTION 10 2113.19 FOR PLASTIC TOILET PARTITIONS.
2. REFER TO SPECIFICATION SECTION 10 5113 FOR LOCKERS AND BENCHES.
3. REFER TO SPECIFICATION SECTION 12 3600 FOR COUNTER TOPS.
4. REFER TO SPECIFICATION SECTION 10 2800 FOR TOILET ACCESSORIES.
5. REFER TO SPECIFICATION SECTION 12 3600 FOR COUNTERTOPS.

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APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/30/2020 2:12:03 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.122 ENLARGED PLANS.dwg			

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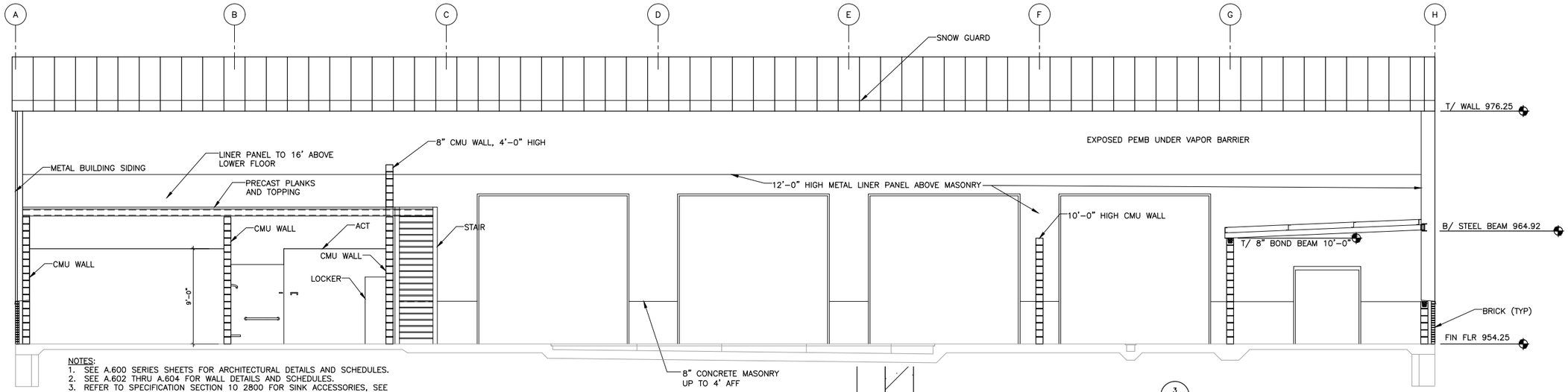
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
ENLARGED PLANS

SHEET NO.
A.122

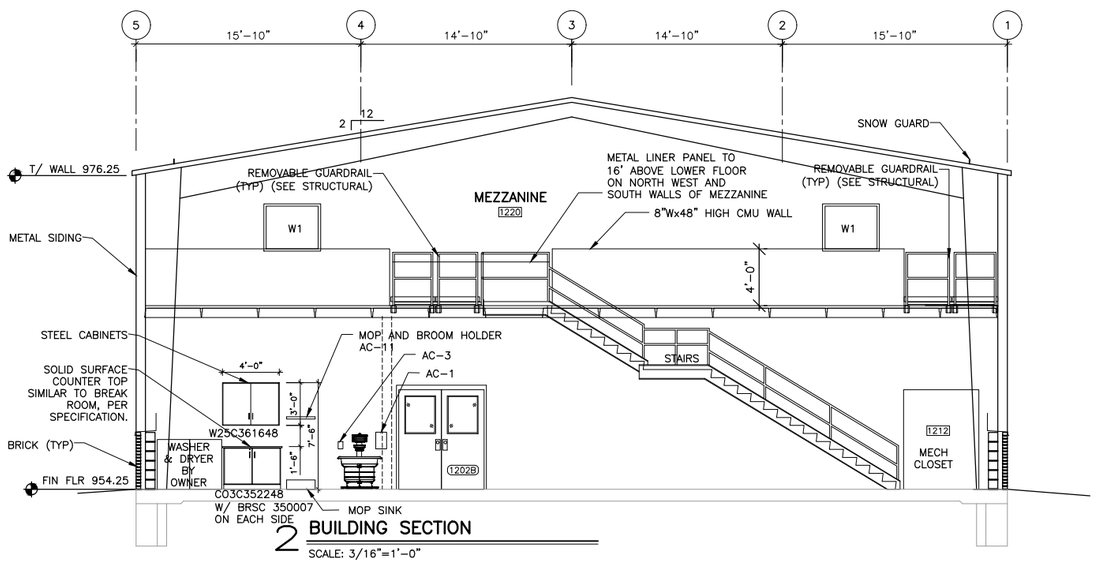
Xrefs: xgl-1-dh01; XS-120-GRID; XA-120-P01



NOTES:
1. SEE A.600 SERIES SHEETS FOR ARCHITECTURAL DETAILS AND SCHEDULES.
2. SEE A.602 THRU A.604 FOR WALL DETAILS AND SCHEDULES.
3. REFER TO SPECIFICATION SECTION 10 2800 FOR SINK ACCESSORIES, SEE ACCESSORIES IN MAINTENANCE AREA ON A.122.
4. SEE SPECIFICATION SECTION 12 3600 FOR COUNTERTOPS.
5. REFER TO SPECIFICATION SECTION 11 5353 FOR CABINETS IN ADMINISTRATION–MAINTENANCE.
6. COORDINATE WITH CABINET MANUFACTURER TO INCLUDE CABINETS IN SECONDARY TREATMENT BUILDING (LABORATORY).
7. CABINET PREFERENCES ON ELEVATIONS ARE BASED ON KEWAUNEE SCIENTIC CORPORATION. CONTRACTOR TO PROVIDE KEWAUNEE OR EQUAL PER SPECIFICATIONS.
8. CABINETS IN ADMINISTRATION BUILDING SHALL BE WOOD. CABINETS IN MAINTENANCE AREA SHALL BE STEEL.

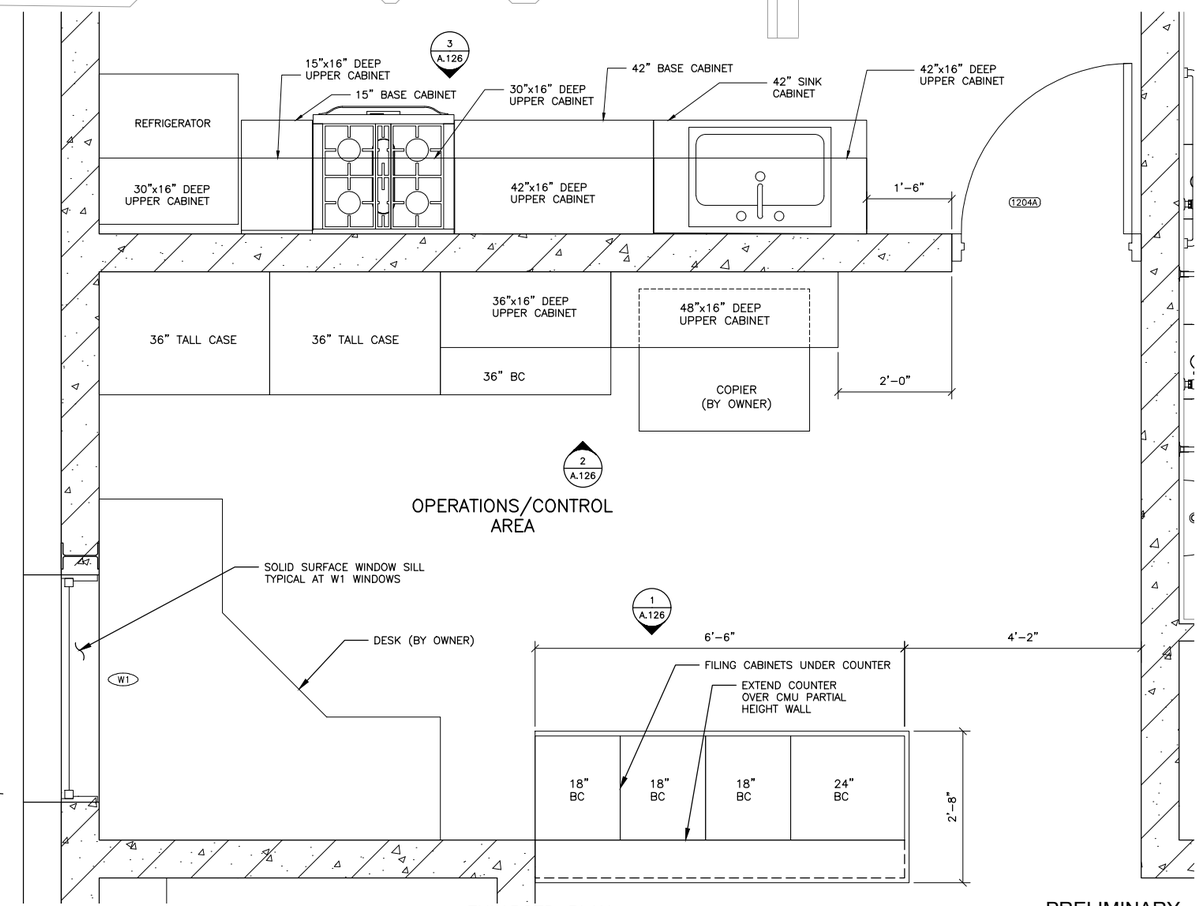
1 BUILDING SECTION

SCALE: 3/16"=1'-0"



2 BUILDING SECTION

SCALE: 3/16"=1'-0"



3 ENLARGED PLAN

SCALE: 3/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/29/2020 4:19:48 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.123 BUILDING SECTIONS.dwg			

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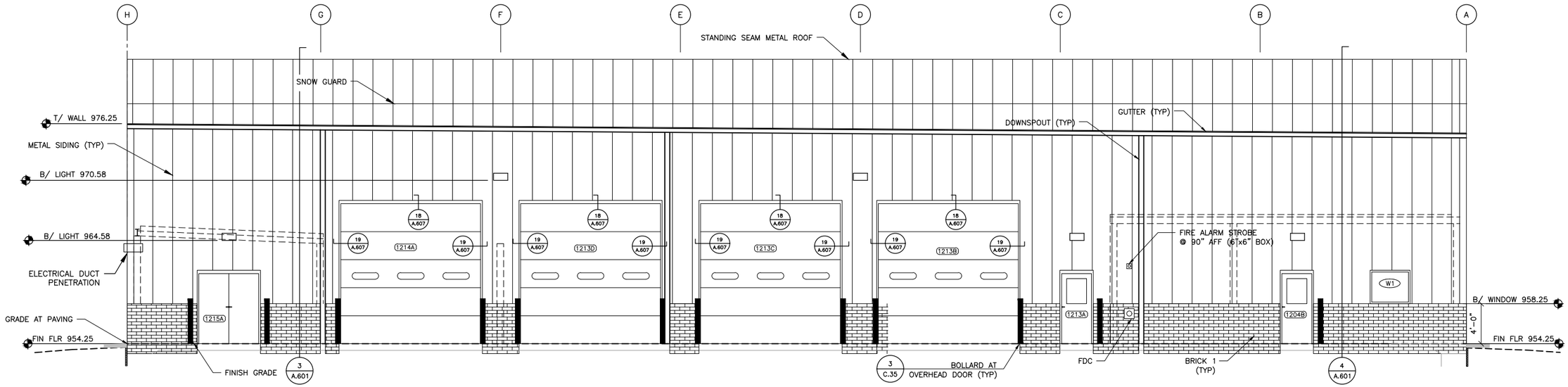
ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
BUILDING SECTIONS

SHEET NO.
A.123

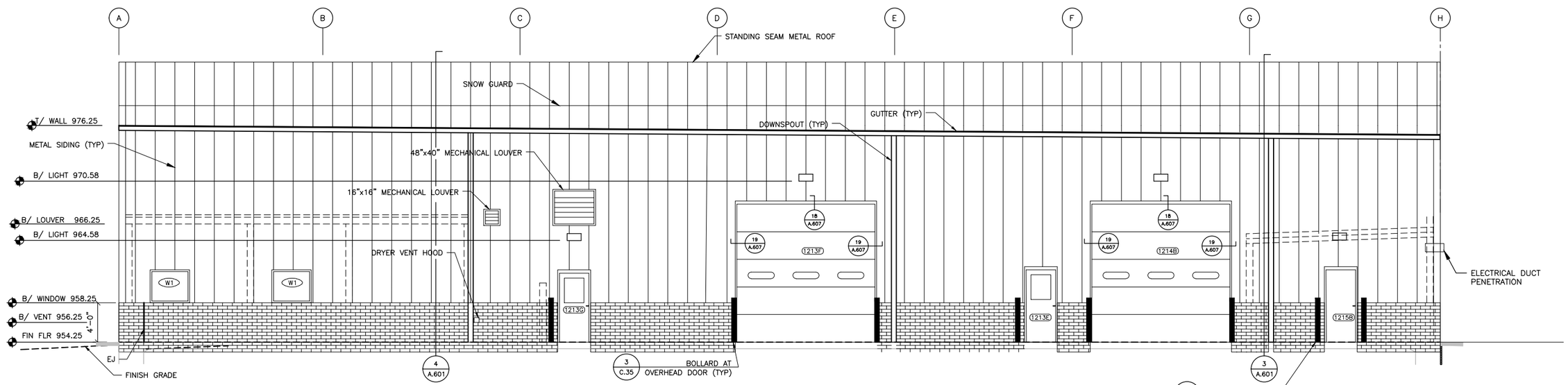
Xrefs: xgt-1-dh01; XA-120-S01; XS-120-S01; XA-120-P01



1 NORTH ELEVATION

SCALE: 3/16"='1-0"

NOTES:
1. SEE A.600 SERIES SHEETS FOR DOOR AND WINDOW TYPES AND DETAILS.
2. COORDINATE LOCATIONS OF HEAT TAPE ELECTRICAL WITH DOWNSPOUT LOCATIONS (TYP)



2 SOUTH ELEVATION

SCALE: 3/16"='1-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/27/2020 9:08:08 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.124 EXTERIOR ELEVATIONS.dwg			

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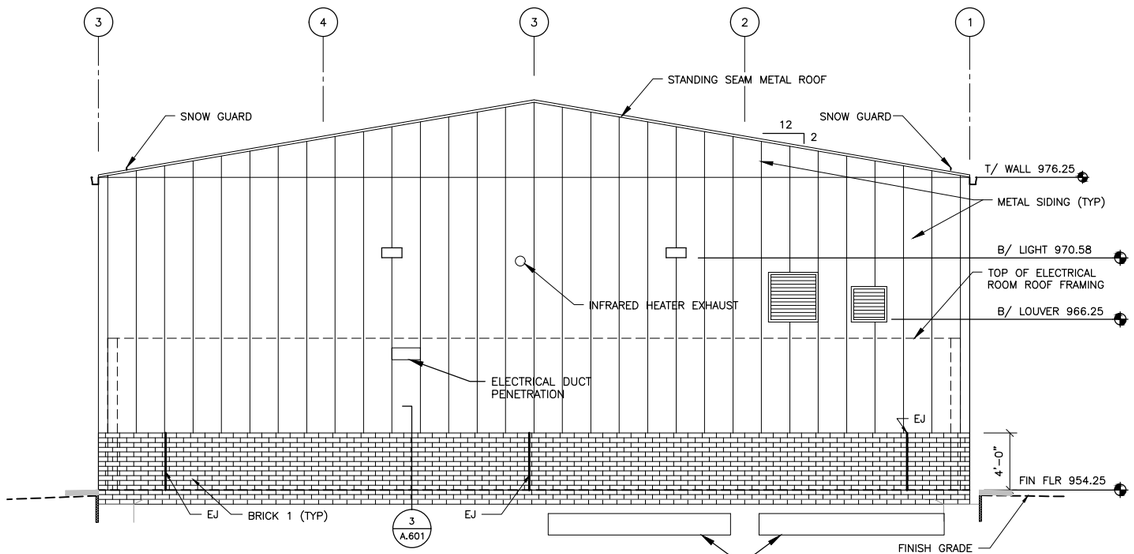
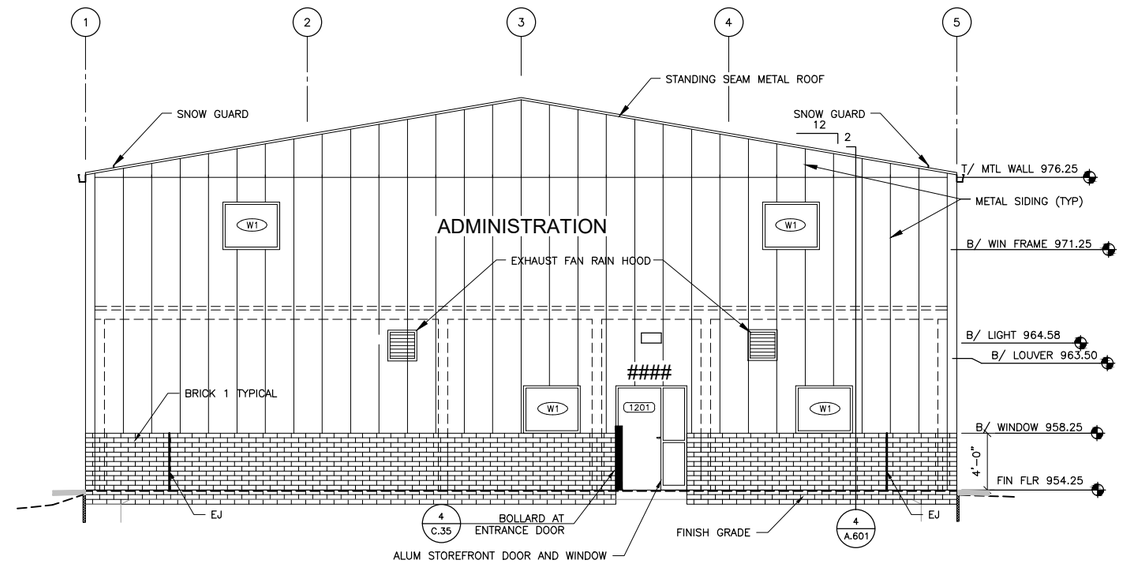
ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.124

Xref's: xgl-1-dh01; XA-120-E01



1 EAST ELEVATION
SCALE: 3/16"='1-0"



2 WEST ELEVATION
SCALE: 3/16"='1-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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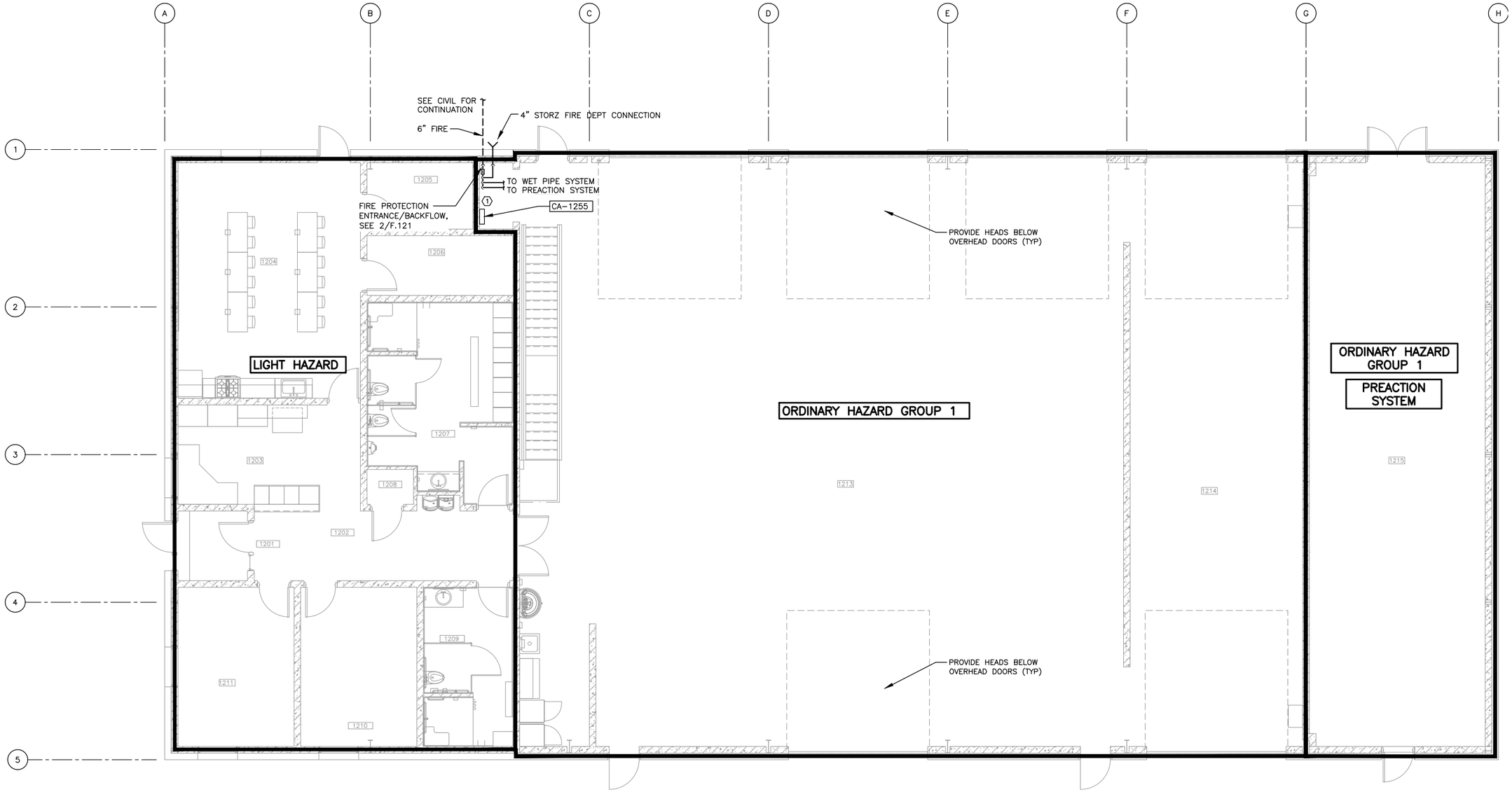
ADMINISTRATION – MAINTENANCE BUILDING – 120
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.125

Xrefs: xgl-1-dh01; XA-120-E01



1 OPERATING LEVEL PLAN

SCALE: 3/16"=1'-0"

KEYNOTES: (X)

1. PROVIDE CONTROL PANEL FOR SINGLE INTERLOCK PREACTION SYSTEM. PANEL SHALL SERVE PREACTION ZONE IN THE ELECTRICAL SWITCHGEAR ROOM. COORDINATE WITH ELECTRICAL CONTRACTOR FOR POWER AND WIRING.

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
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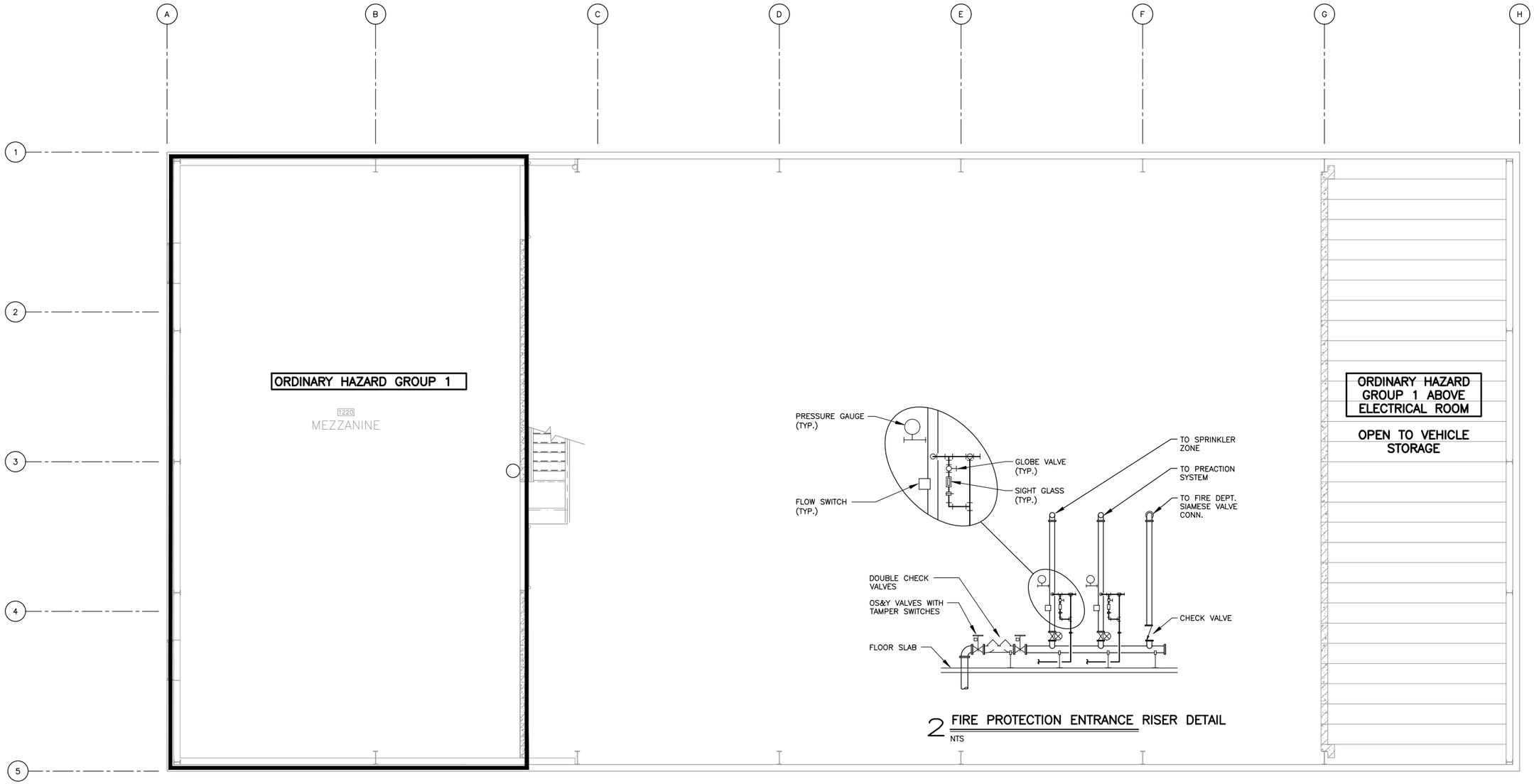
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
FIRE PROTECTION
OPERATING LEVEL FIRE PROTECTION PLAN

SHEET NO.
F.120

Xrefs: xgt-1-dh01; XA-120-P01; XS-120-GRID; XMF-120-P01



2 FIRE PROTECTION ENTRANCE RISER DETAIL
NTS

1 MEZZANINE LEVEL PLAN
SCALE: 3/16"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
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DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DAS	JOB NUMBER: 160473		
CAD DATE: 7/29/2020 2:59:11 PM			
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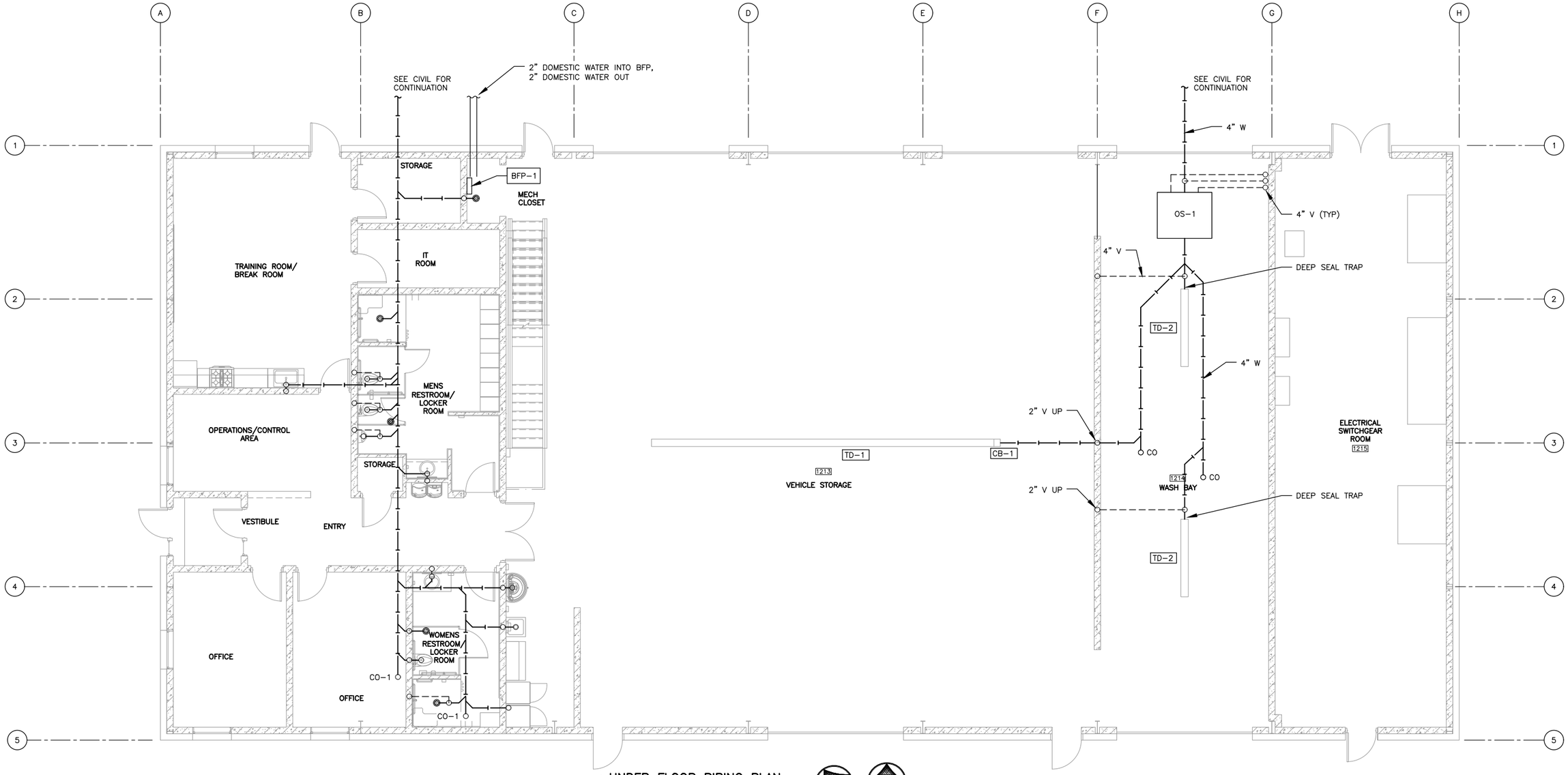
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
FIRE PROTECTION
MEZZANINE LEVEL FIRE PROTECTION PLAN

SHEET NO.
F.121

Xrefs: xgt-1-dh01; XA-120-P01; XS-120-GRID; XA-120-MEZZ; XMF-120-P02



1 UNDER FLOOR PIPING PLAN

SCALE: 3/16"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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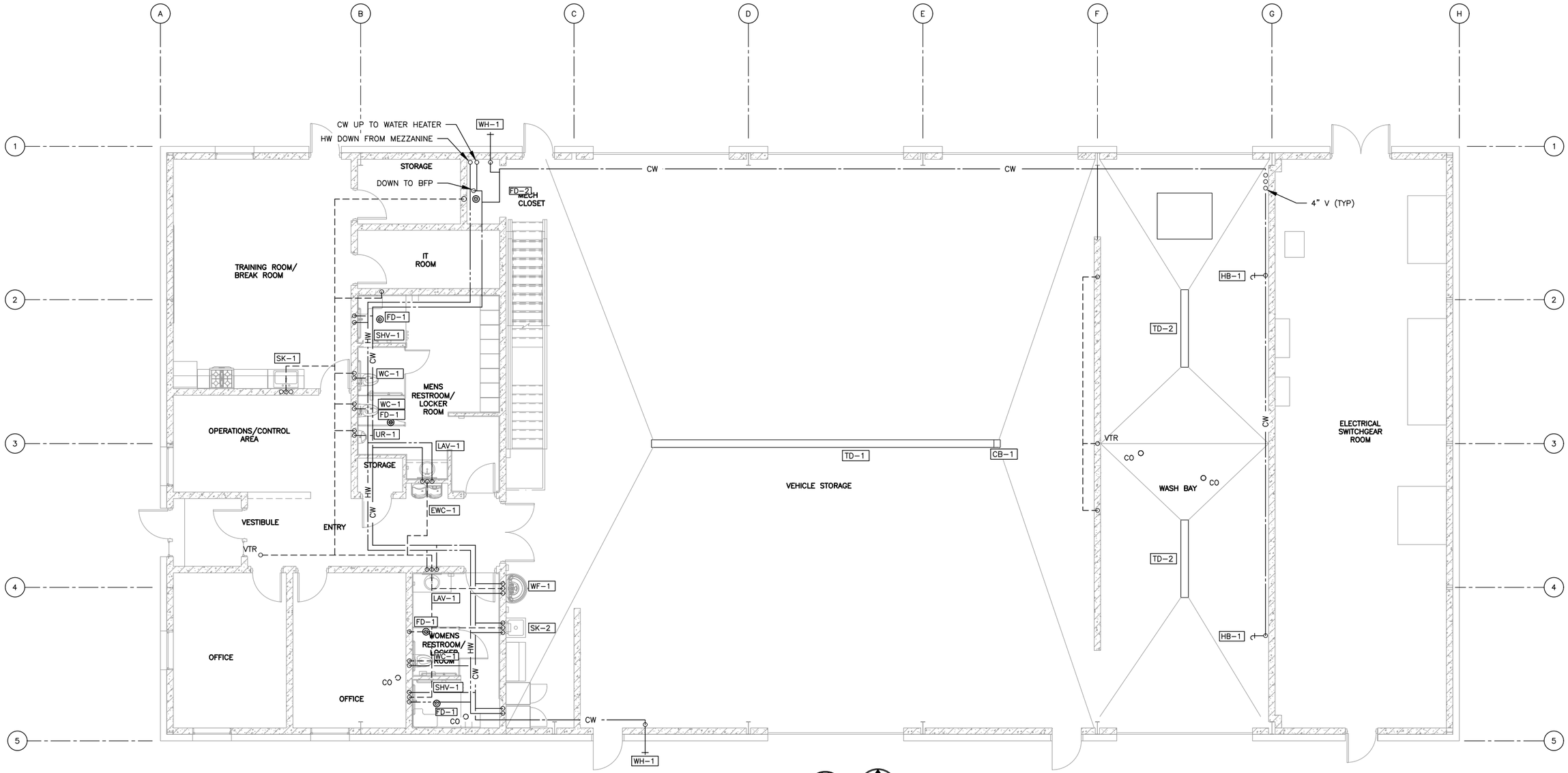
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
MECHANICAL
UNDERFLOOR PLUMBING PLAN

SHEET NO.
M.120

Xrefs: xgl-1-dh01; XA-120-P01; XS-120-GRID; XA-120-MEZZ; XS-120-P00; XMP-120-P00



1 PLUMBING PLAN

SCALE: 3/16"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: DAS	JOB NUMBER: 160473	0 1"	
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CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.121 OPERATING LEVEL PLUMBING PLAN.dwg			

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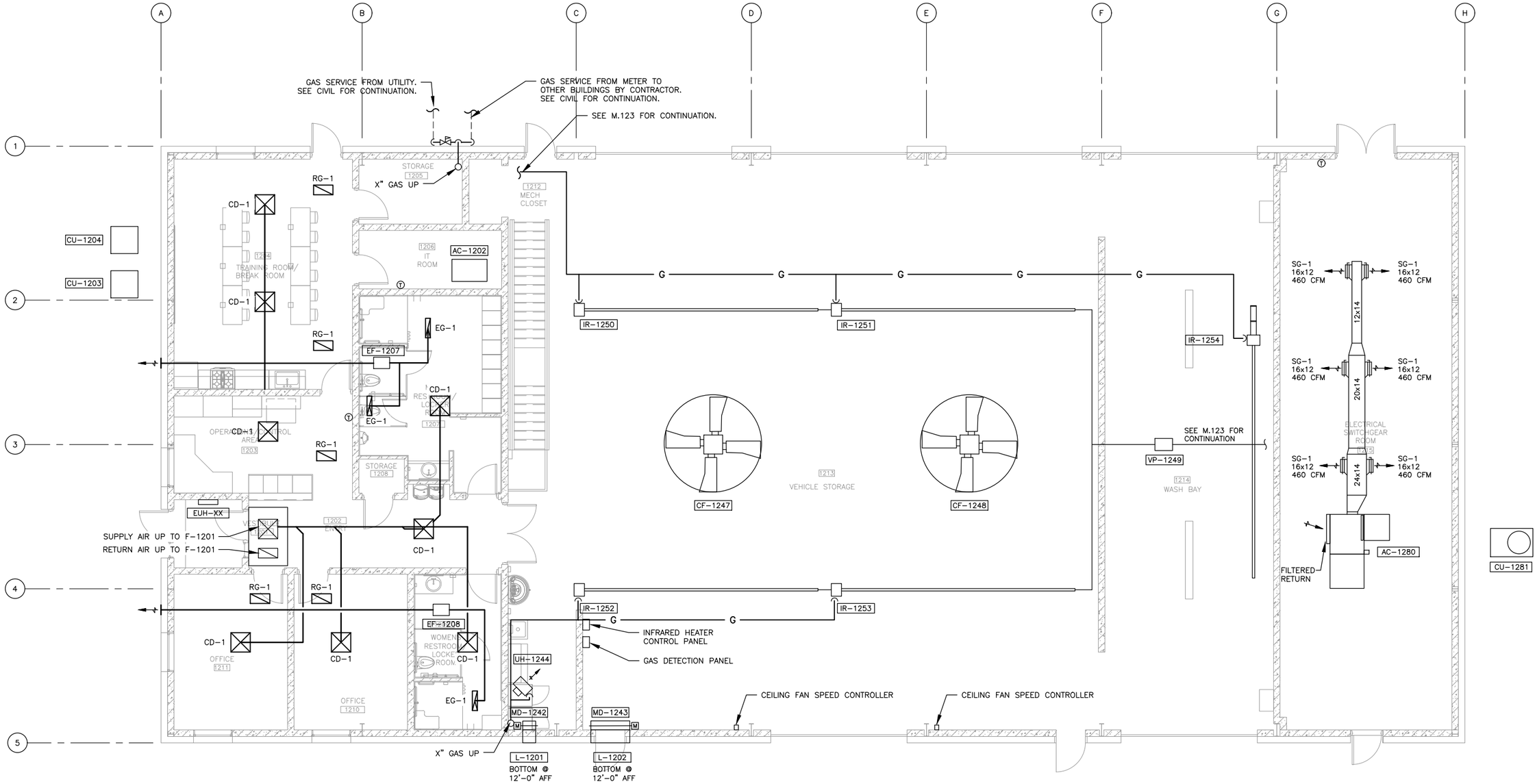
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
MECHANICAL
OPERATING LEVEL PLUMBING PLAN

SHEET NO.
M.121

Xrefs: xgt-1-dh01; XA-120-P01; XS-120-GRID; XS-120-P00; XMP-120-P01



1 HVAC FLOOR PLAN

SCALE: 3/16"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 — 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.122 OPERATING LEVEL HVAC PLAN.dwg			

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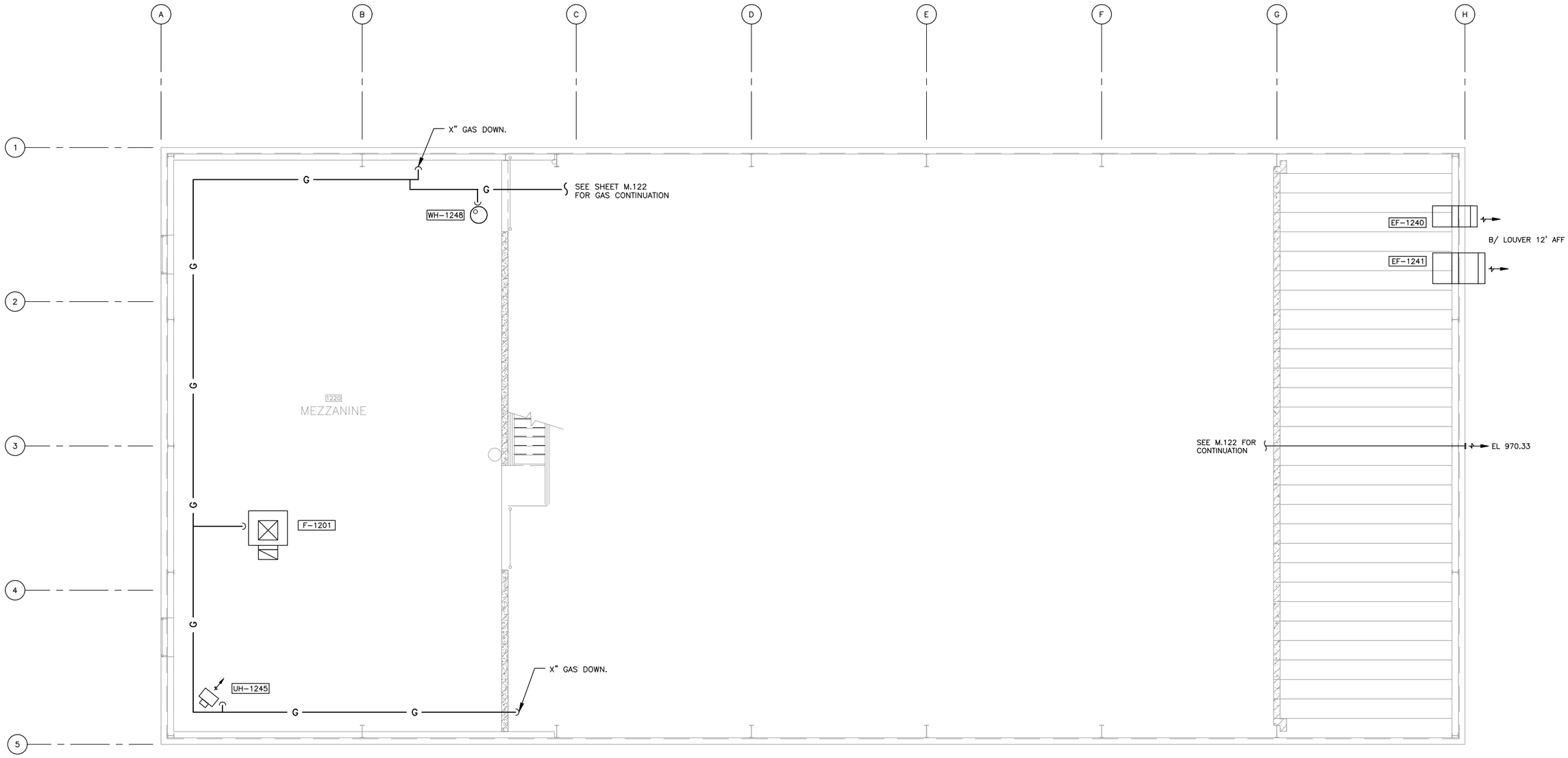
ADMINISTRATION – MAINTENANCE BUILDING – 120
MECHANICAL
OPERATING LEVEL HVAC PLAN

SHEET NO.
M.122

Xrefs: xgl-1-dh01; XS-120-GRID; XA-120-P01; XMH-120-P01



1 MEZZANINE HVAC FLOOR PLAN

SCALE: 3/16"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DAS	JOB NUMBER: 160473		
CAD DATE: 7/30/2020 8:58:03 AM			
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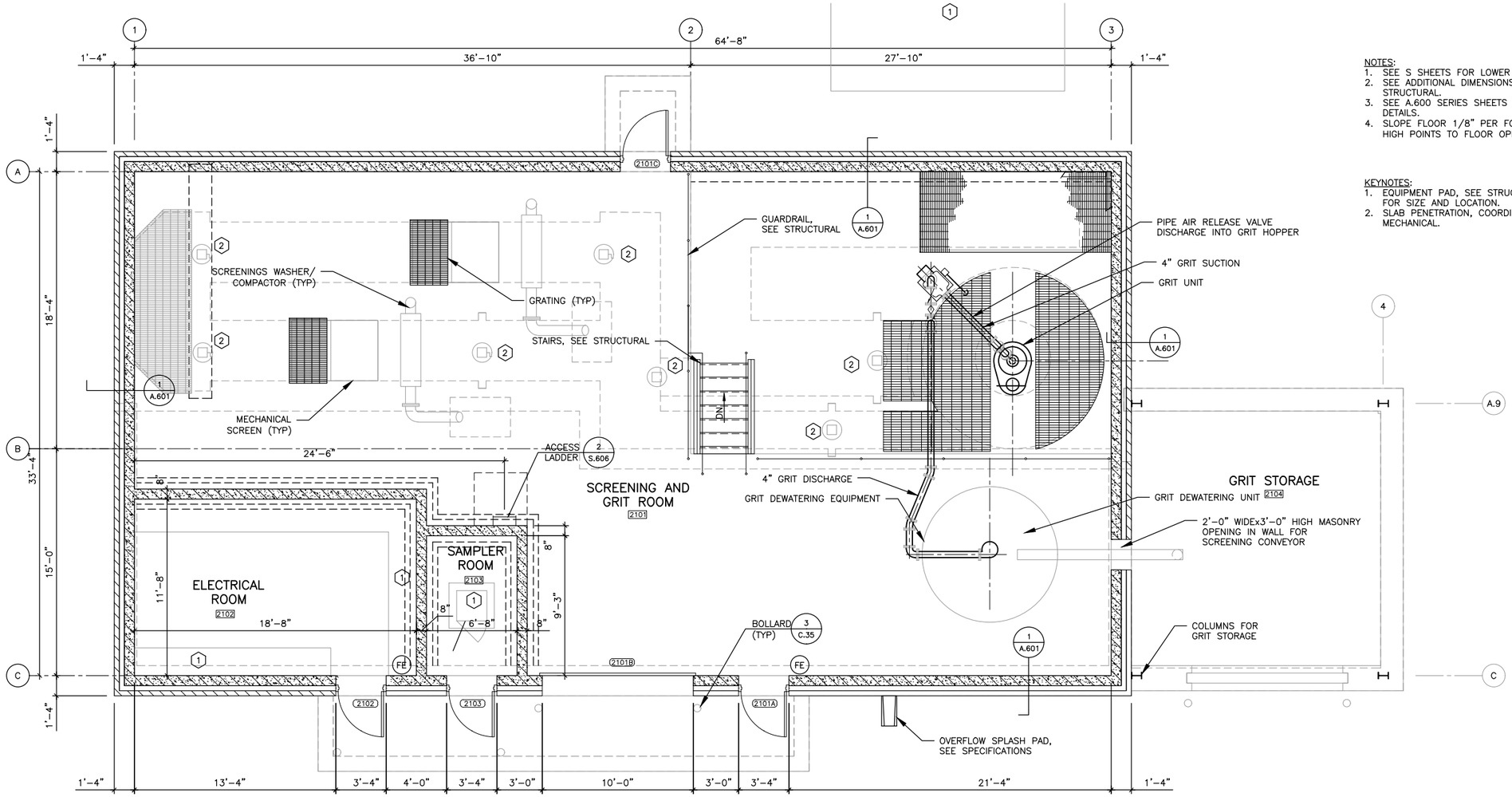
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

ADMINISTRATION – MAINTENANCE BUILDING – 120
MECHANICAL
UPPER LEVEL HVAC PLAN

SHEET NO.
M.123

Xrefs: xgl-1-dh01; XS-120-GRID; XA-120-MEZZ; XMH-120-R02



NOTES:
1. SEE S SHEETS FOR LOWER LEVEL.
2. SEE ADDITIONAL DIMENSIONS ON PROCESS AND STRUCTURAL.
3. SEE A.600 SERIES SHEETS FOR SCHEDULES AND DETAILS.
4. SLOPE FLOOR 1/8" PER FOOT FROM PERIMETERS AND HIGH POINTS TO FLOOR OPENINGS AND GRATING.

KEYNOTES:
1. EQUIPMENT PAD, SEE STRUCUTRAL AND MECHANICAL FOR SIZE AND LOCATION.
2. SLAB PENETRATION, COORDINATE WITH PROCESS AND MECHANICAL.

1 OPERATING LEVEL PLAN
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
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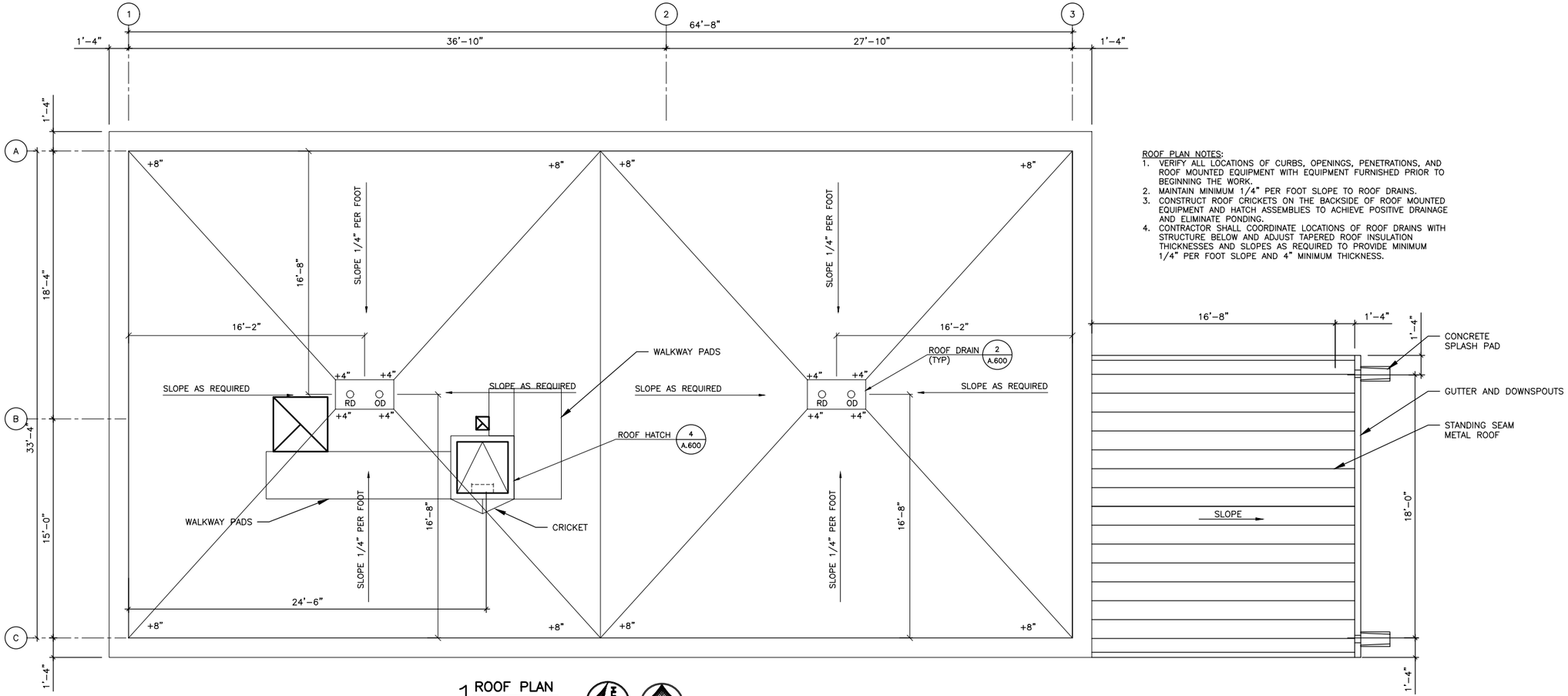
CITY OF NEVADA
NEVADA, IOWA

HEADWORKS BUILDING – 210
ARCHITECTURAL
OPERATING LEVEL PLAN

SHEET NO.
A.210

Xrefs: xgt-1-dh01; XS-210-GRID; XA-210-P01; XS-210-P00; XS-210-P01; XP-210-P01



ROOF PLAN NOTES:

1. VERIFY ALL LOCATIONS OF CURBS, OPENINGS, PENETRATIONS, AND ROOF MOUNTED EQUIPMENT WITH EQUIPMENT FURNISHED PRIOR TO BEGINNING THE WORK.
2. MAINTAIN MINIMUM 1/4" PER FOOT SLOPE TO ROOF DRAINS.
3. CONSTRUCT ROOF CRICKETS ON THE BACKSIDE OF ROOF MOUNTED EQUIPMENT AND HATCH ASSEMBLIES TO ACHIEVE POSITIVE DRAINAGE AND ELIMINATE PONDING.
4. CONTRACTOR SHALL COORDINATE LOCATIONS OF ROOF DRAINS WITH STRUCTURE BELOW AND ADJUST TAPERED ROOF INSULATION THICKNESSES AND SLOPES AS REQUIRED TO PROVIDE MINIMUM 1/4" PER FOOT SLOPE AND 4" MINIMUM THICKNESS.

1 ROOF PLAN
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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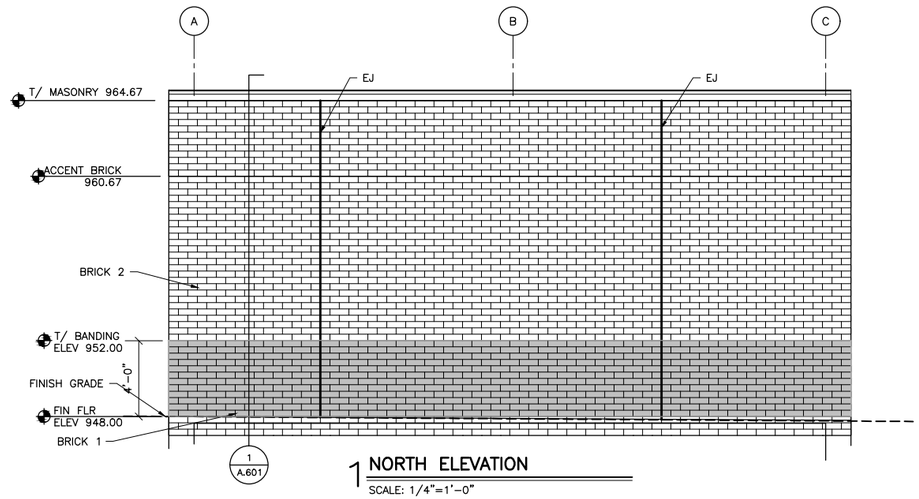
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

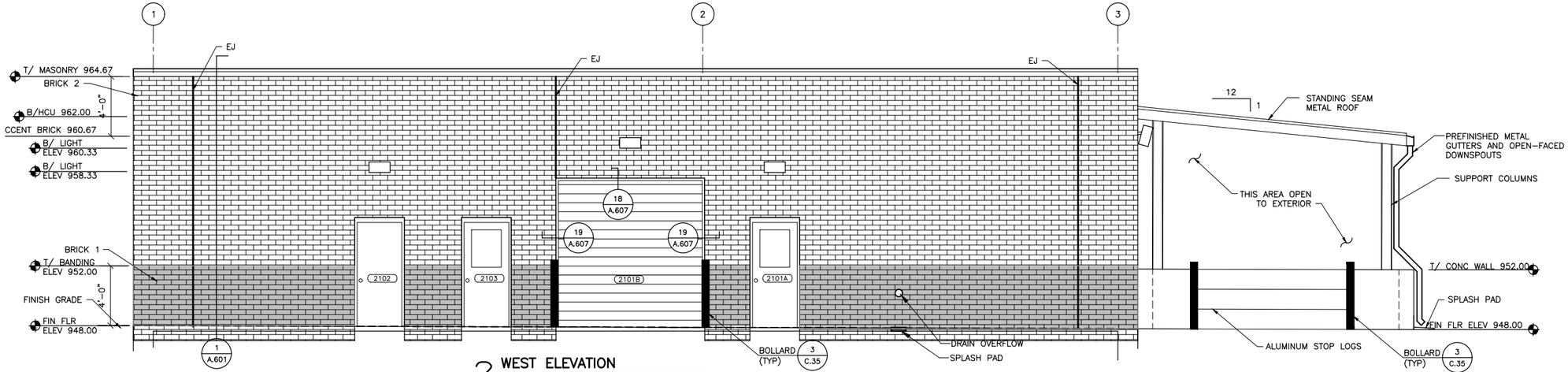
HEADWORKS BUILDING – 210
ARCHITECTURAL
ROOF PLAN

SHEET NO.
A.211

Xrefs: xgl-1-dh01; XS-210-GRID; XA-210-P02 ROOF PLAN



1 NORTH ELEVATION
SCALE: 1/4"=1'-0"



2 WEST ELEVATION
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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NO.	DATE	BY	REVISION DESCRIPTION

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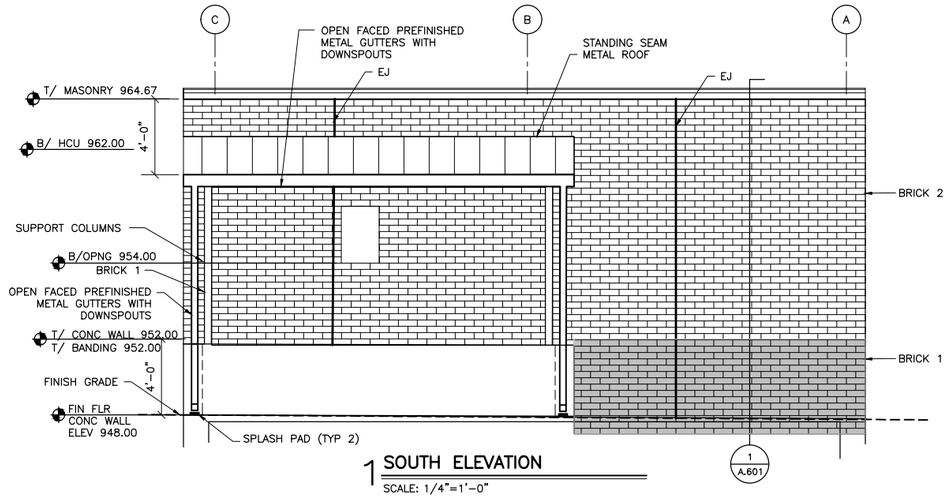
CITY OF NEVADA
NEVADA, IOWA

HEADWORKS BUILDING – 210
ARCHITECTURAL
EXTERIOR ELEVATIONS

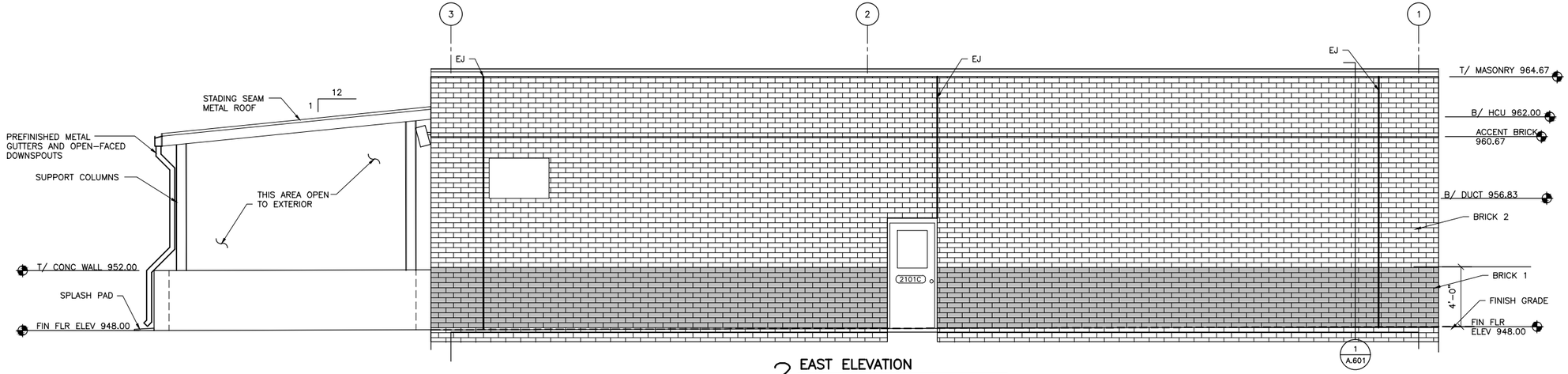
SHEET NO.
A.212

Xrefs: xgt-1-dh01; XA-210-E01



1 SOUTH ELEVATION

SCALE: 1/4"=1'-0"



2 EAST ELEVATION

SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.213 EXTERIOR ELEVATIONS.dwg			

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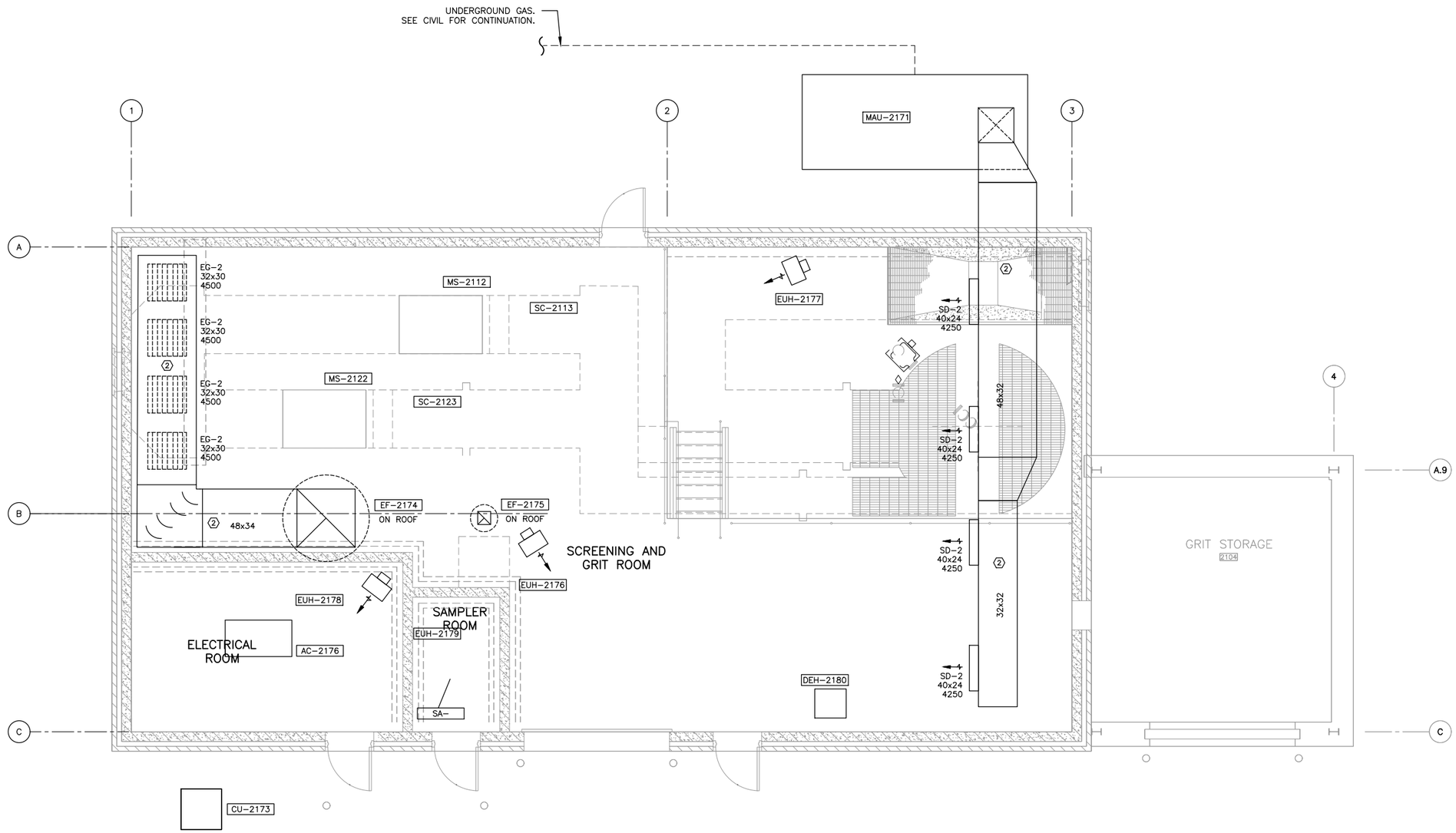
CITY OF NEVADA
NEVADA, IOWA

HEADWORKS BUILDING – 210
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.213

Xrefs: xgt-1-dh01; XA-210-E01



1 HVAC PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES:

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION, DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. SUPPLY AND EXHAUST DUCTWORK SHALL BE STAINLESS STEEL.
3. SUPPLY AND EXHAUST DUCTWORK SHALL BE GALVANIZED STEEL

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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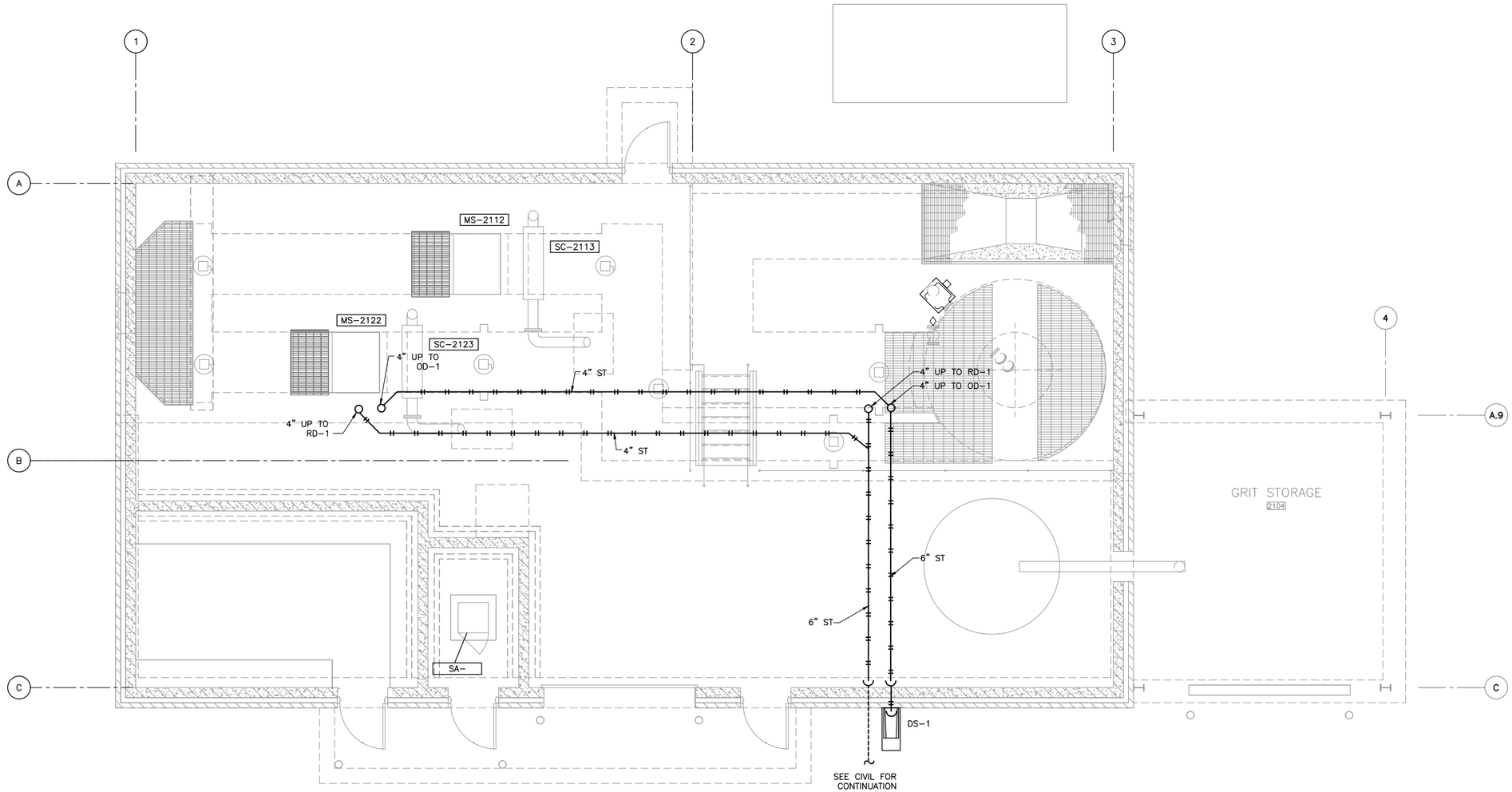
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

HEADWORKS BUILDING – 210
MECHANICAL
HVAC PLAN

SHEET NO.
M.210

Xrefs: xgt-1-dh01; XS-210-P01; XA-210-P01; XP-210-P01; XS-210-P00; XS-210-GRID; XMH-210-P01



1 OPERATING LEVEL PLUMBING PLAN

SCALE: 1/4"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: DAS	JOB NUMBER: 160473	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD DATE: 8/1/2020 1:53:42 PM			
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NO.	DATE	BY	REVISION DESCRIPTION

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NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

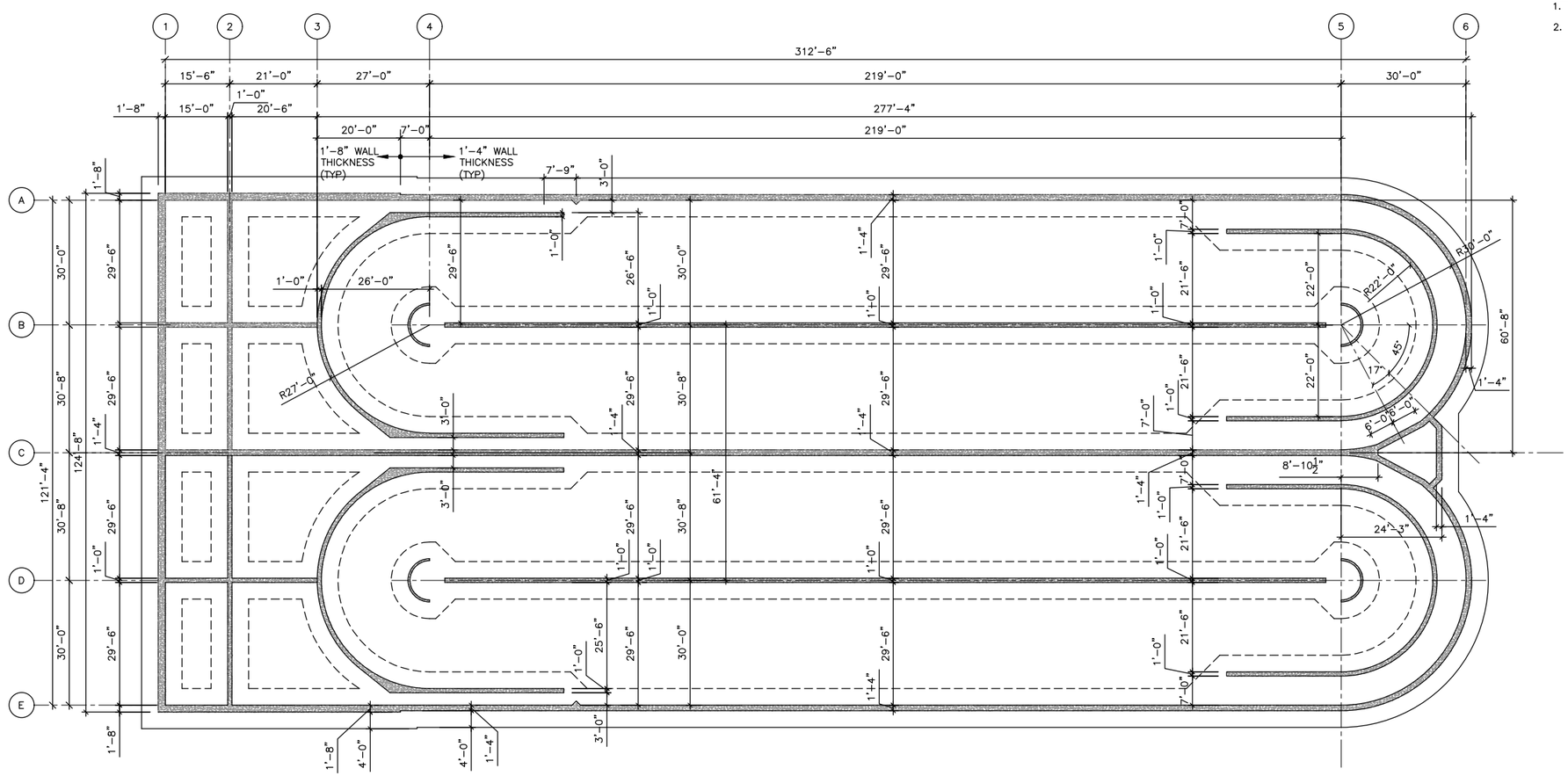
HEADWORKS BUILDING – 210
MECHANICAL
OPERATING LEVEL PLUMBING PLAN

SHEET NO.
M.211

Xrefs: xgl-1-dh01; XS-210-P01; XA-210-P01; XP-210-P01; XS-210-P00; XS-210-GRID; XMH-210-P00

GENERAL NOTES:
1. SEE SHEET G.07 FOR GENERAL NOTES.
2. SUB-DRAINS ARE REQUIRED UNDER AND AROUND FOUNDATIONS. DUE TO POTENTIAL FOR FREEZING TO OCCUR WITH OXIDATION DITCH EMPTY, SUBDRAINS SHALL BE AT FROST DEPTH BELOW TANK SLAB. MINIMUM OF 8" FDGGF BELOW FOUNDATION WITH 2'-8" FDGGF AT SUB-DRAINS. SEE SUB-DRAINS SHEET C.14.

KEYNOTES:
1. INDICATES THICKENED BASE SLAB (TYP). SEE SECTIONS.
2. WALL & BASE BARS CIRCUMFERENTIAL & RADIAL LAPPED WITH SLAB BARS IN GRID.



1 FOUNDATION PLAN
SCALE: 1/16"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: GPB	JOB NUMBER: 160473		
CAD DATE: 8/2/2020 7:56:41 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\S\S.320 FOUNDATION PLAN.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

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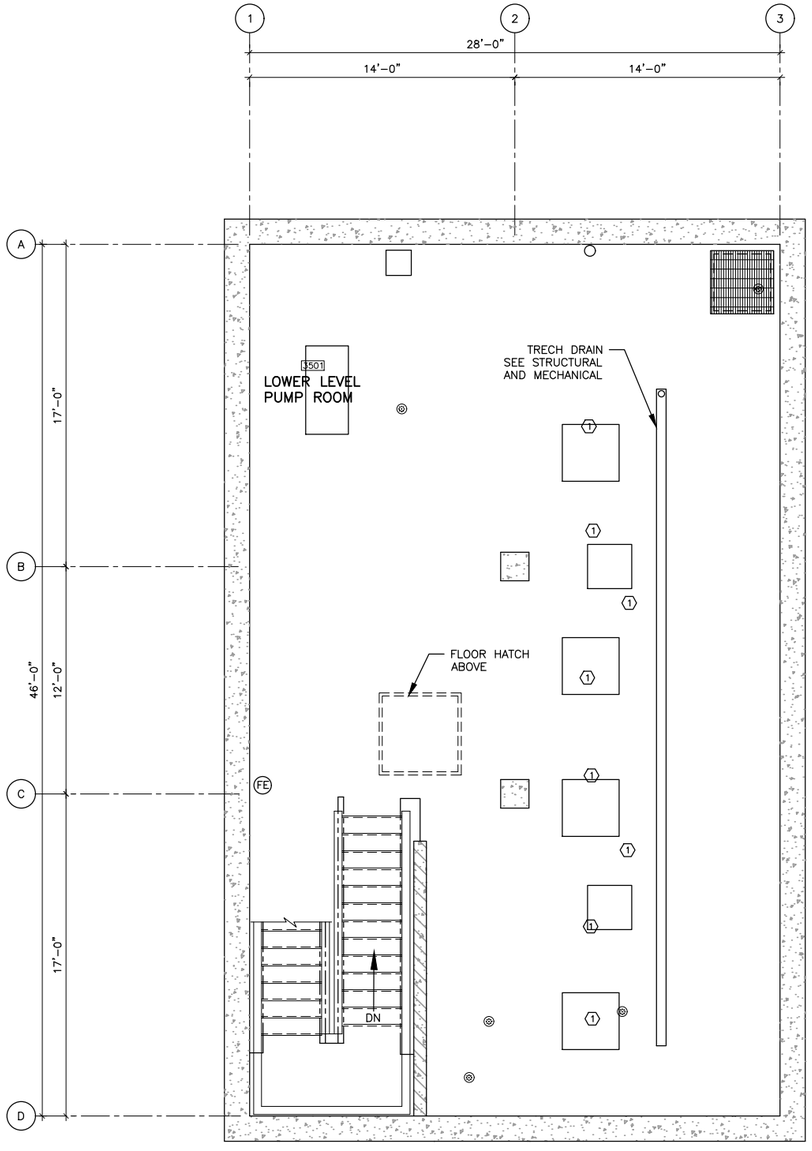
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

OXIDATION DITCHES – 320
STRUCTURAL
FOUNDATION PLAN

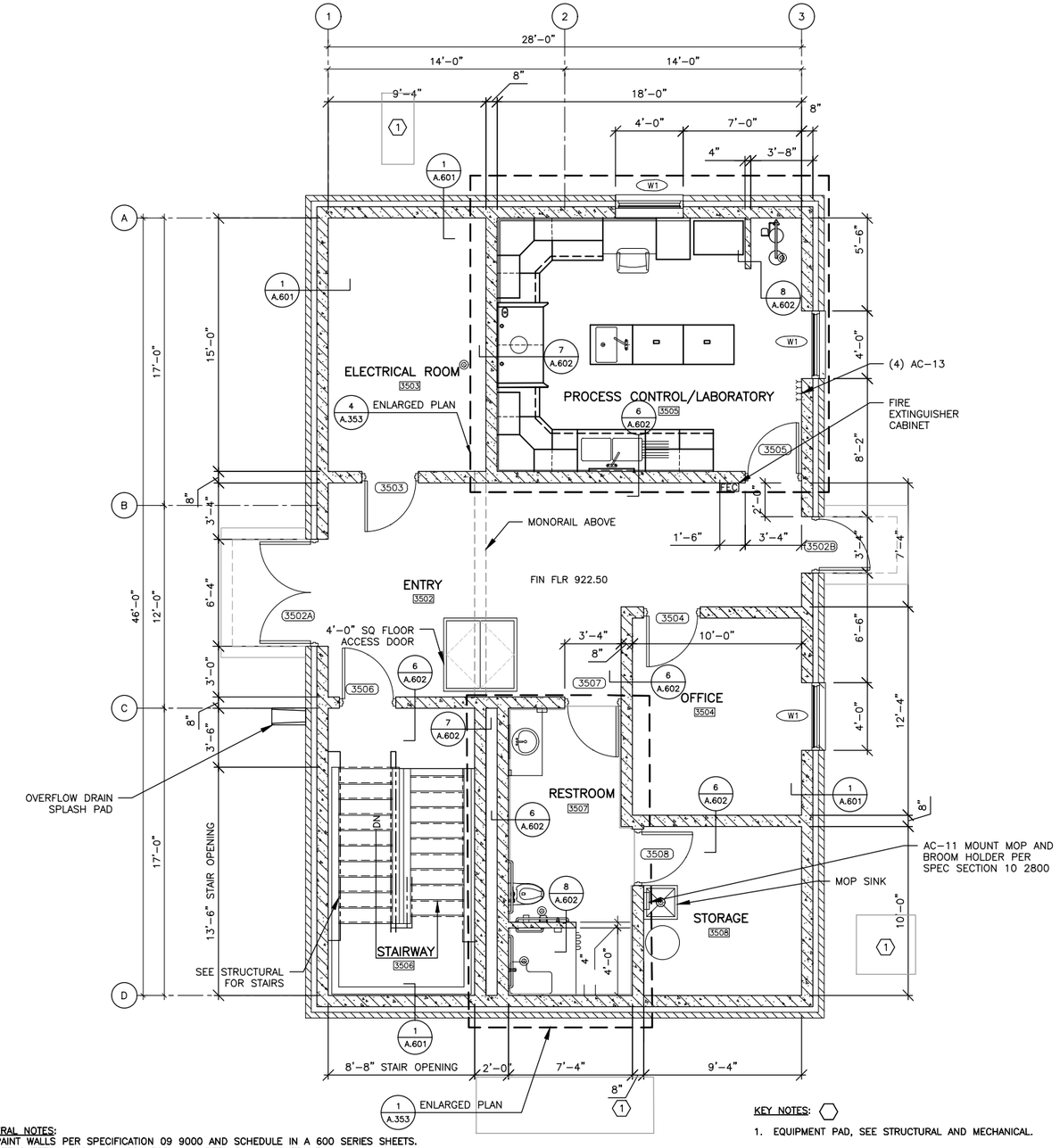
SHEET NO.
S.320

Xrefs: xgl-1-dh01; XS-320-P00; xs-320-grid



1 LOWER LEVEL PLAN

SCALE: 1/4"=1'-0"



2 OPERATING LEVEL PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:
1. PAINT WALLS PER SPECIFICATION 09 9000 AND SCHEDULE IN A 600 SERIES SHEETS.
2. SEE SHEETS A.602 AND A.604 FOR WALL DETAILS AND SCHEDULE.
3. SEE A.600 SERIES SHEETS FOR ARCHITECTURAL SCHEDULES AND DETAILS.
4. PROVIDE RESILIENT BASE PER SPEC & ROOM FINISH SCHEDULE.

KEY NOTES:
1. EQUIPMENT PAD, SEE STRUCTURAL AND MECHANICAL.

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
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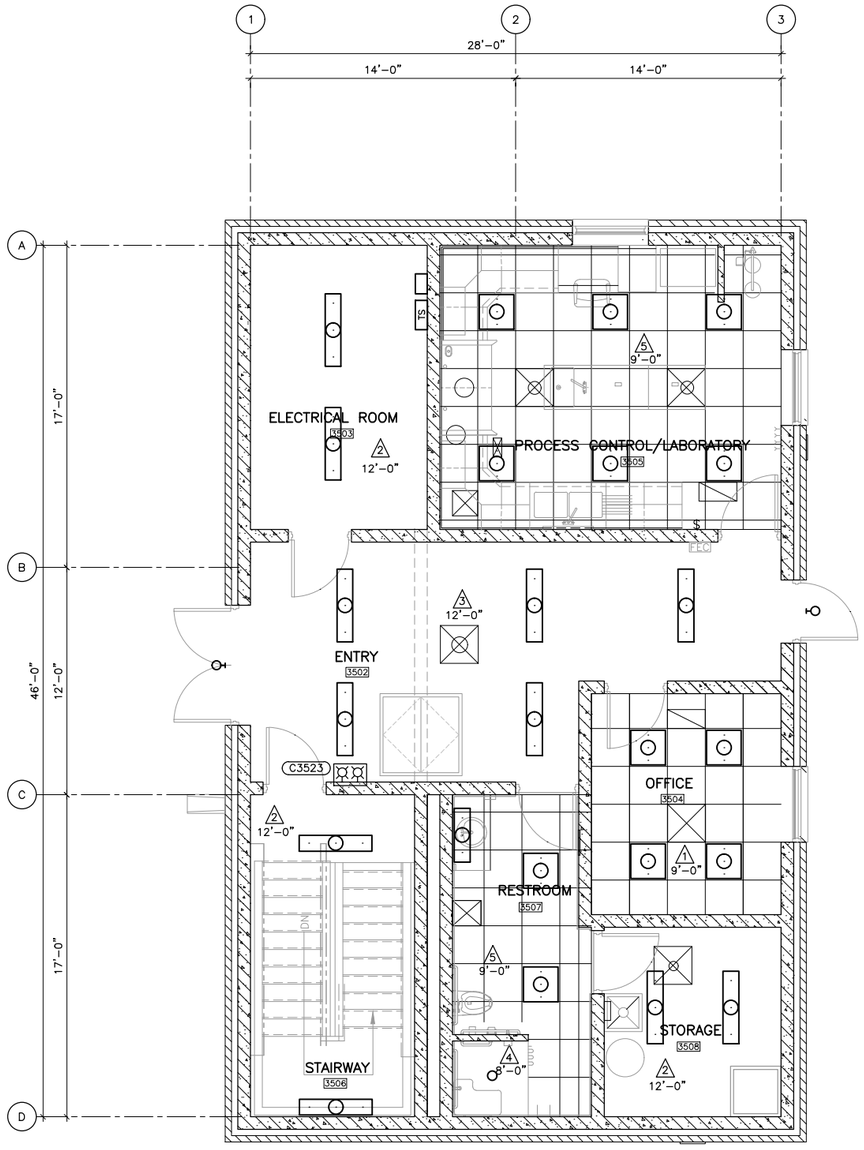
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
ARCHITECTURAL
OPERATING LEVEL PLAN

SHEET NO.
A.350

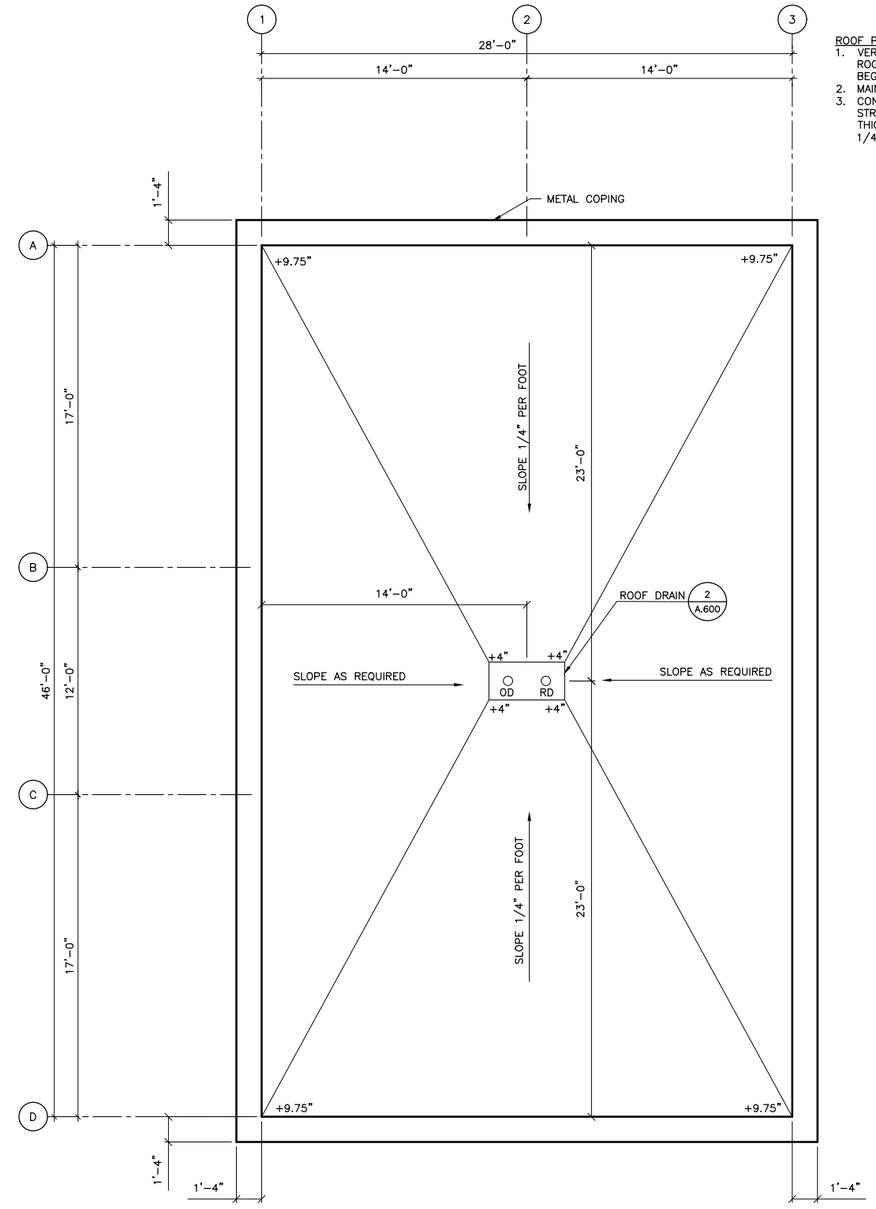
Xrefs: xgl-1-dh01; XA-350-P01; XS-350-GRID; XS-350-P00; XS-350-P01



LEGEND:

1. ACT-1 AS SPECIFIED
2. EXPOSED STRUCTURE
3. IN 3502 PAINT EXPOSED STRUCTURAL MEMBERS, CONDUITS AND CONC ABOVE.
4. MOISTURE RESISTANT GYPSUM BOARD PROVIDE BULKHEAD AT JUNCTION WITH ACT
5. ACT-2 AS SPECIFIED

1 REFLECTED CEILING PLAN
SCALE: 1/4"=1'-0"



ROOF PLAN NOTES:

1. VERIFY ALL LOCATIONS OF CURBS, OPENINGS, PENETRATIONS, AND ROOF MOUNTED EQUIPMENT WITH EQUIPMENT FURNISHED PRIOR TO BEGINNING THE WORK.
2. MAINTAIN MINIMUM 1/4" PER FOOT SLOPE TO ROOF DRAINS.
3. CONTRACTOR SHALL COORDINATE LOCATIONS OF ROOF DRAINS WITH STRUCTURE BELOW AND ADJUST TAPERED ROOF INSULATION THICKNESSES AND SLOPES AS REQUIRED TO PROVIDE MINIMUM 1/4" PER FOOT SLOPE AND 4" MINIMUM THICKNESS.

2 ROOF PLAN
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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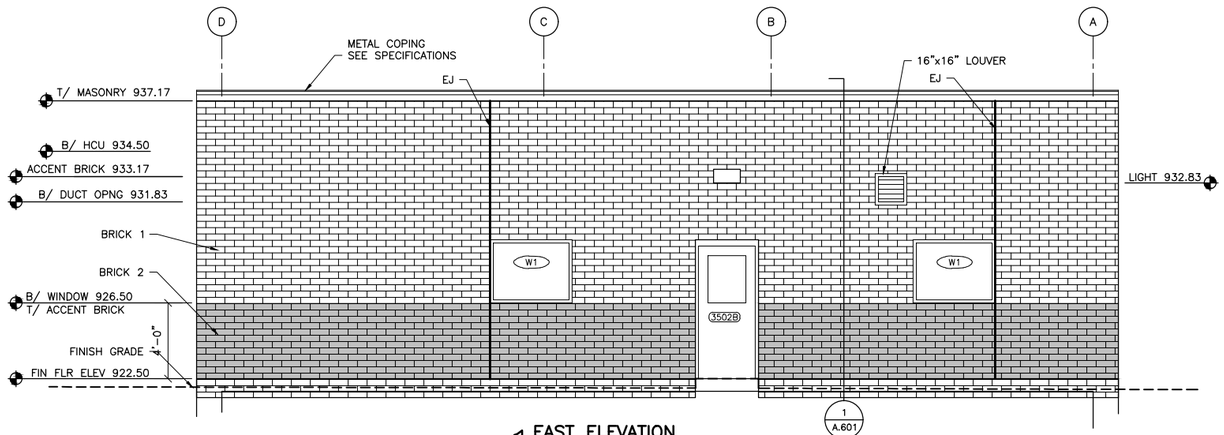
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
ARCHITECTURAL
REFLECTED CEILING AND ROOF PLAN

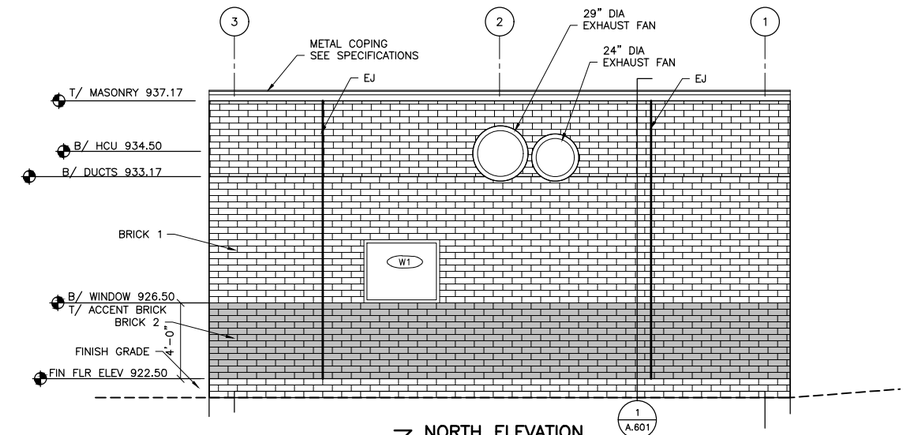
SHEET NO.
A.351

Xrefs: xgl-1-dh01; XA-350-P03-REF-CLG; XA-350-P01; XS-350-GRID; XA-350-P02; XMH-350-P01; XEL-350-P01



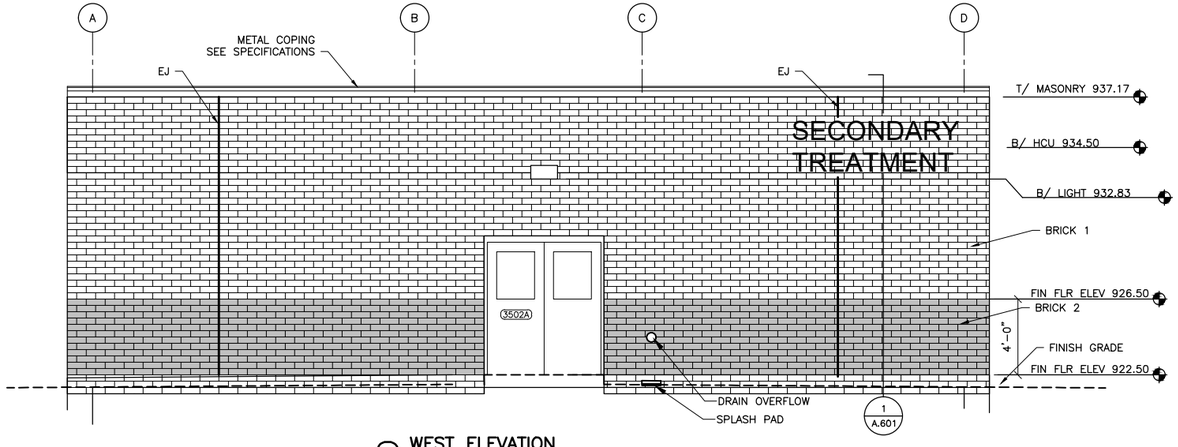
1 EAST ELEVATION

SCALE: 1/4"=1'-0"



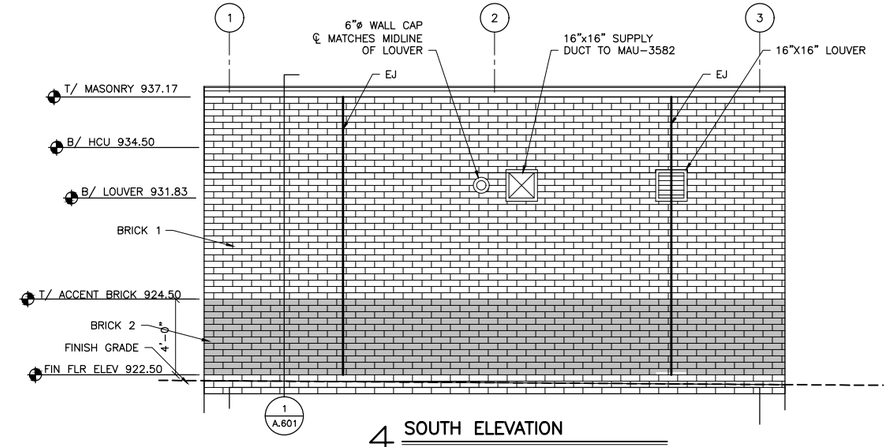
3 NORTH ELEVATION

SCALE: 1/4"=1'-0"



2 WEST ELEVATION

SCALE: 1/4"=1'-0"



4 SOUTH ELEVATION

SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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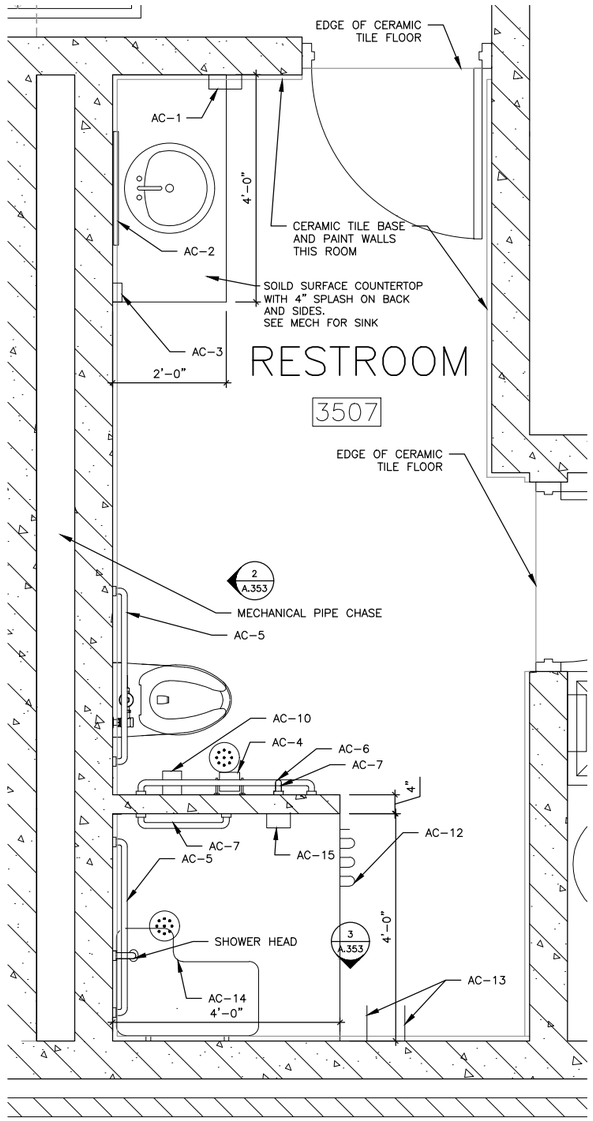
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
ARCHITECTURAL
EXTERIOR ELEVATIONS

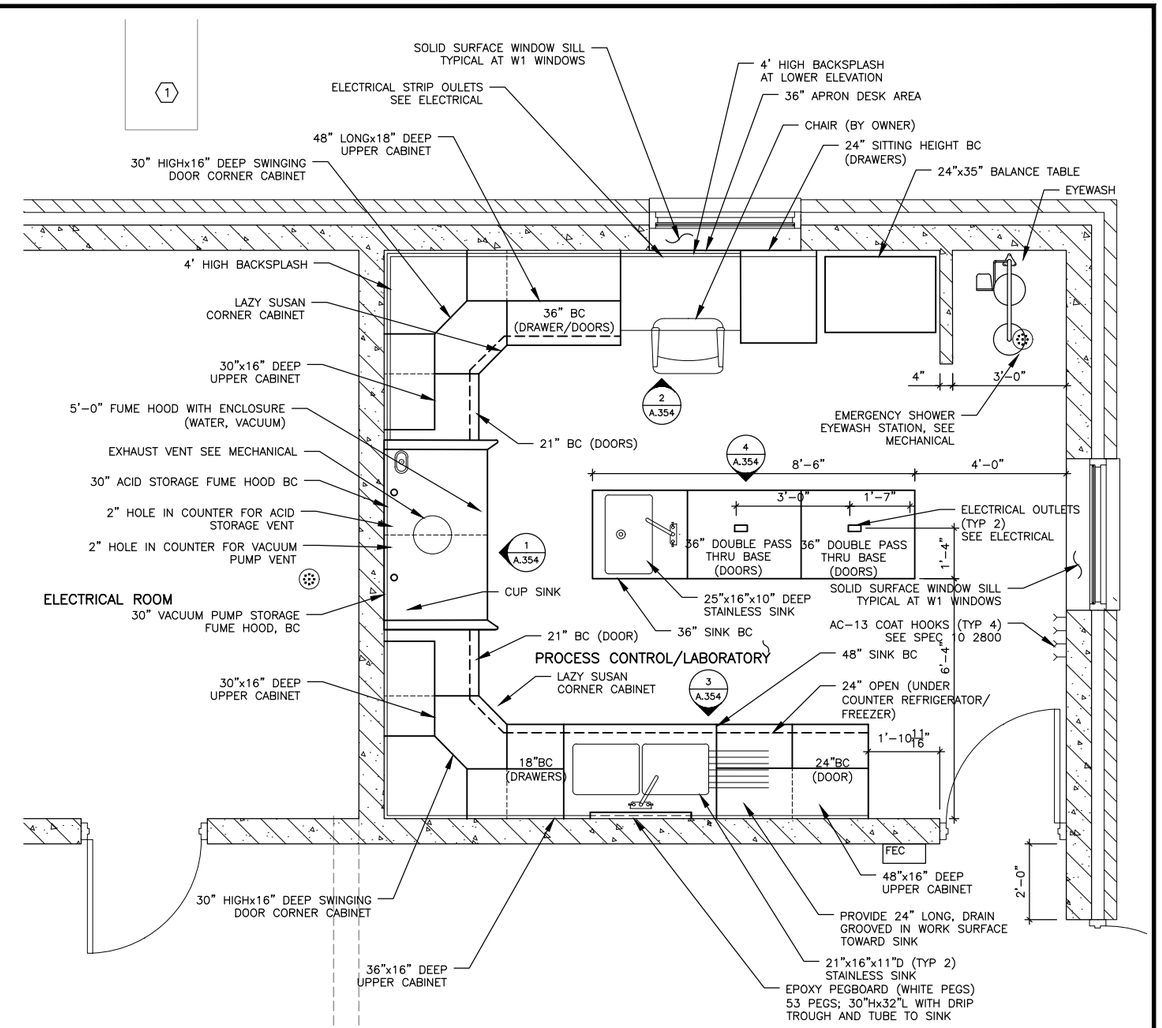
SHEET NO.
A.352

Xrefs: xgl-1-dh01; XA-350-E01



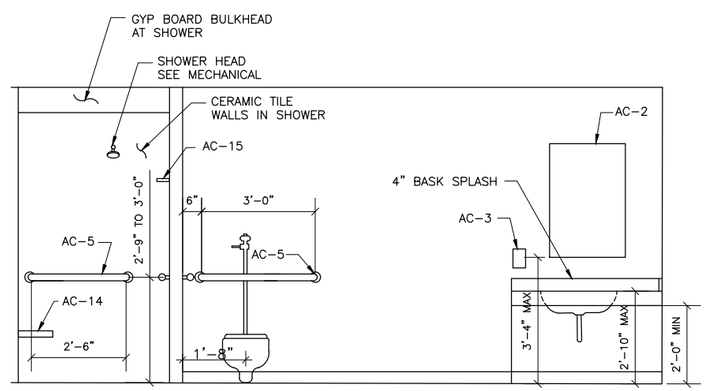
1 RESTROOM ENLARGED PLAN

SCALE: 3/4"=1'-0"



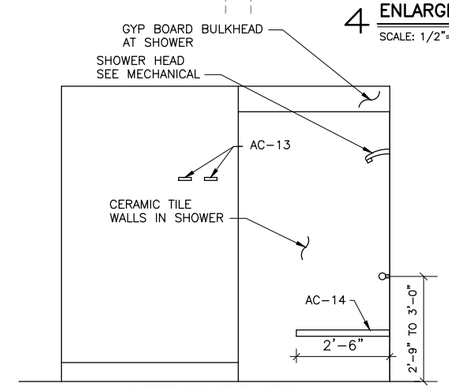
4 ENLARGED LABRATORY PLAN

SCALE: 1/2"=1'-0"



2 INTERIOR ELEVATION

SCALE: 1/2"=1'-0"



3 INTERIOR ELEVATION

SCALE: 1/2"=1'-0"

GENERAL NOTES:

1. REFER TO SPECIFICATION SECTION 11 5353 FOR LABORATORY FURNITURE AND EQUIPMENT.
2. CABINET REFERENCES ON ELEVATIONS ARE BASED ON KEWAUNEE SCIENTIFIC CORPORATION. CONTRACTOR TO PROVIDE KEWAUNEE OR EQUAL PER SPECIFICATIONS.
3. COAT FLOOR PER SPECIFICATION 09 9500. FLOORING COATING TO BE AN EPOXY, DECORATIVE QUARTZ FLOORING, TREMEC COLOR Q205 OR EQUAL. STAGE FLOOR COATING PRIOR TO NEW CABINET INSTALLATION.
4. PAINT WALLS PER SPECIFICATION 09 9000 AND SCHEDULE IN A SHEETS.
5. SINKS SHALL BE STAINLESS STEEL PER SPEC 22 4000.
6. COUNTER TOPS SHALL BE 1" THICK EPOXY PER SPECIFICATIONS. COUNTERTOPS SHALL HAVE MATINE EDGE EXCEPT AT SITTING HEIGHT DESK AREA.
7. CABINETS SHALL BE STEEL.
8. SAFETY SHOWER AND EYEWASH. REFER TO SPECIFICATION SECTION 22 4000.
9. SEE SHEET E.351 TO COORDINATE ELECTRICAL.
10. PROVIDE RESILIENT BASE PER SPEC & ROOM FINISH SCHEDULE.
11. COORDINATE WITH CABINET MANUFACTURER TO INCLUDE CABINETS IN ADMINISTRATION BUILDING (LAUNDRY AREA, OPERATIONS/CONTROL AREA, BREAK ROOM).

KEY NOTES:

1. EQUIPMENT PAD, SEE STRUCTURAL AND MECHANICAL.

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
APPROVED: DJH	JOB NUMBER: 160473	0 1"	
CAD DATE: 7/30/2020 2:25:42 PM		IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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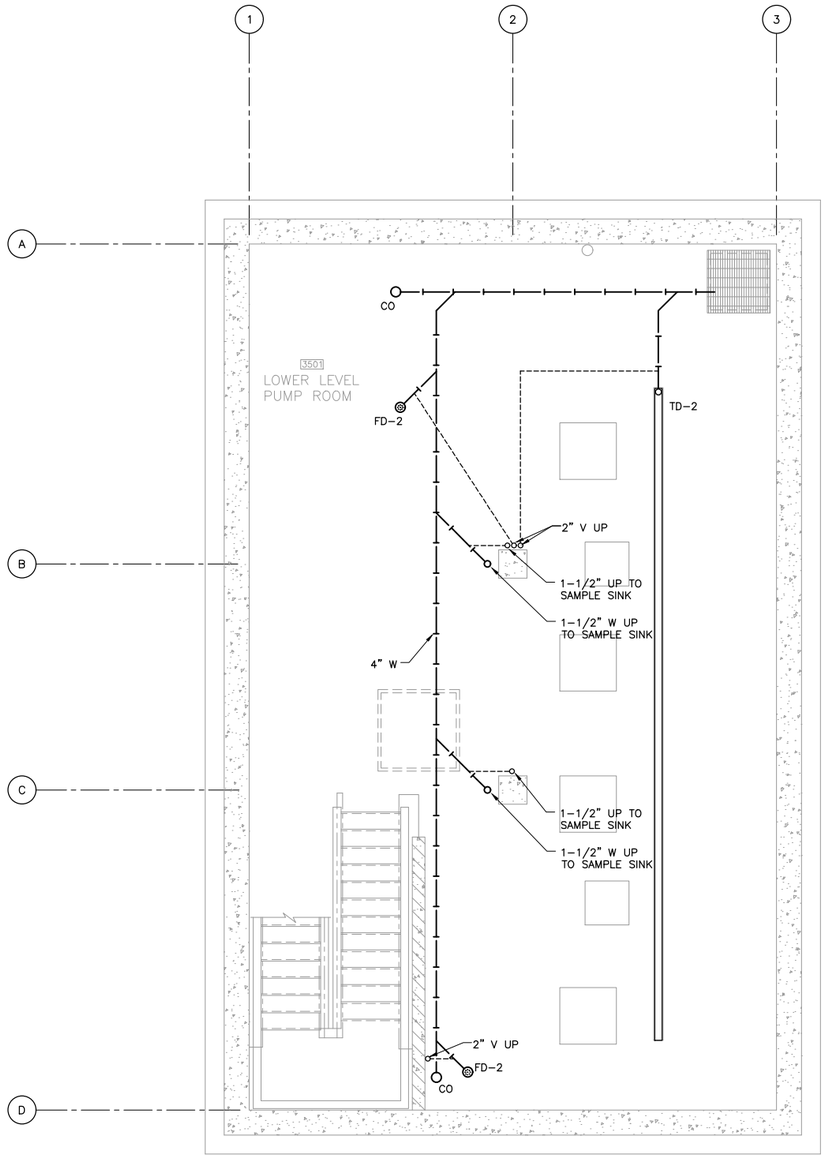
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
ARCHITECTURAL
RESTROOM AND LABORATORY ENLARGED PLANS

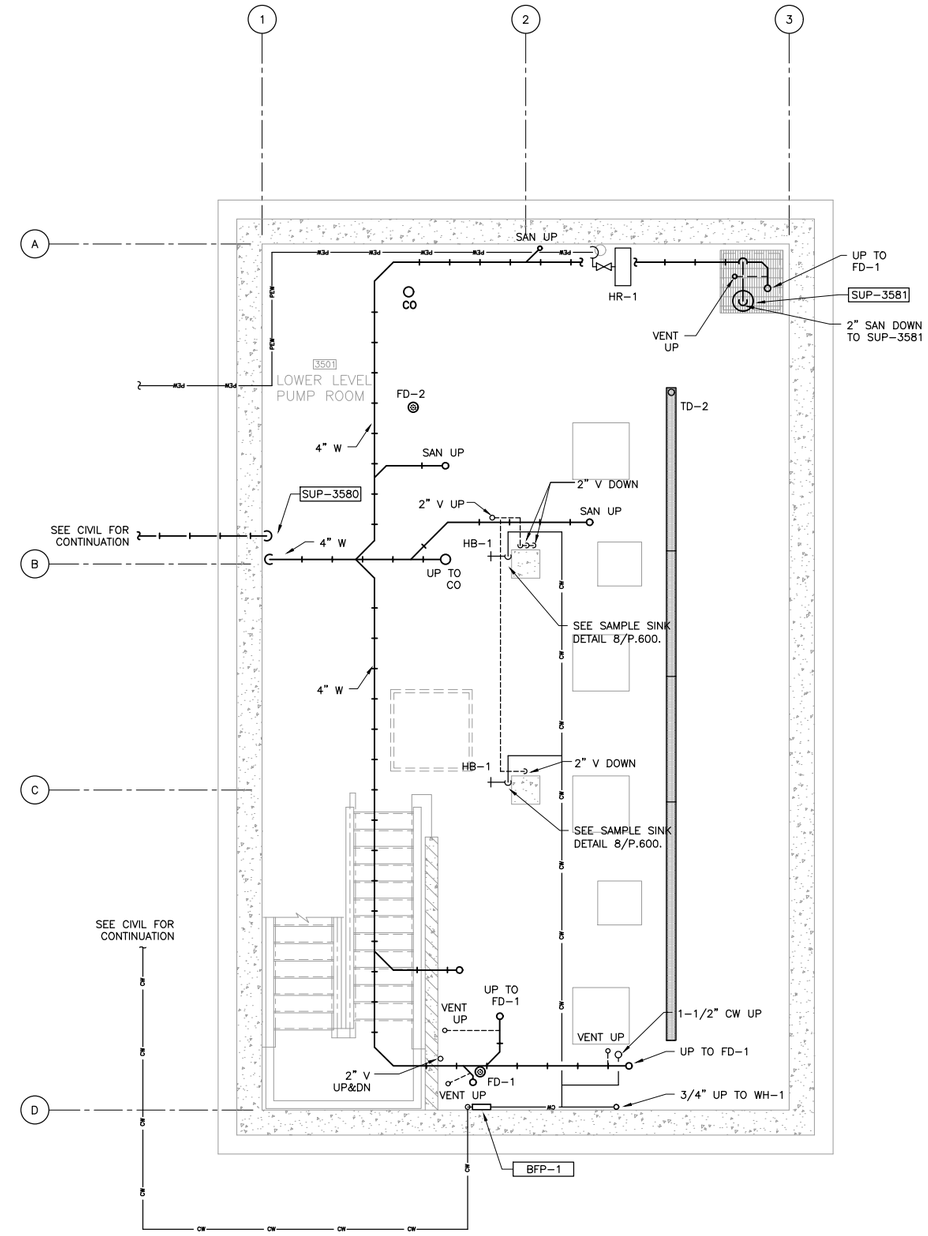
SHEET NO.
A.353

Xrefs: xgt-1-dh01; XA-350-P01; XS-350-GRID



1 UNDERFLOOR PIPING PLAN

SCALE: 1/4"=1'-0"



2 LOWER LEVEL PLUMBING PLAN

SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
APPROVED: DAS	JOB NUMBER: 160473	0 1"	
CAD DATE: 7/31/2020 10:53:18 AM		IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.350 UNDERFLOOR AND LOWER LEVEL PLUMBING PLAN.dwg			

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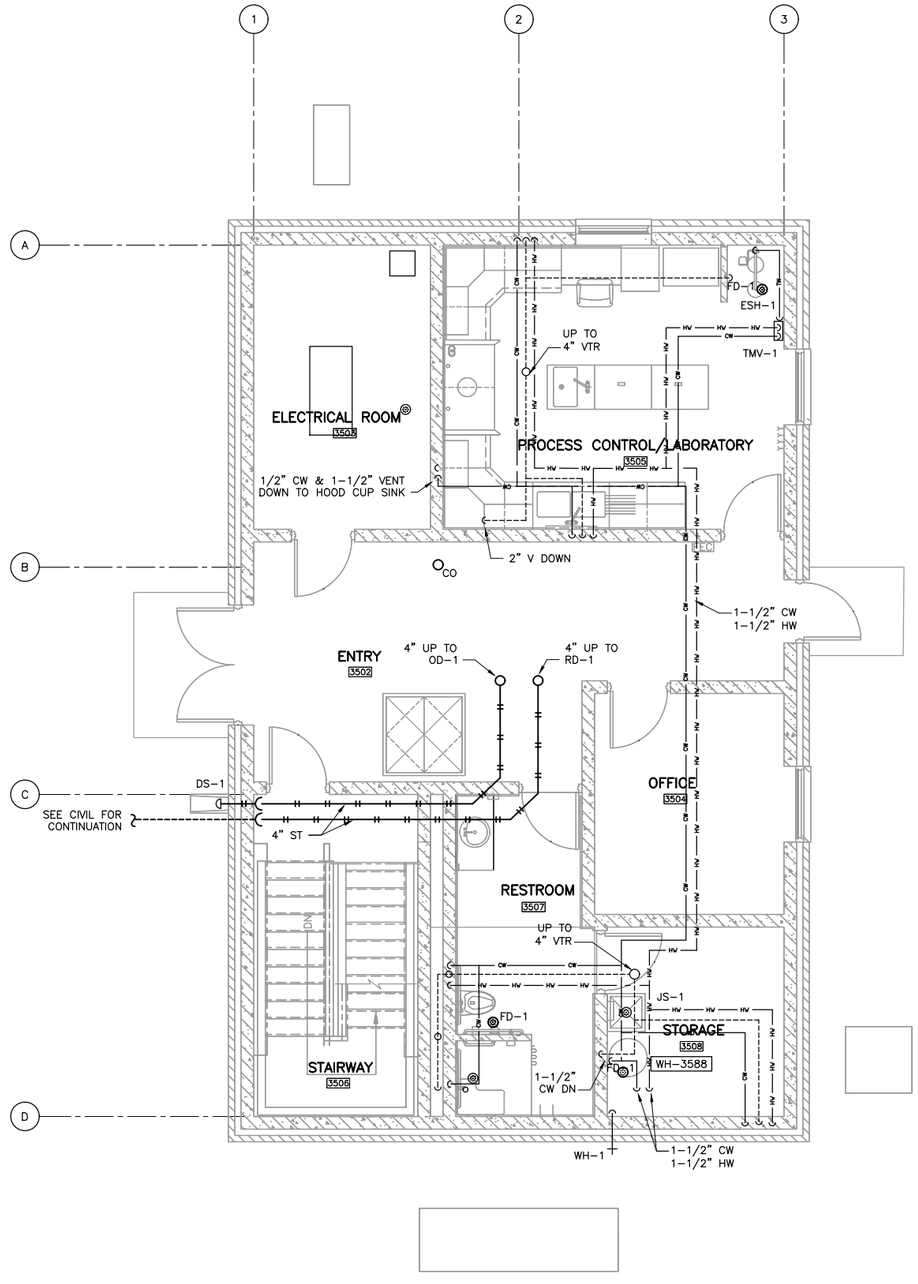
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
MECHANICAL
UNDERFLOOR AND LOWER LEVEL PLUMBING PLAN

SHEET NO.
M.350

Xrefs: xgt-1-dh01; XS-350-GRID; XS-350-P00; XMP-350-P00; XMP-350-P01



1 OPERATING LEVEL PIPING PLAN

SCALE: 1/4"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
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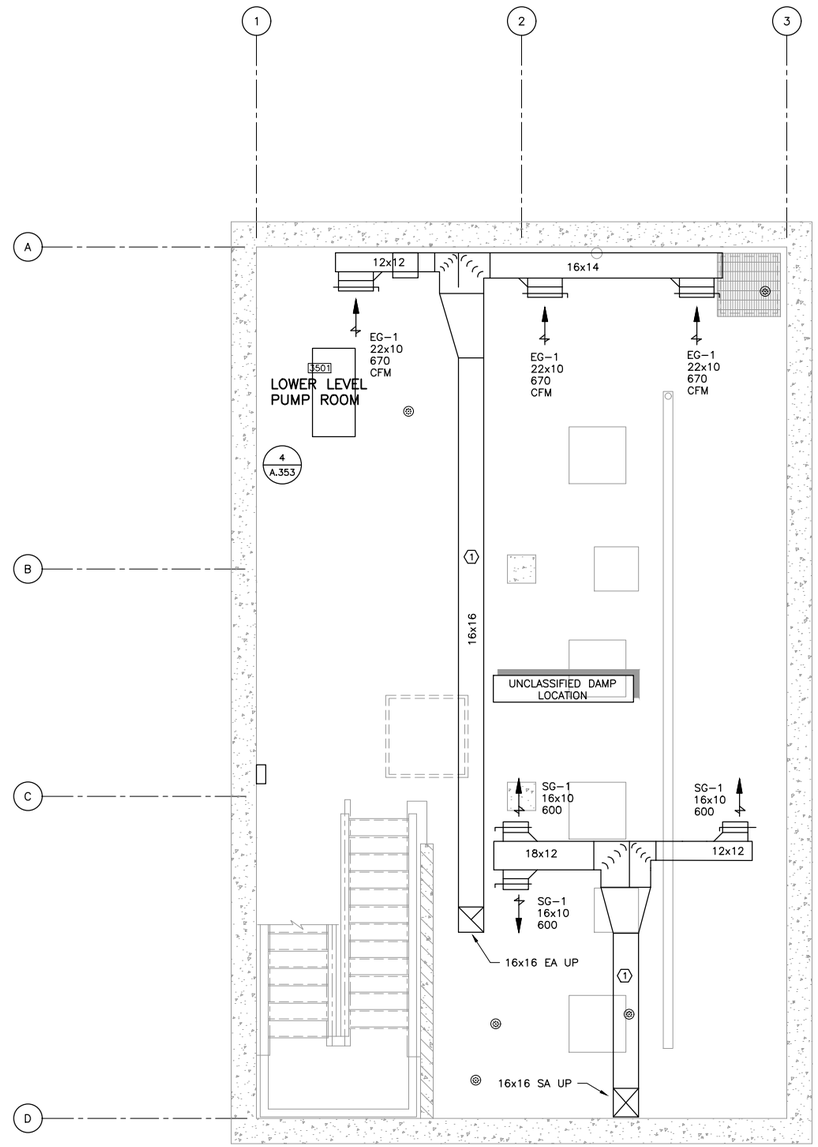
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT BUILDING – 350
MECHANICAL
OPERATING LEVEL PLUMBING PLAN

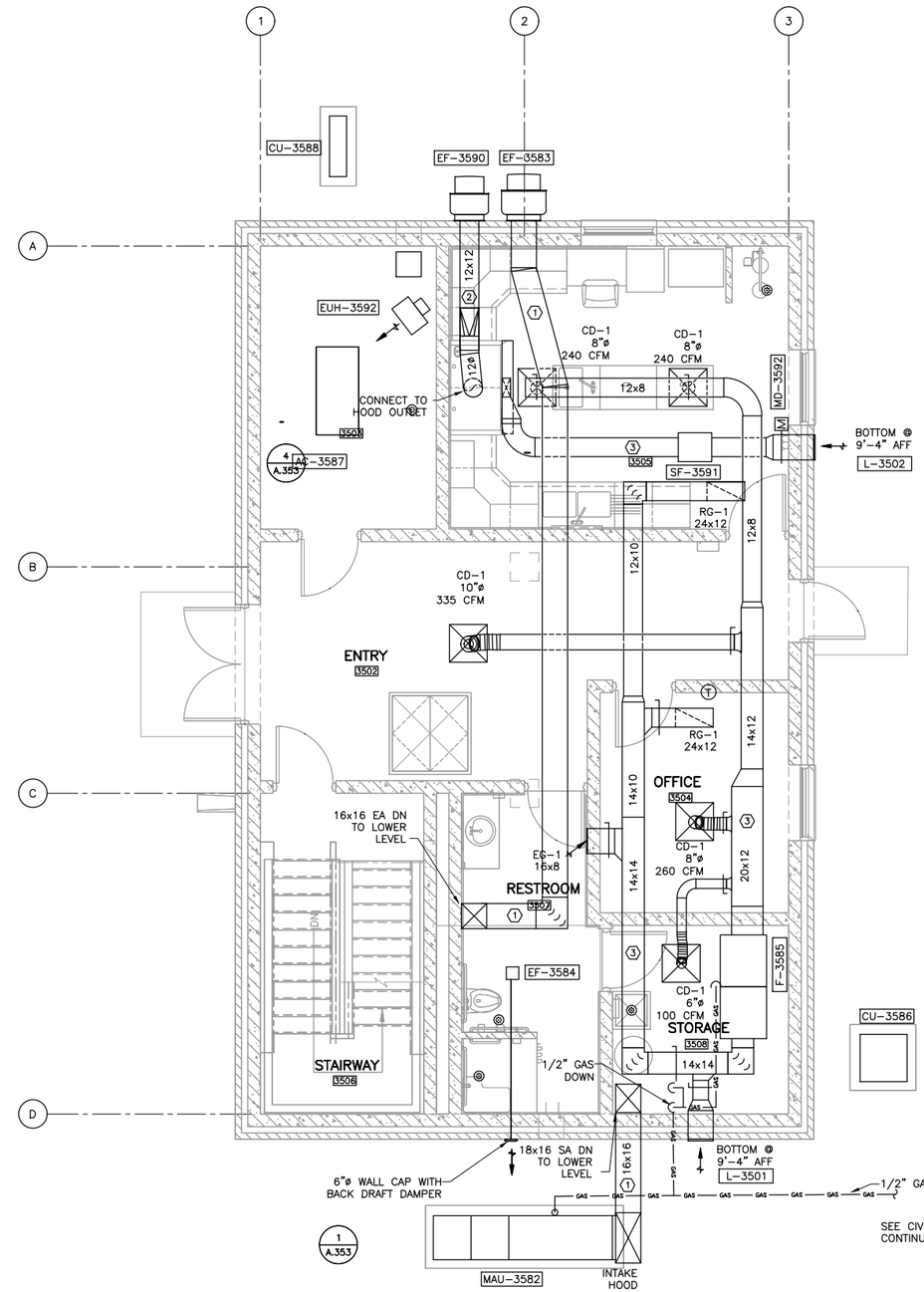
SHEET NO.
M.351

Xrefs: xgl-1-dh01; XS-350-GRID; XA-350-P01; XS-350-P01; XMP-350-P02



1 LOWER LEVEL HVAC PLAN

SCALE: 1/4"=1'-0"



2 OPERATING LEVEL HVAC PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES:

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION, DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. SUPPLY AND EXHAUST DUCTWORK SHALL BE STAINLESS STEEL.
3. SUPPLY AND EXHAUST DUCTWORK SHALL BE GALVANIZED STEEL

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.352 LOWER AND OPERATING LEVEL HVAC PLAN.dwg			

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NEVADA, IOWA

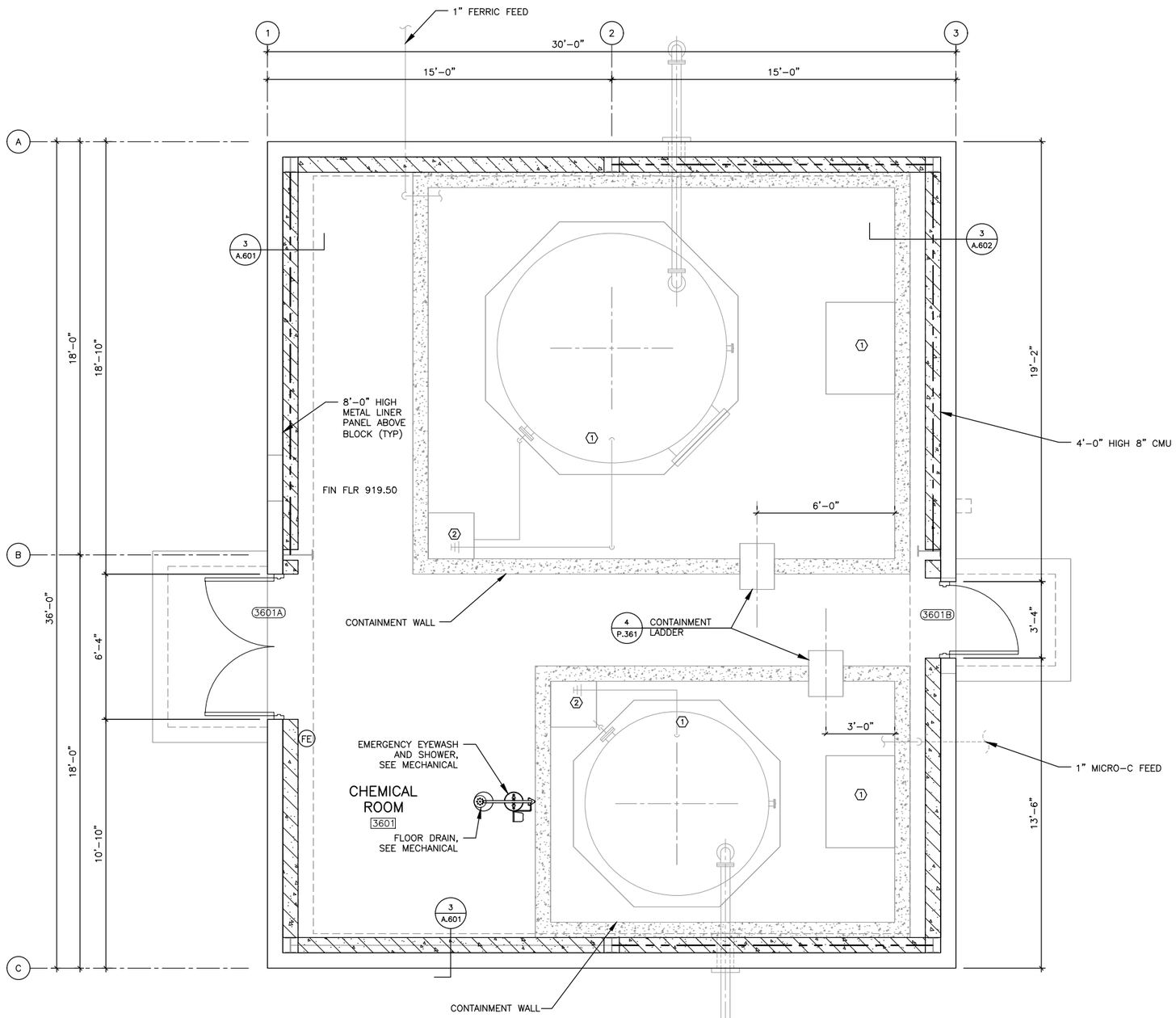
SECONDARY TREATMENT BUILDING – 350
MECHANICAL
LOWER AND OPERATING LEVEL HVAC PLAN

SHEET NO.
M.352

Xrefs: xgl-1-dtn01; XS-350-GRID; XS-350-P00; XMH-350-P00; XA-350-P01; XS-350-P01; XMH-350-P01

NOTES:
1. SEE A.600 SERIES SHEETS FOR SCHEDULES AND DETAILS.
2. CONCRETE INSIDE CONTAINMENT AREA, INCLUDING TOP OF EXPOSED CONTAINMENT WALLS SHALL RECEIVE VINYL ESTER LINING FOR CHEMICAL RESISTANCE.

KEYNOTES:
1. EQUIPMENT PAD, SEE STRUCUTRAL AND PROCESS.
2. SUMP AREA, SEE STRUCTURAL.



1 OPERATING LEVEL PLAN
SCALE: 3/8"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: DJH	JOB NUMBER: 160473	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.360 OPERATING LEVEL PLAN.dwg			

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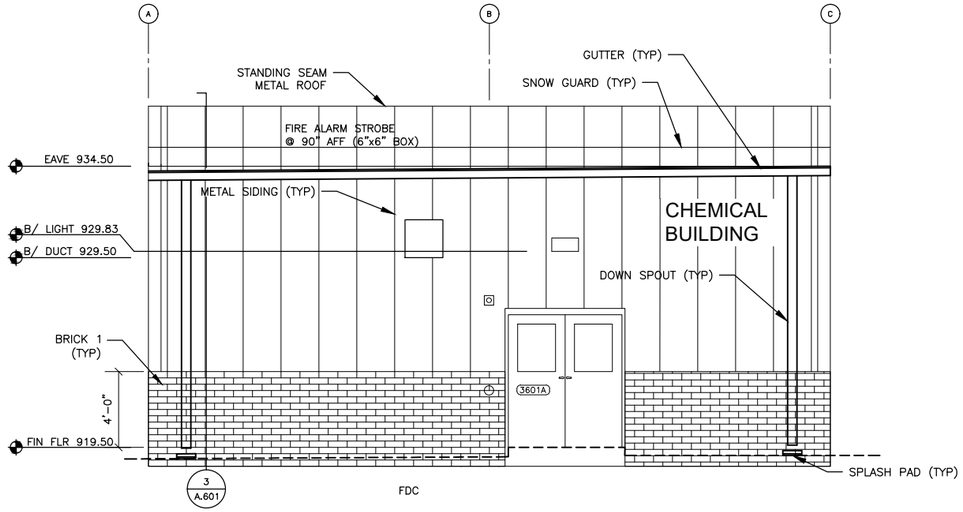
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT CHEMICAL STORAGE BUILDING – 360
ARCHITECTURAL
OPERATING LEVEL PLAN

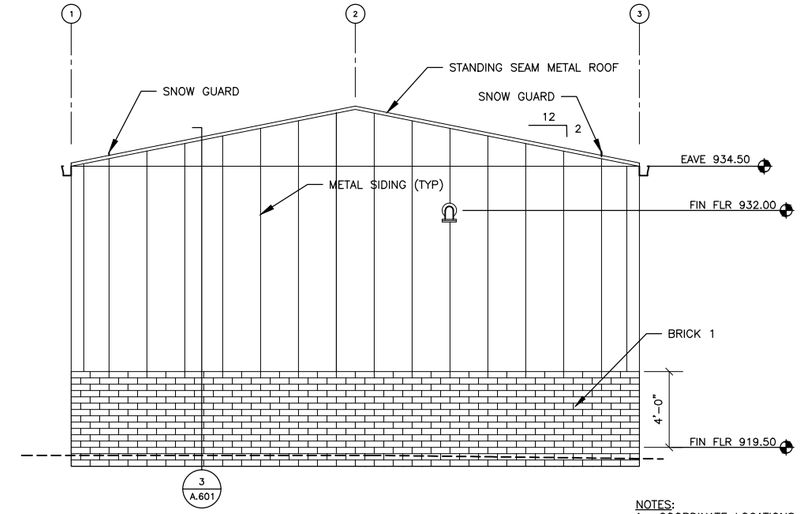
SHEET NO.
A.360

Xrefs: xgt-1-dh01; XS-360-P01; XA-360-P01; XP-360-P01; XS-360-GRID



1 WEST ELEVATION

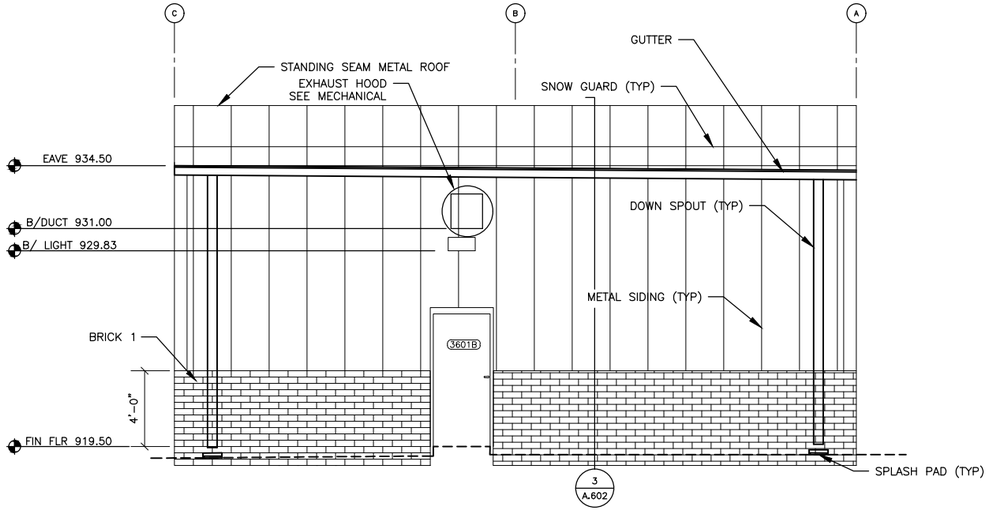
SCALE: 1/4"=1-0"



2 SOUTH ELEVATION

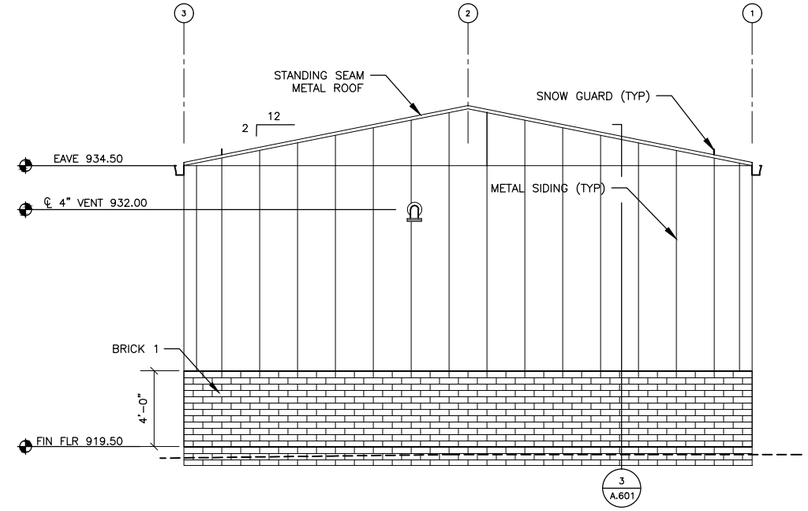
SCALE: 1/4"=1-0"

NOTES:
1. COORDINATE LOCATIONS OF HEAT TAPE ELECTRICAL WITH DOWNSPOUT LOCATIONS (TYP).



3 EAST ELEVATION

SCALE: 1/4"=1-0"



4 NORTH ELEVATION

SCALE: 1/4"=1-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/30/2020 12:59:30 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.361 EXTERIOR ELEVATIONS.dwg			

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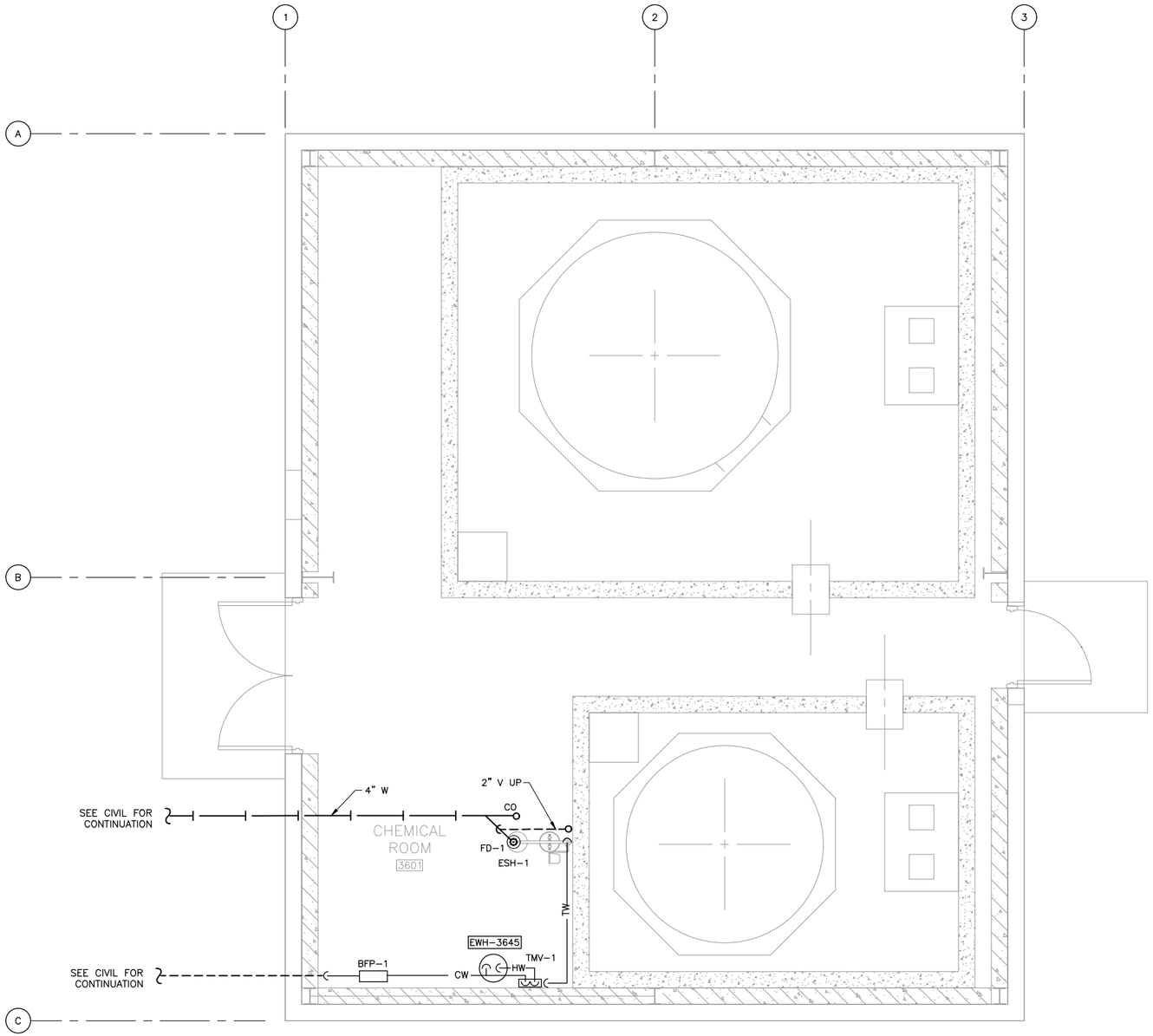
NEVADA, IOWA

SECONDARY TREATMENT CHEMICAL STORAGE BUILDING – 360
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.361

Xrefs: xgl-1-dh01; XA-360-E01 EXT ELEV



1 OPERATING LEVEL PLUMBING PLAN

SCALE: 3/8"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: DAS	JOB NUMBER: 160473	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD DATE: 7/31/2020 10:56:07 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.360 OPERATING LEVEL PLUMBING PLAN.dwg			

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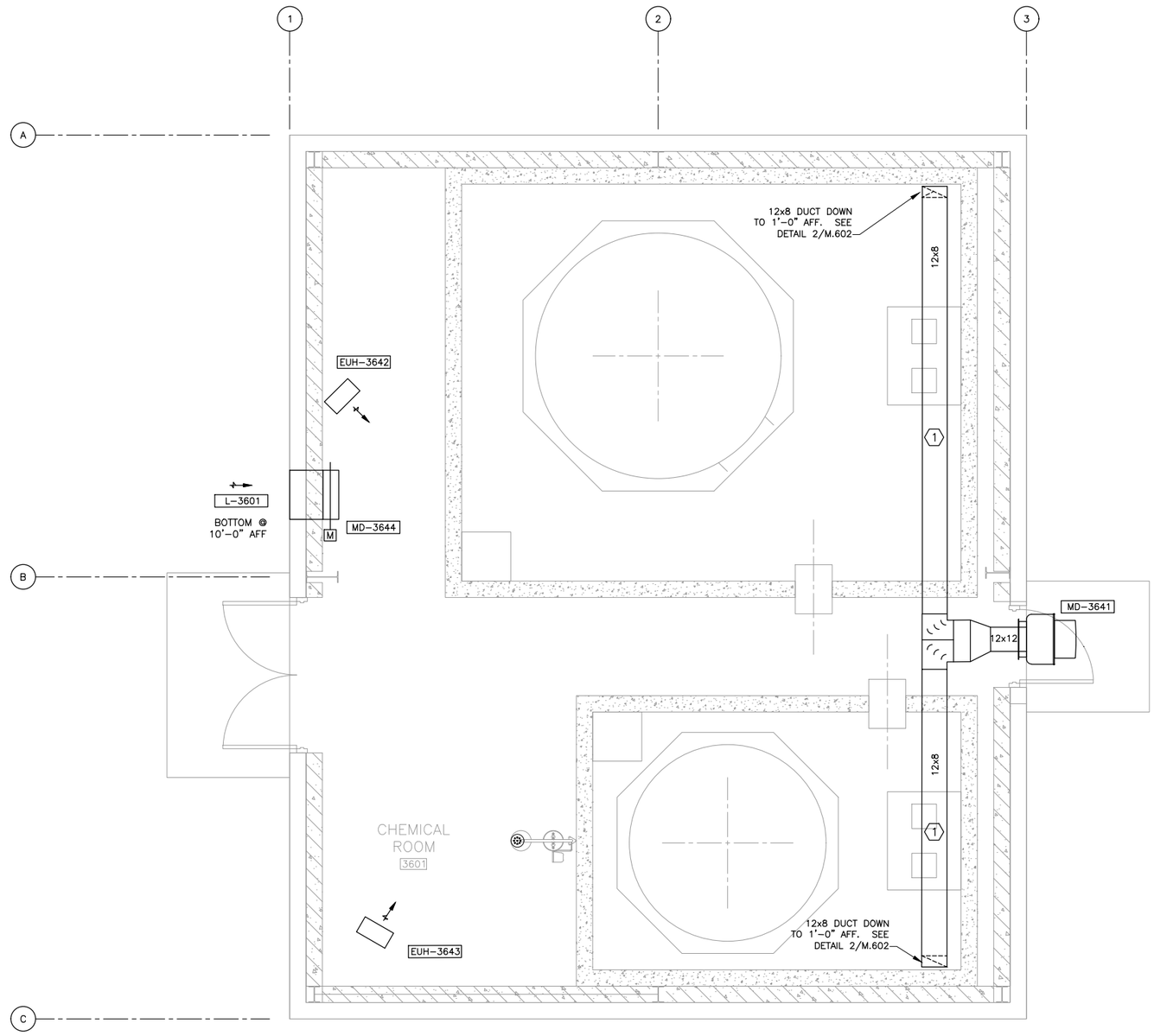
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT CHEMICAL STORAGE BUILDING – 360
MECHANICAL
OPERATING LEVEL PLUMBING PLAN

SHEET NO.
M.360

Xrefs: xgl-1-dh01; XA-360-P01; XS-360-GRID; XS-360-P01; XP-360-P01; XMH-360-P00



1 OPERATING LEVEL HVAC PLAN

SCALE: 3/8"=1'-0"

NORTH

PLAN NORTH

GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES: ⟨-⟩

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION. DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. CONNECT 3/4" PEW SERVING HOSE REEL TO 6" PEW DISCHARGED FROM PEW PUMP PEW-4211.

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: DAS	JOB NUMBER: 160473		
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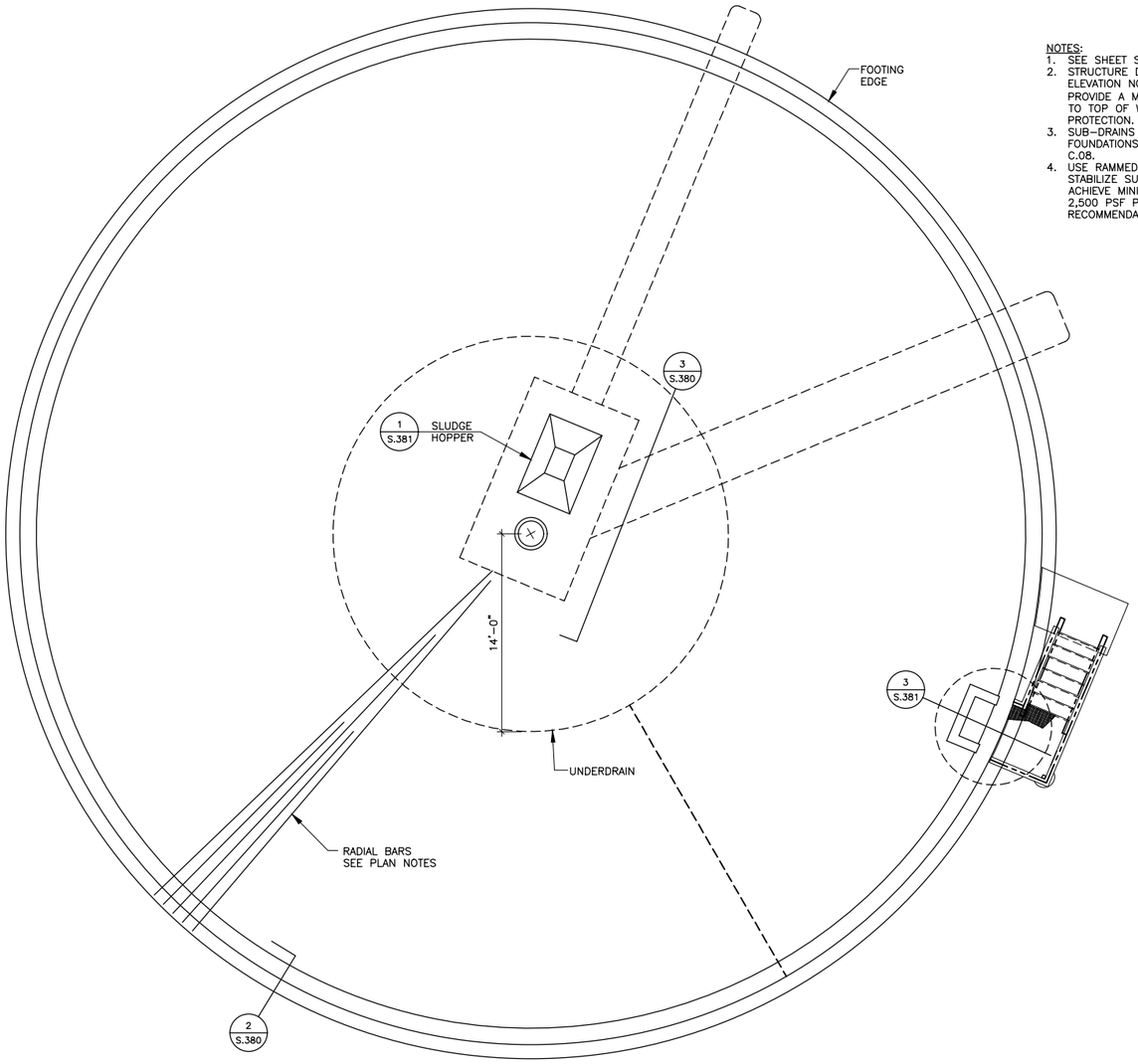
CITY OF NEVADA
NEVADA, IOWA

SECONDARY TREATMENT CHEMICAL STORAGE BUILDING – 360
MECHANICAL
OPERATING LEVEL HVAC PLAN

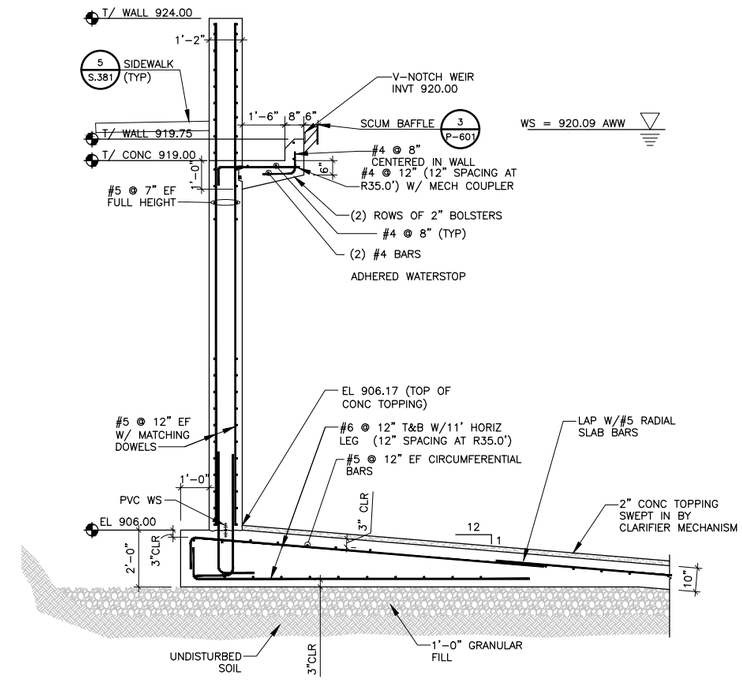
SHEET NO.
M.361

Xrefs: xgl-1-dh01; XA-360-P01; XS-360-GRID; XS-360-P01; XP-360-P01; XMH-360-P01

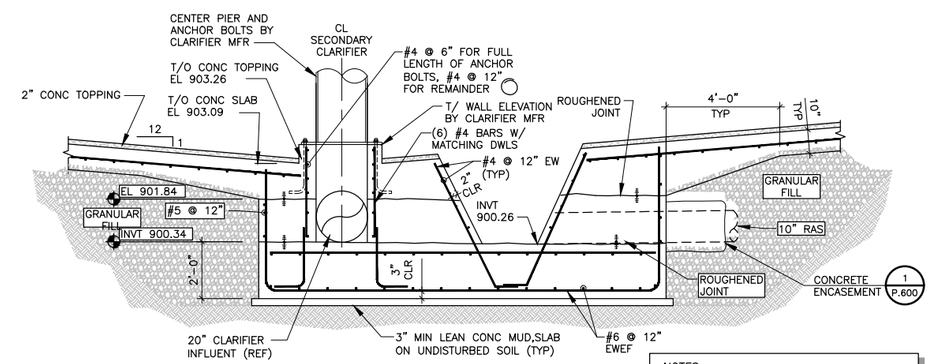
NOTES:
1. SEE SHEET S.01 FOR GENERAL NOTES.
2. STRUCTURE DESIGNED FOR GRADE ELEVATION NO GREATER THAN EL 829.5 TO PROVIDE A MINIMUM OF 3'-6" FREEBOARD TO TOP OF WALL REQUIRED FOR FALL PROTECTION.
3. SUB-DRAINS ARE REQUIRED AROUND FOUNDATIONS. SEE SUB-DRAINS SHEET C.08.
4. USE RAMMED AGGREGATE PIERS TO STABILIZE SUBGRADE SOILS AND TO ACHIEVE MINIMUM BEARING CAPACITY OF 2,500 PSF PER GEOTECHNICAL ENGINEER RECOMMENDATION.



1 SECONDARY CLARIFIER No. 2 FOUNDATION PLAN
SCALE: 3/16"=1'-0"



2 SECTION
SCALE: 3/8"=1'-0"



3 SECTION
SCALE: NONE

NOTES:
1. ALL BARS 2" CLR UNLESS NOTED.
2. PROVIDE ADHERED WATERSTOP AT ALL CONSTRUCTION JOINTS IN CENTER PIER / SLUDGE HOPPER

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: GPB	JOB NUMBER: 160473		
CAD DATE: 7/9/2020 11:16:25 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\S\S.380 TYPICAL SECONDARY CLARIFIER FOUNDATION PLAN.dwg			

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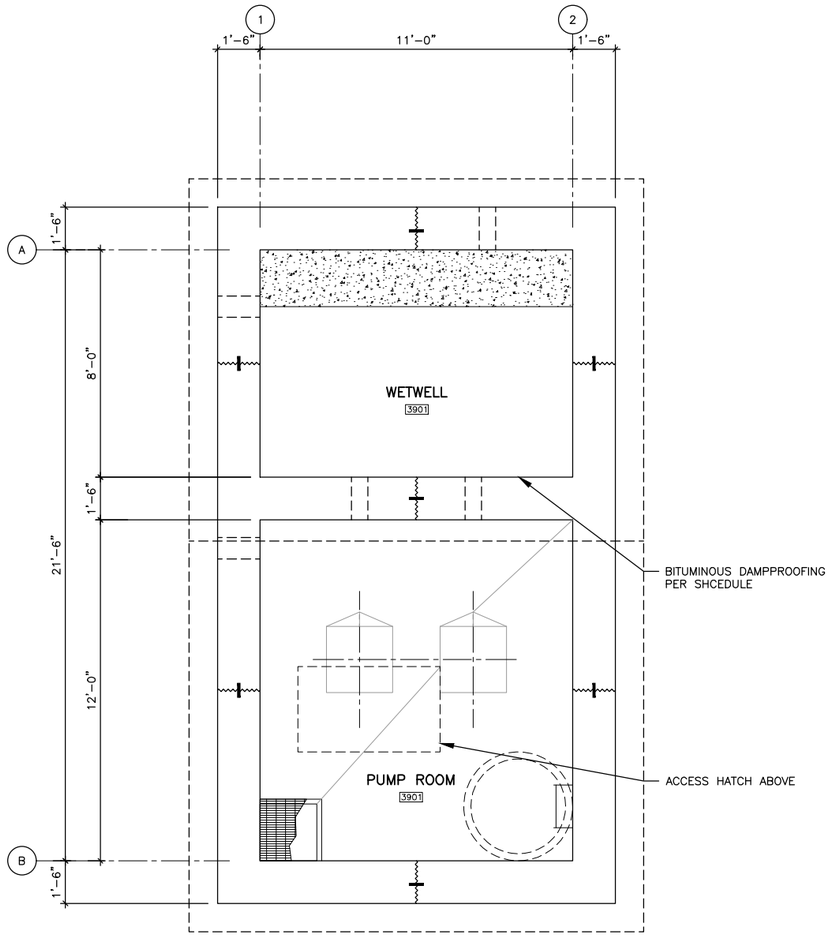
CITY OF NEVADA
NEVADA, IOWA

SECONDARY CLARIFIERS – 380
STRUCTURAL
TYPICAL SECONDARY CLARIFIER FOUNDATION PLAN

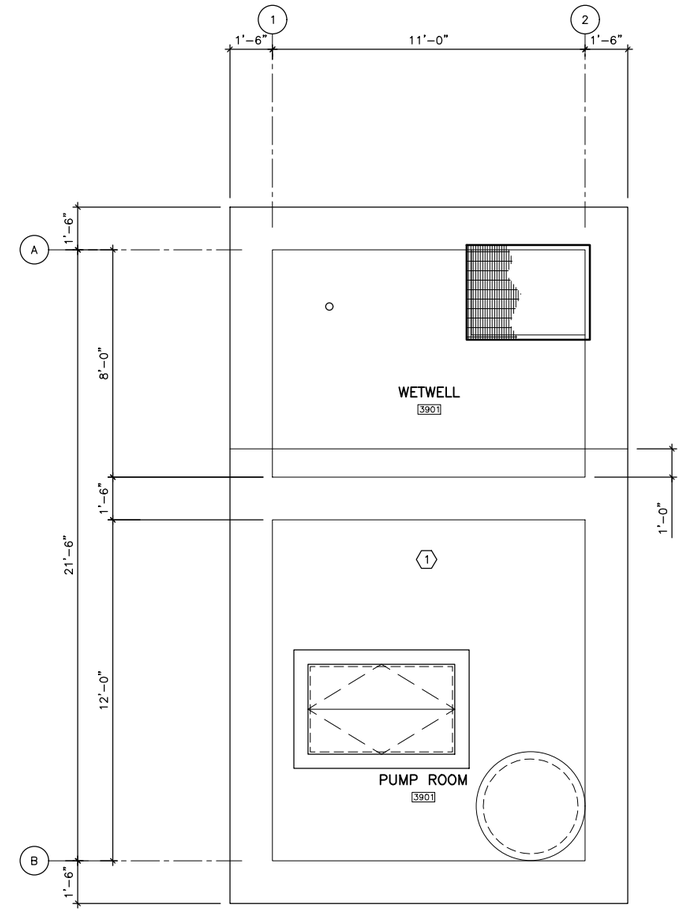
SHEET NO.
S.380

Xrefs: xgt-1-dh01; XS-380-P00; XS-380-S02



1 LOWER LEVEL PLAN

SCALE: 3/8"=1'-0"



KEYNOTES:

1. ELASTOMERIC DECK COVERING ON DRY PIT TOP SLAB. SEE P. 390 FOR EXTENDING OVER EDGES.

2 UPPER LEVEL PLAN

SCALE: 3/8"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB,CR	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/30/2020 2:33:40 PM			
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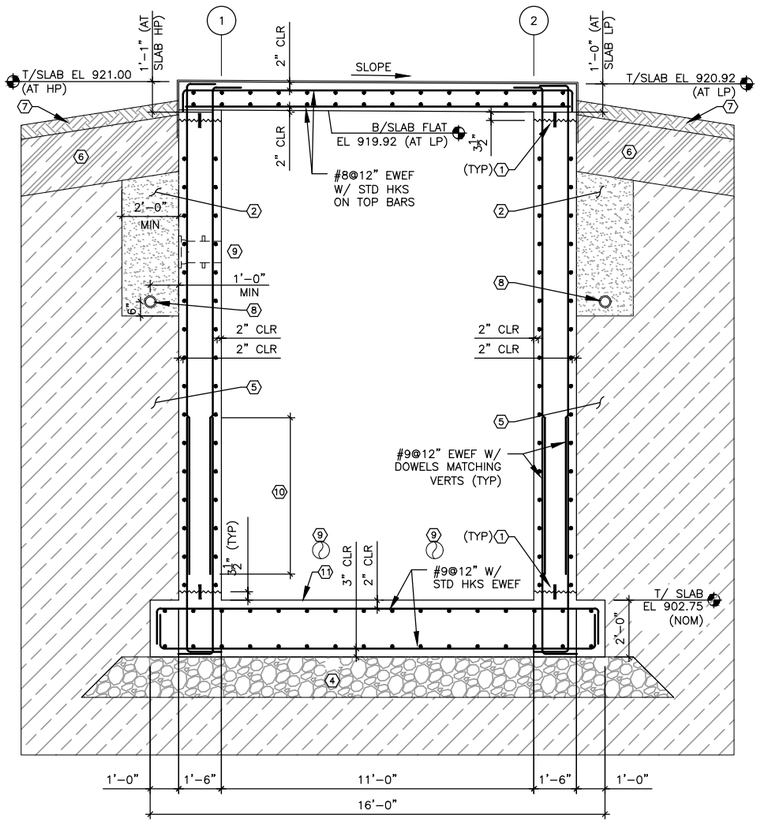
CITY OF NEVADA
NEVADA, IOWA

RETURN PUMP STATION – 390
ARCHITECTURAL
LOWER AND UPPER LEVEL PLANS

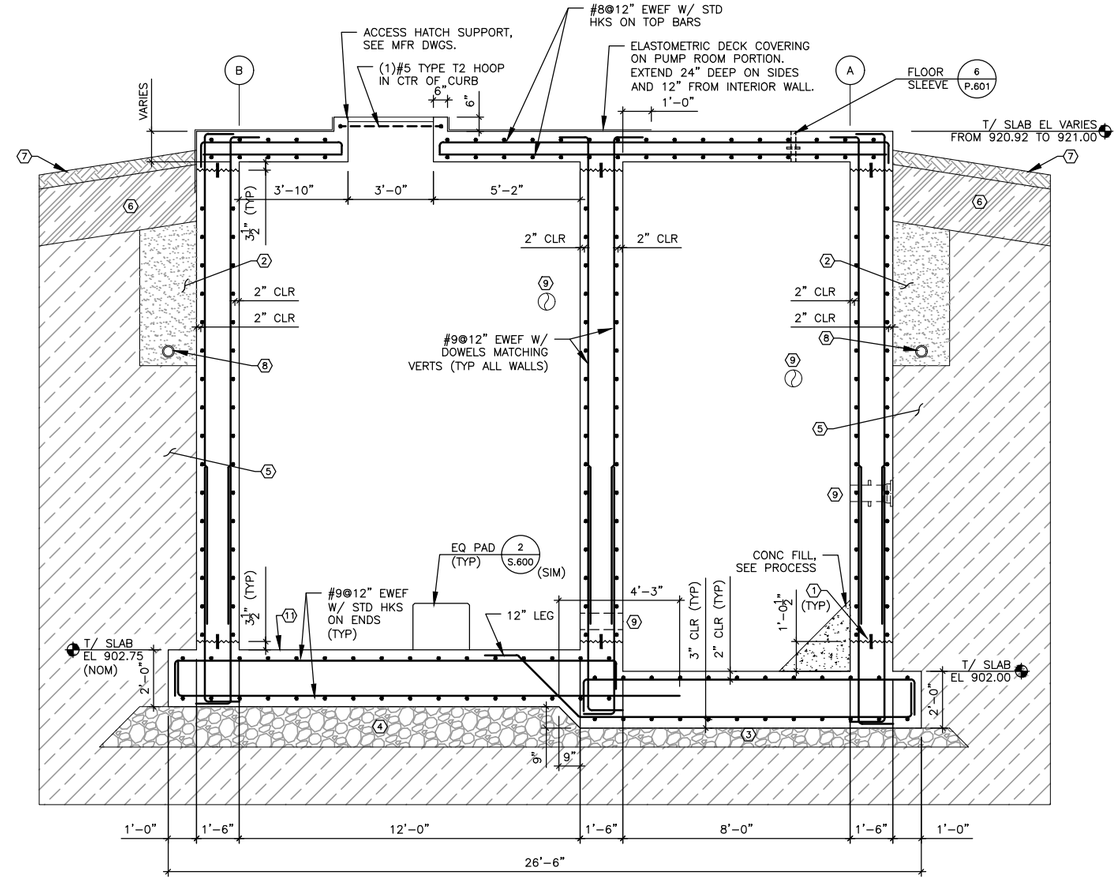
SHEET NO.
A.390

Xrefs: xgl-1-dh01; XS-390-GRID; XS-390-P00; XS-390-P01



1 SECTION

SCALE: 3/8"=1'-0"



2 SECTION

SCALE: 3/8"=1'-0"

KEYNOTES:

1. CONSTRUCTION JOINT ROUGHENED TO 1/4" AMPLITUDE W/ 6" PVC WATERSTOP.
2. FDGGF OR CRUSHED ROCK WRAPPED IN FILTER FABRIC, FILTER FABRIC EXTEND UPWARD TO AND BENEATH THE ABOVE IMPERVIOUS CLAY LAYER PER IOWA DOT TABLE 4196.01-2.
3. 8" MIN THICK COMPACTED CRUSHED ROCK SUBBASE WITH LESS THAN 4% PASSING #200 SIEVE.
4. 1'-5" MIN THICK COMPACTED CRUSHED ROCK SUBBASE WITH LESS THAN 4% PASSING #200 SIEVE
5. EXCAVATION BACKFILL WITH COMPACTED STRUCTURAL FILL PER GEOTECHNICAL NOTES IN SHEET G.07.
6. 2'-0" THICK IMPERVIOUS CLAY LAYER.
7. SURFACE TOPSOIL, MIN 1% SLOPE.
8. 6" MIN PERFORATED SUB-DRAIN PIPE, HP INV EL 912.75. SLOPE TO WEST TO INV EL 912.35.
9. PIPE PENETRATION, SEE PROCESS.
10. ALT PROJ OF 5'-6" & 11'-0". 5'-6" SPLICE VERT REINF TO DWL (TYP ALL WALLS).
11. TOP OF SLAB SLOPES FROM HP 903.00 TO LP 902.75 AT SUMP. SEE PLAN.

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CRR	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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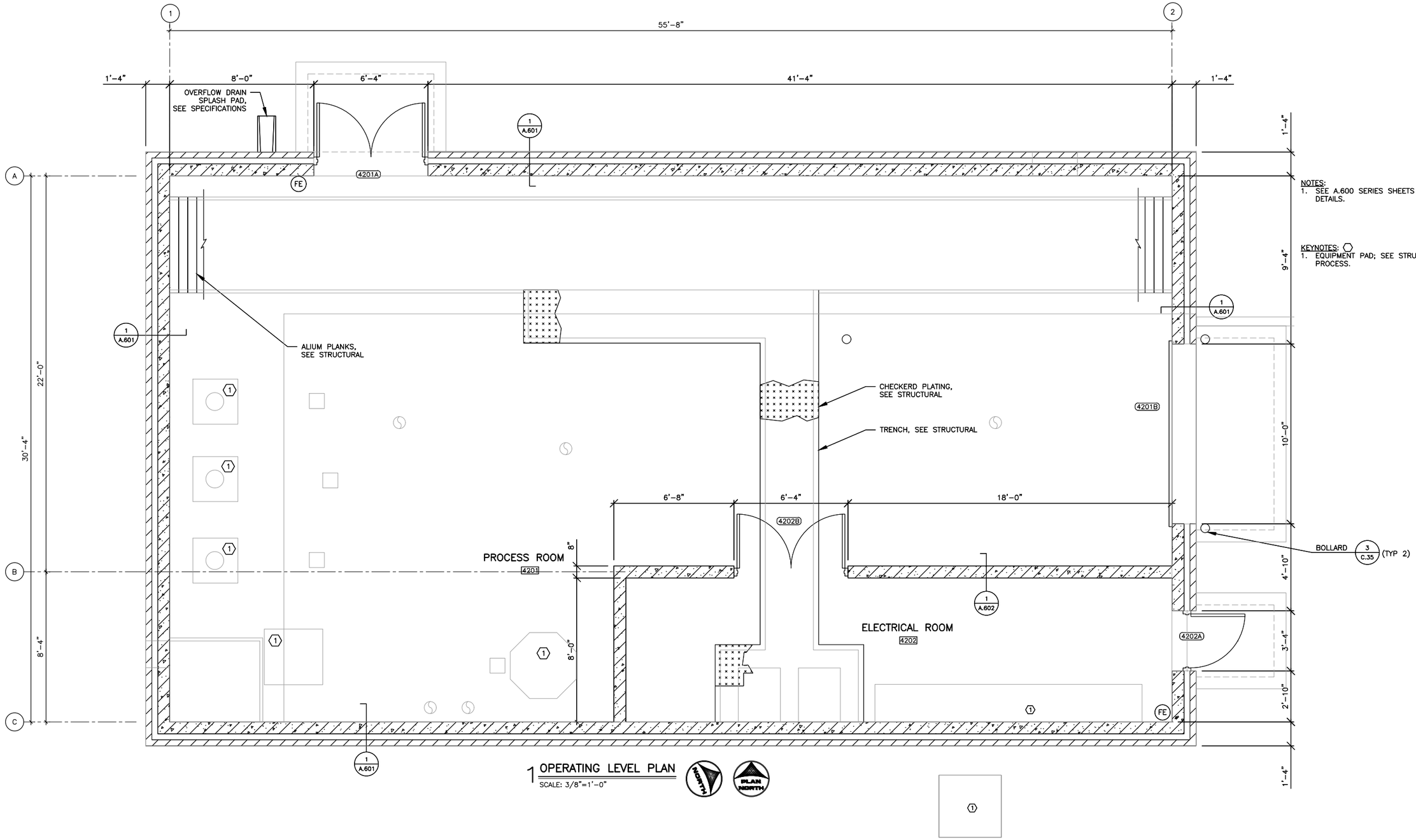
CITY OF NEVADA
NEVADA, IOWA

RETURN PUMP STATION – 390
STRUCTURAL
SECTIONS

SHEET NO.
S.391

Xrefs: xgl-1-dh01; XS-390-S01



NOTES:
1. SEE A.600 SERIES SHEETS FOR SCHEDULES AND DETAILS.

KEYNOTES:
1. EQUIPMENT PAD; SEE STRUCTURAL, MECHANICAL, AND PROCESS.

1 OPERATING LEVEL PLAN
SCALE: 3/8"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/30/2020 7:44:04 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.420 OPERATING LEVEL PLAN.dwg			

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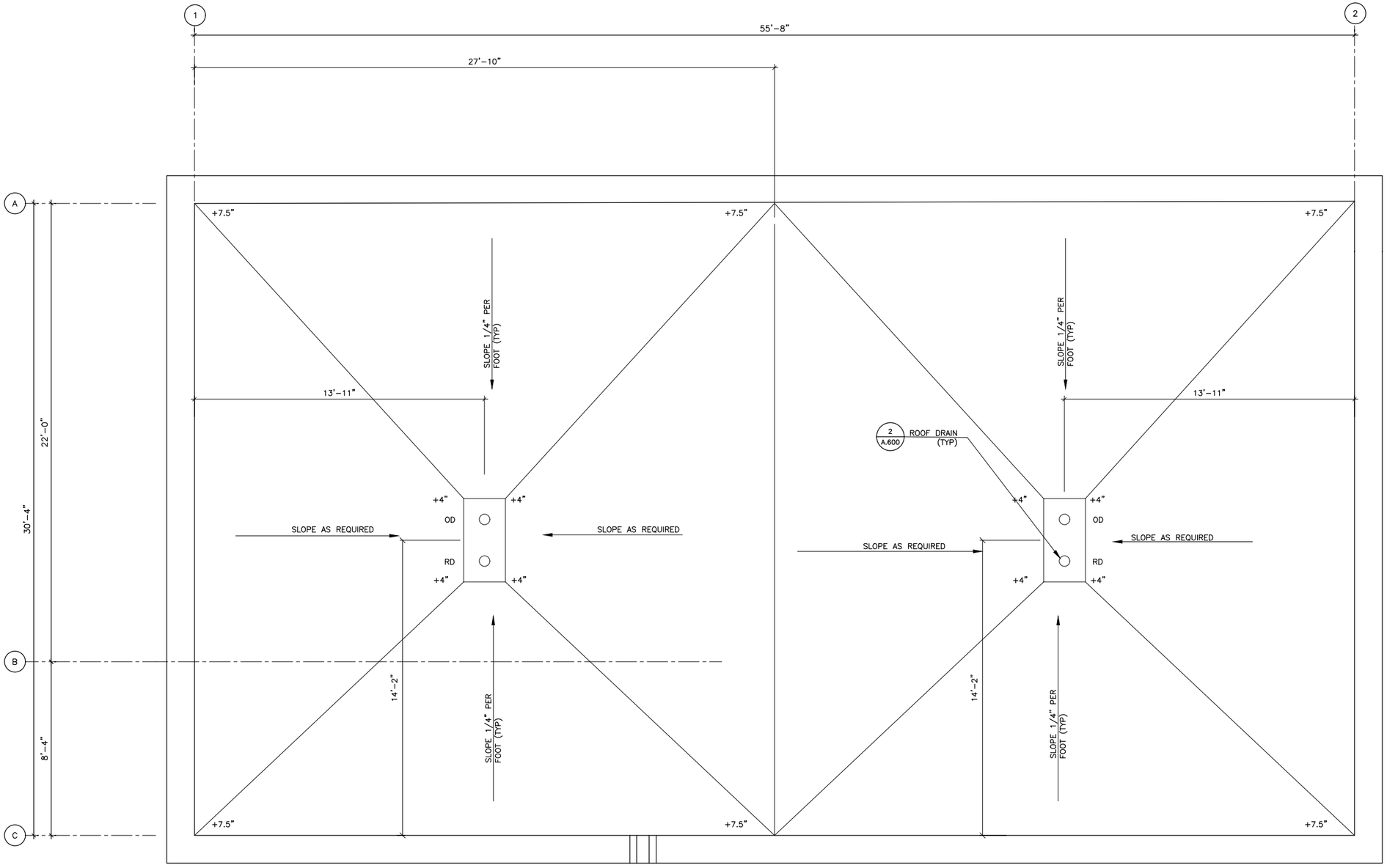
CITY OF NEVADA
NEVADA, IOWA

UV DISINFECTION BUILDING – 420
ARCHITECTURAL
OPERATING LEVEL PLAN

SHEET NO.
A.420

Xrefs: xgl-1-dh01; XA-420-P01; XS-420-GRID; XA-420-P02 ROOF PLAN; XS-420-P01



ROOF PLAN NOTES:

1. VERIFY ALL LOCATIONS OF CURBS, OPENINGS, PENETRATIONS, AND ROOF MOUNTED EQUIPMENT WITH EQUIPMENT FURNISHED PRIOR TO BEGINNING THE WORK.
2. MAINTAIN MINIMUM 1/4" PER FOOT SLOPE TO ROOF DRAINS.
3. CONSTRUCT ROOF CRICKETS ON THE BACKSIDE OF ROOF MOUNTED EQUIPMENT AND HATCH ASSEMBLIES TO ACHIEVE POSITIVE DRAINAGE AND ELIMINATE PONDING.
4. CONTRACTOR SHALL COORDINATE LOCATIONS OF ROOF DRAINS WITH STRUCTURE BELOW AND ADJUST TAPERED ROOF INSULATION THICKNESSES AND SLOPES AS REQUIRED TO PROVIDE MINIMUM 1/4" PER FOOT SLOPE AND 4" MINIMUM THICKNESS.
5. PIPE PENRTRATION; SEE A.600 FOR DETAILS.

1 ROOF PLAN
SCALE: 3/8"=1'-0"

NORTH

PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/9/2020 3:01:27 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.421 ROOF PLAN.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

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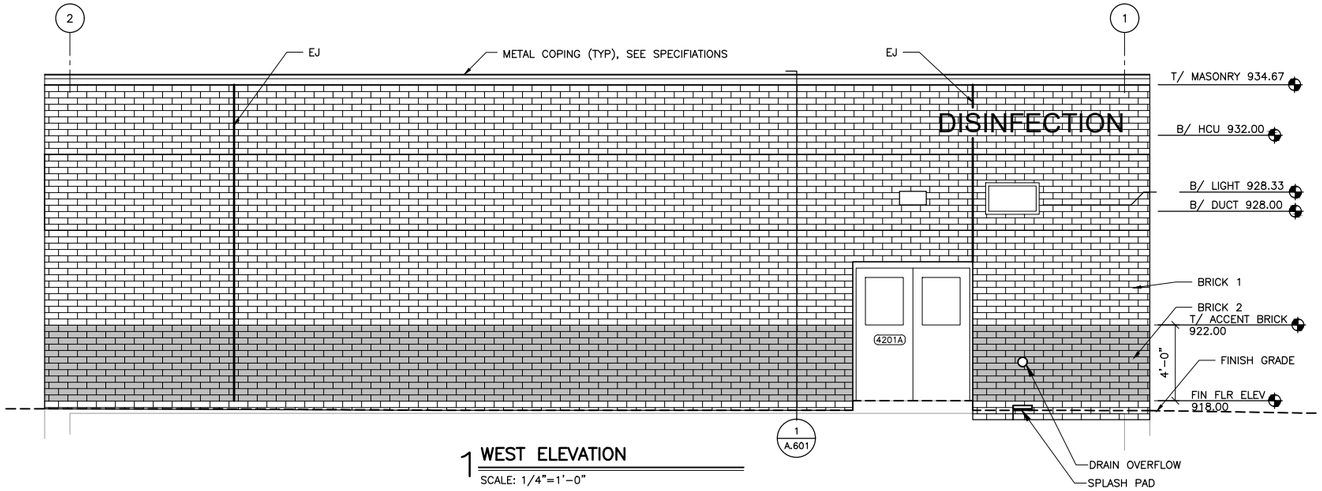
CITY OF NEVADA
NEVADA, IOWA

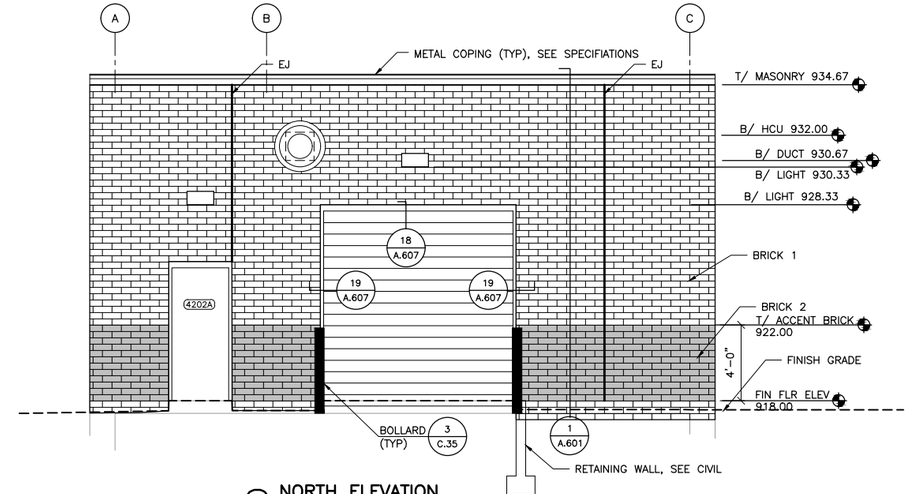
UV DISINFECTION BUILDING – 420
ARCHITECTURAL
ROOF PLAN

SHEET NO.
A.421

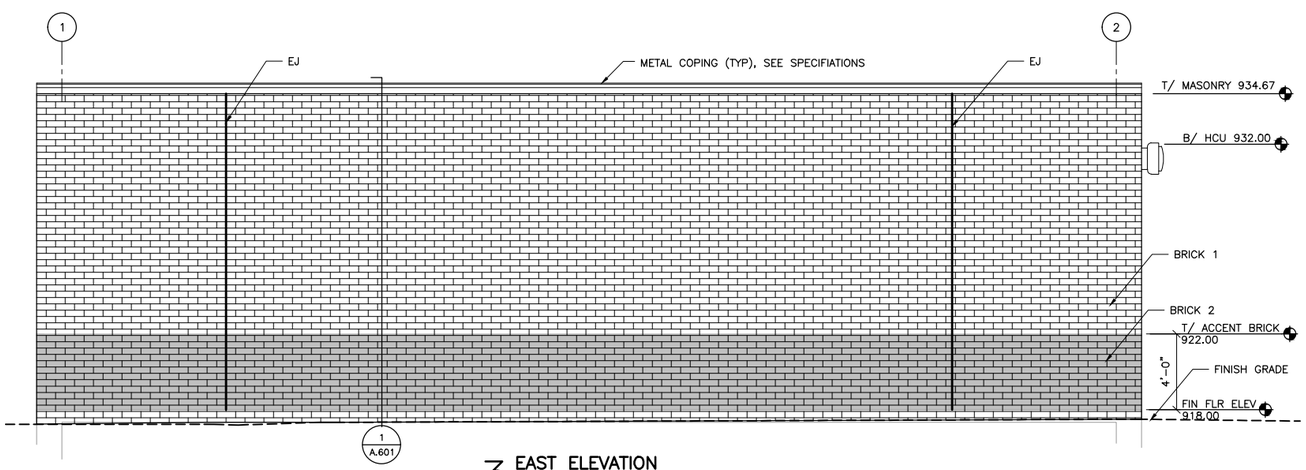
Xrefs: xgl-1-dh01; XS-420-GRID; XA-420-P02 ROOF PLAN



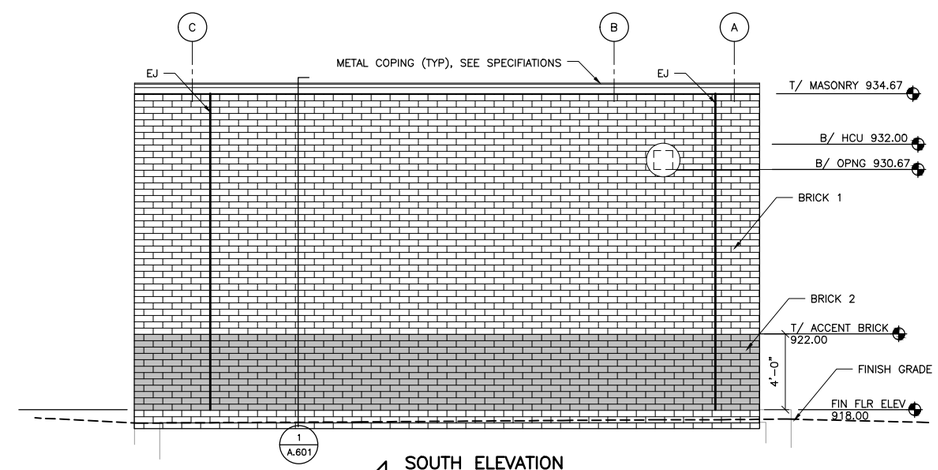
1 WEST ELEVATION
SCALE: 1/4"=1'-0"



2 NORTH ELEVATION
SCALE: 1/4"=1'-0"



3 EAST ELEVATION
SCALE: 1/4"=1'-0"



4 SOUTH ELEVATION
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 5/26/2020 8:25:44 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.422 EXTERIOR ELEVATIONS.dwg			

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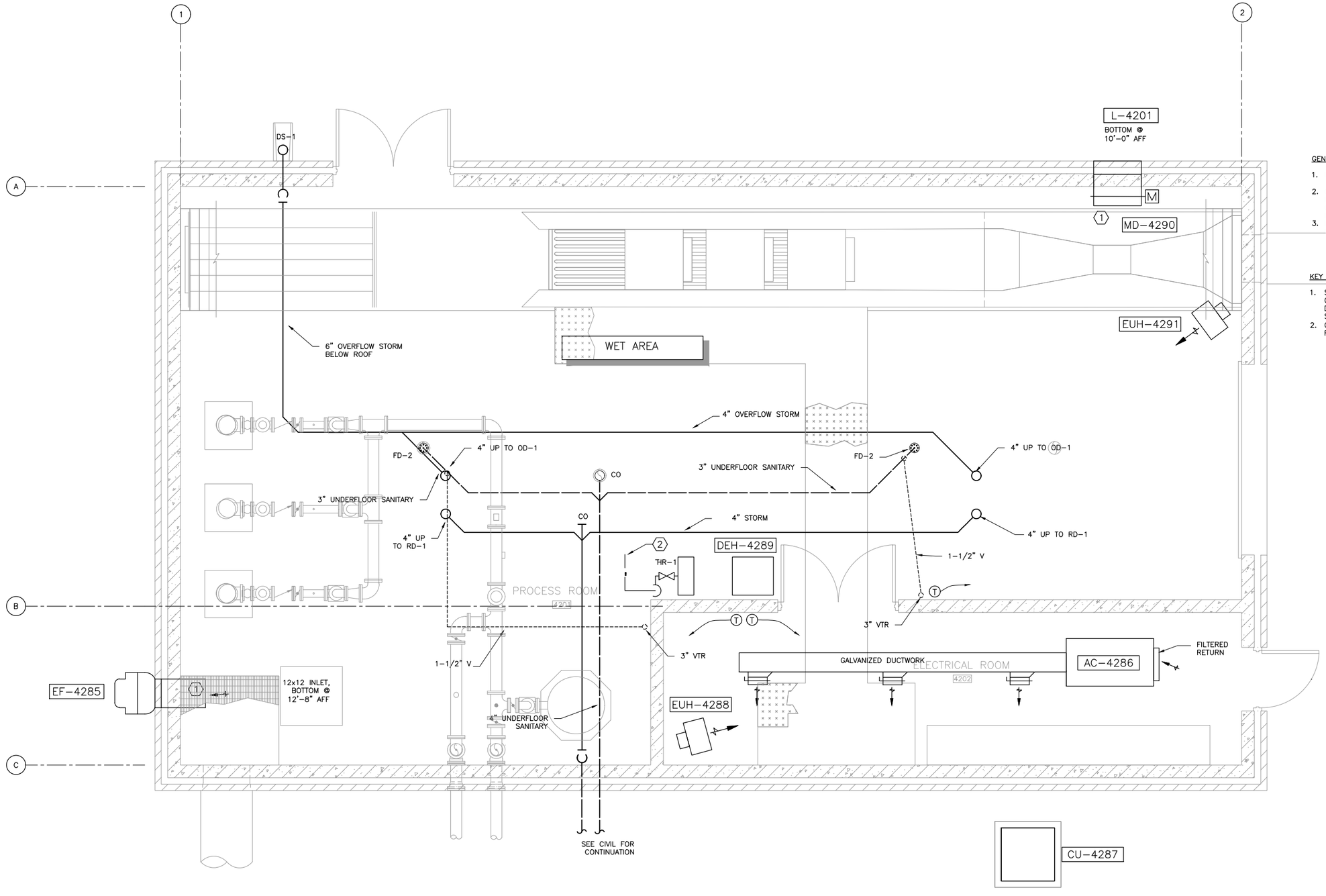
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

UV DISINFECTION BUILDING – 420
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.422

Xrefs: xgl-1-dh01; XA-420-E01



GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES:

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION. DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. CONNECT 3/4" PEW SERVING HOSE REEL TO 6" PEW DISCHARGED FROM PEW PUMP PEW-4211.

1 OPERATING LEVEL PLUMBING AND HVAC PLAN

SCALE: 3/8"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: JV	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DAS	JOB NUMBER: 160473		
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CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.420 OPERATING LEVEL PLUMBING AND HVAC PLAN.dwg			

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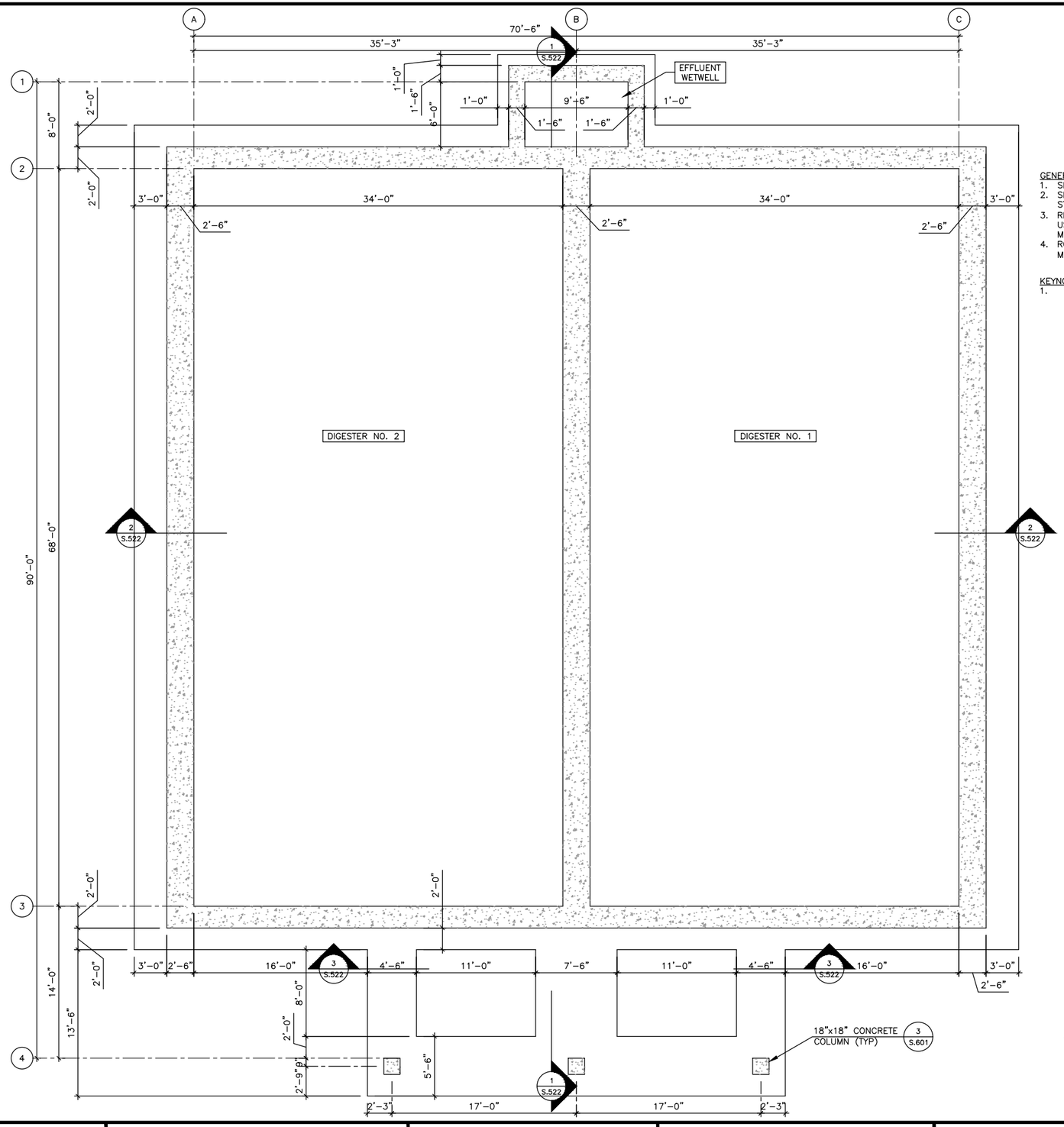
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

UV DISINFECTION BUILDING – 420
MECHANICAL
OPERATING LEVEL PLUMBING AND HVAC PLAN

SHEET NO.
M.420

Xrefs: xgl-1-dh01; XA-420-P01; XS-420-GRID; XMH-420-P01; XP-420-P01; XS-420-P01



GENERAL NOTES:
1. SEE SHEET G.07 FOR GENERAL STRUCTURAL NOTES.
2. SEE SHEETS S.600–S.606 FOR STANDARD STRUCTURAL DETAILS.
3. REFER TO CONCRETE MATERIAL SCHEDULE 3/S.600, USE MIX 1 FOR STRUCTURAL CONCRETE, AND USE MIX 2 FOR CONCRETE FILL.
4. ROUGHEN ALL CONSTRUCTION JOINT SURFACES TO MIN. 1/4" AMPLITUDE.

KEYNOTES: ⬡
1.

1 LOWER LEVEL PLAN
SCALE: 3/16" = 1'-0"

NORTH PLAN NORTH

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CRR	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: GPB	JOB NUMBER: 160473		
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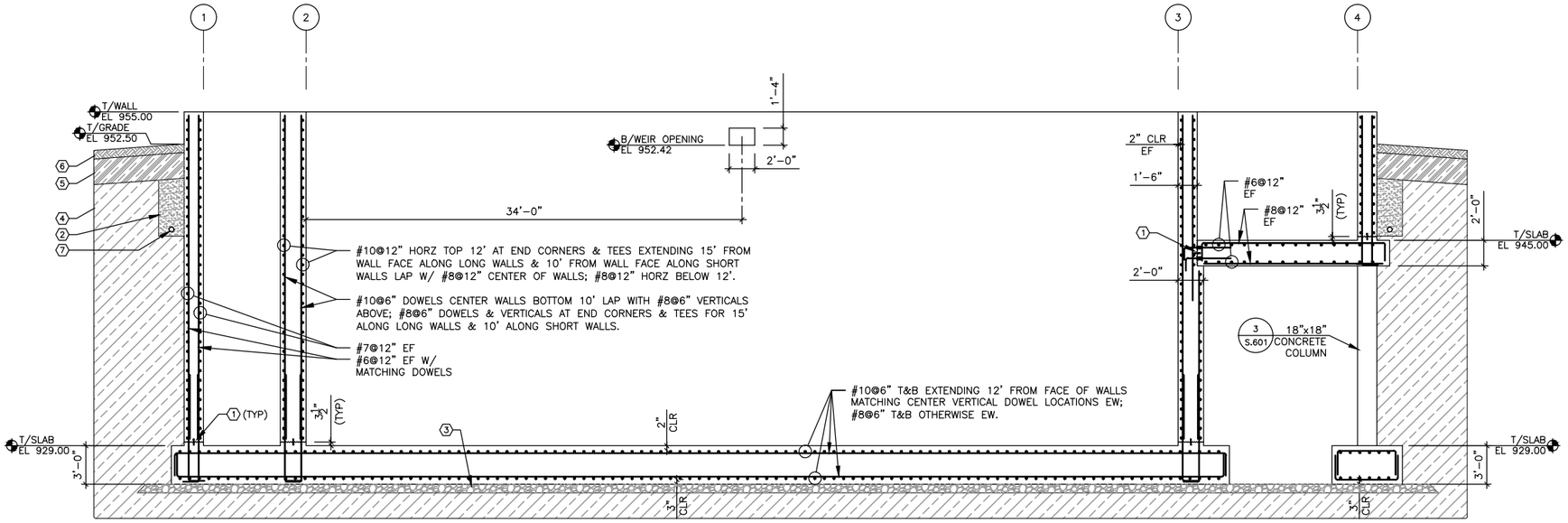
CITY OF NEVADA
NEVADA, IOWA

AEROBIC DIGESTERS – 520
STRUCTURAL
LOWER LEVEL PLAN

SHEET NO.
S.520

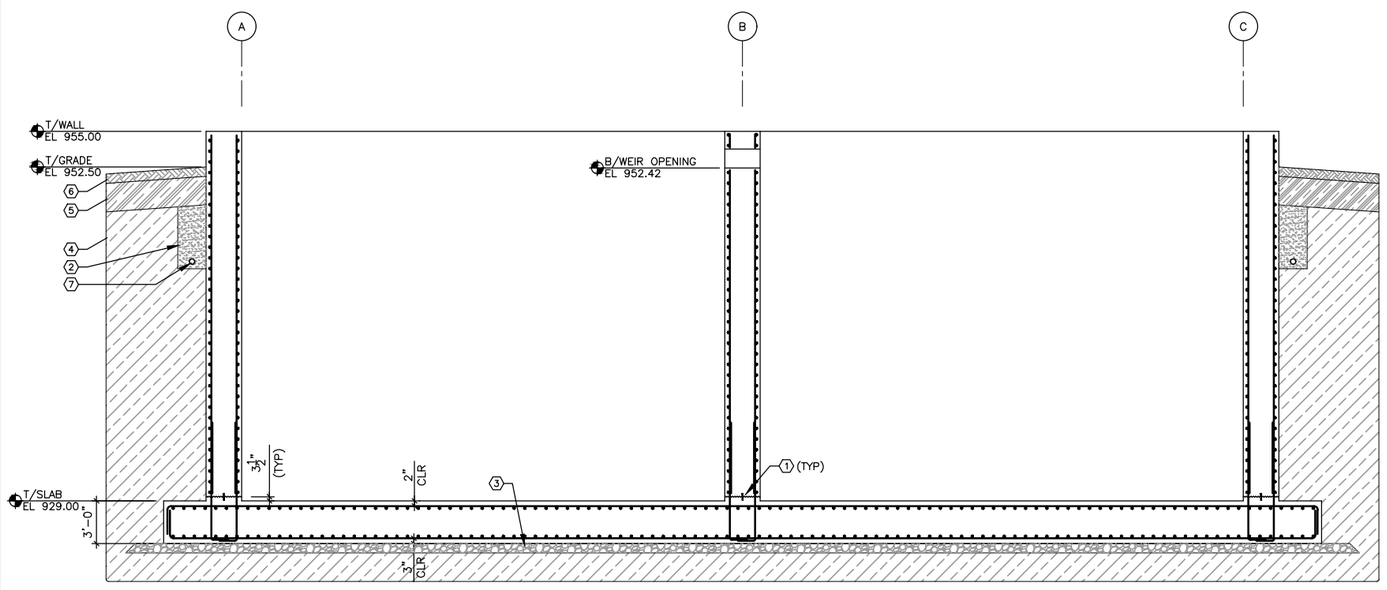
Xrefs: xgl-1-dh01; XS-520-P00; XS-520-GRID



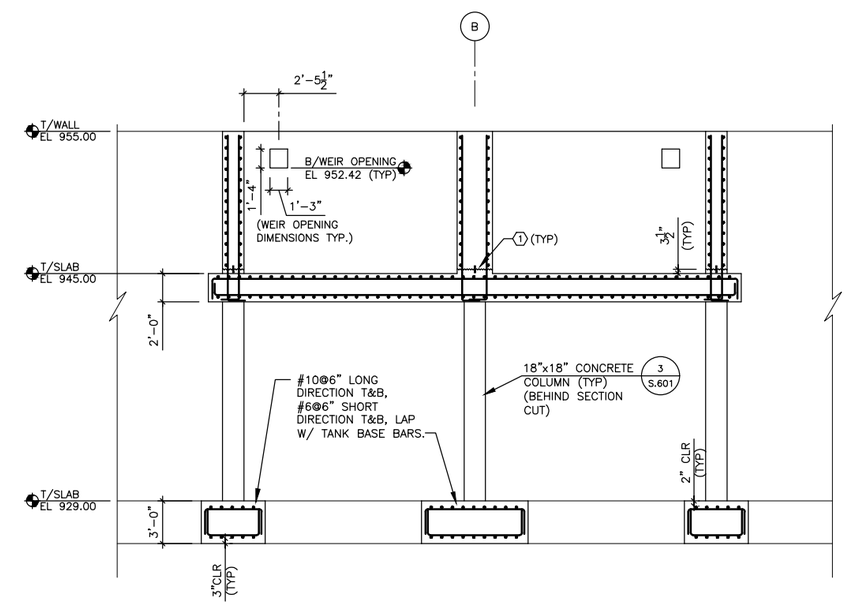
1 SECTION
SCALE: 3/16" = 1'-0"

GENERAL NOTES:
1. SEE SHEET G.07 FOR GENERAL STRUCTURAL NOTES.
2. SEE SHEETS S.600–S.606 FOR STANDARD STRUCTURAL DETAILS.
3. REFER TO CONCRETE MATERIAL SCHEDULE 3/S.600, USE MIX 1 FOR STRUCTURAL CONCRETE, AND USE MIX 2 FOR CONCRETE FILL.
4. ROUGHEN ALL CONSTRUCTION JOINT SURFACES TO MIN. 1/4" AMPLITUDE.

KEYNOTES:
1. CONSTRUCTION JOINT ROUGHENED TO 1/4" AMPLITUDE W/ 6" PVC WATERSTOP.
2. FDGGF OR CRUSHED ROCK WRAPPED IN FILTER FABRIC, FILTER FABRIC EXTEND UPWARD TO AND BENEATH THE ABOVE IMPERVIOUS CLAY LAYER PER IOWA DOT TABLE 4196.01–2.
3. 8" MIN THICK COMPACTED CRUSHED ROCK SUBBASE WITH LESS THAN 4% PASSING #200 SIEVE.
4. EXCAVATION BACKFILL WITH COMPACTED STRUCTURAL FILL PER GEOTECHNICAL NOTES IN SHEET G.07.
5. 2'-0" THICK IMPERVIOUS CLAY LAYER.
6. SURFACE TOPSOIL, MIN 1% SLOPE.
7. 6" MIN PERFORATED SUB-DRAIN PIPE, HP INV EL 9XX.XX. SLOPE TO XXXX TO INV EL 9XX.XX.



2 SECTION
SCALE: 3/16" = 1'-0"



3 SECTION
SCALE: 3/16" = 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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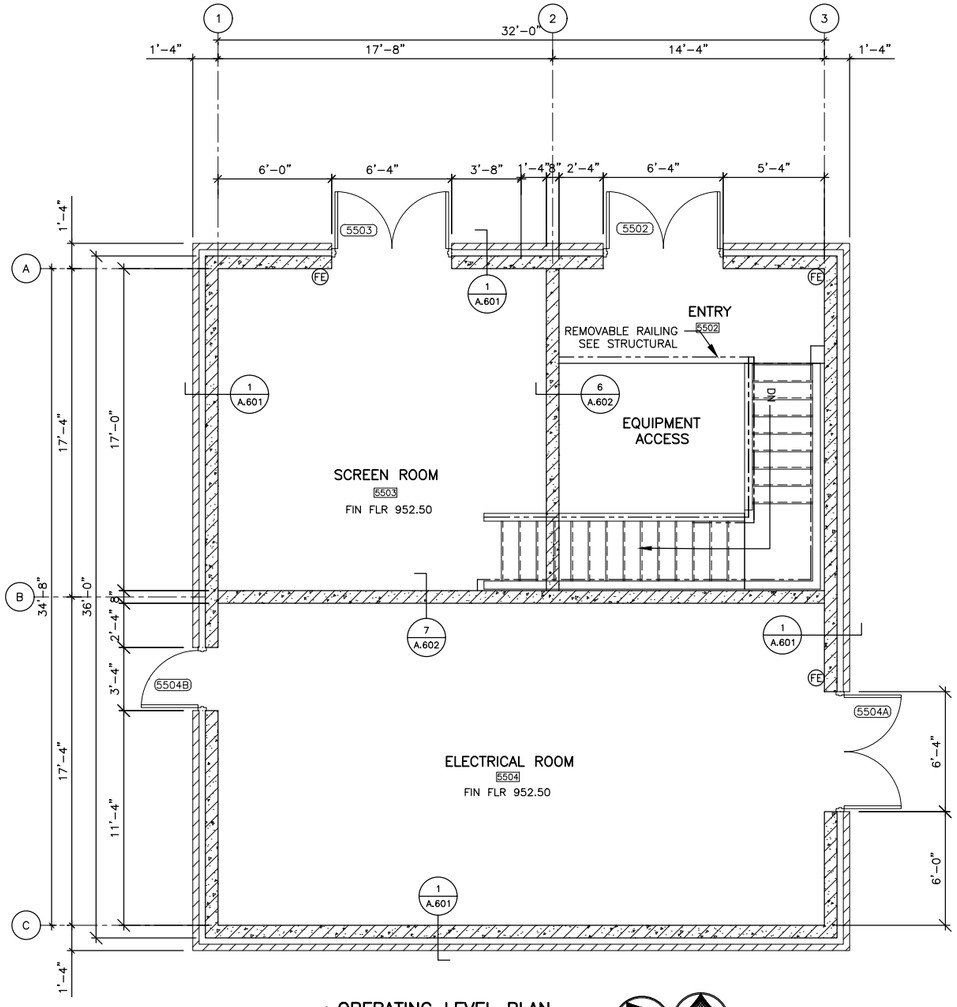
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

AEROBIC DIGESTERS – 520
STRUCTURAL
SECTIONS

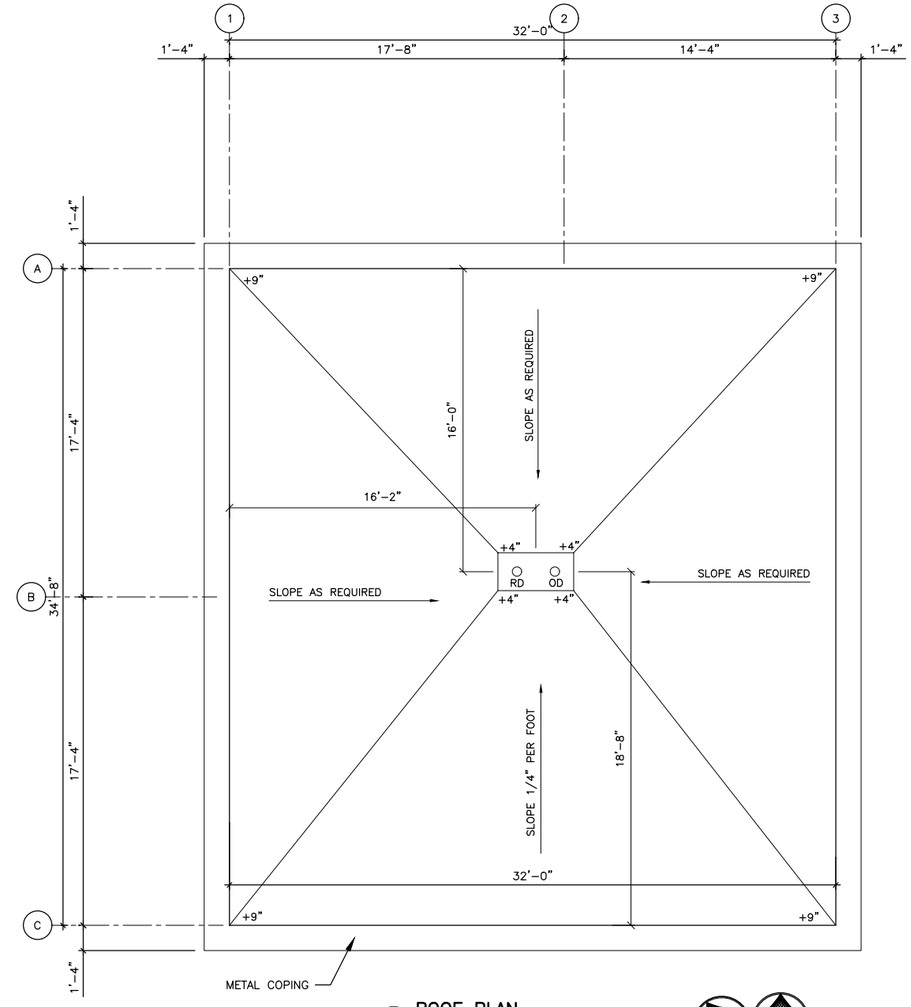
SHEET NO.
S.522

Xrefs: xgl-1-dh01; XS-520-S01



1 OPERATING LEVEL PLAN

SCALE: 1/4"=1'-0"



2 ROOF PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:
1. PAINT WALLS PER SPECIFICATION 09 9000 AND SCHEDULE IN A 600 SERIES SHEETS.
2. SEE SHEETS A.602 AND A.604 FOR WALL DETAILS AND SCHEDULE.
3. SEE A.600 SERIES SHEETS FOR ARCHITECTURAL SCHEDULES AND DETAILS.
4. SEE S SHEET FOR LOWER LEVEL FIRE EXTINGUISHER LOCATION.

PRELIMINARY
NOT FOR CONSTRUCTION

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CAD DATE: 7/31/2020 9:42:54 AM		IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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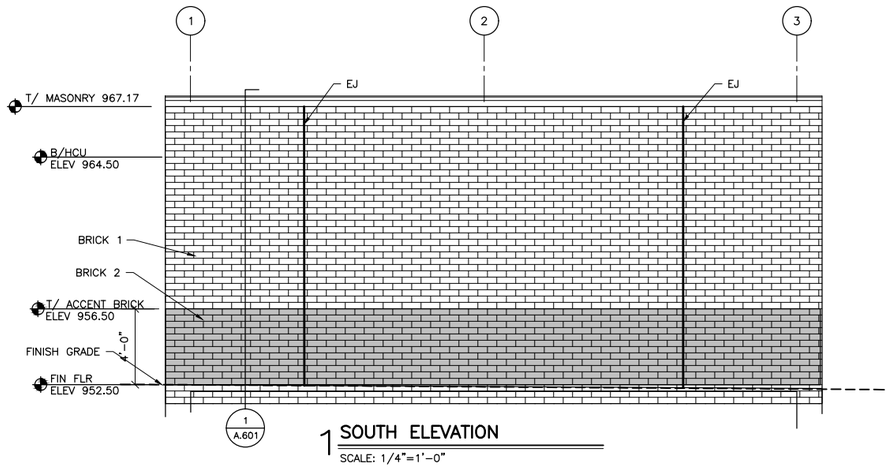
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

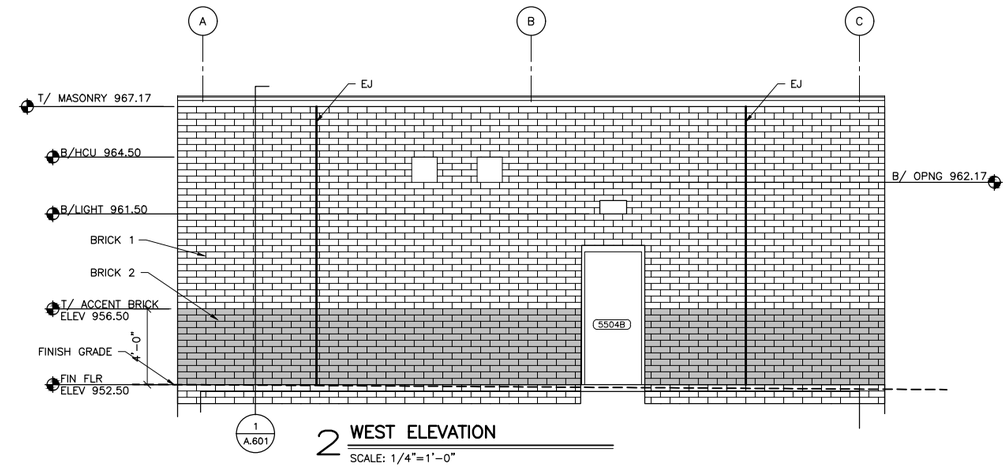
SOLIDS PROCESSING BUILDING – 550
ARCHITECTURAL
OPERATING LEVEL AND ROOF PLAN

SHEET NO.
A.550

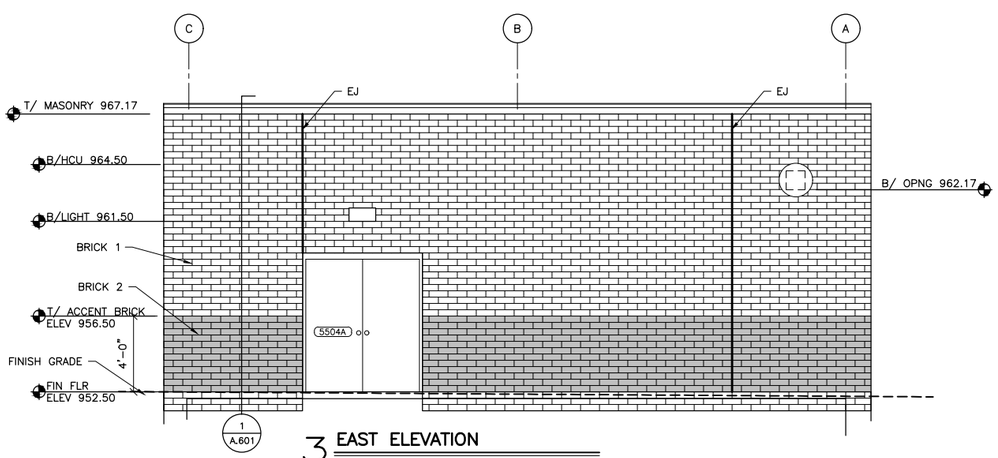
Xrefs: xgl-1-dh01; XA-550-P01; XS-550-GRID; XA-550-P02 ROOF PLAN



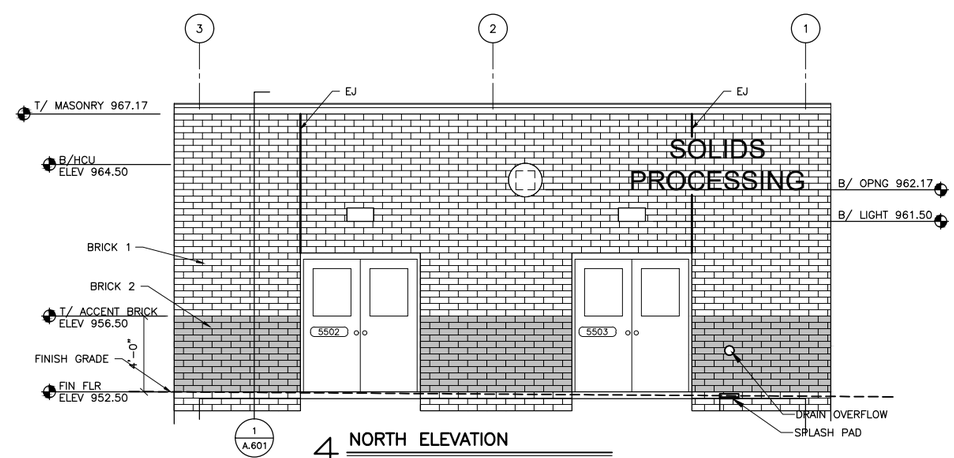
1 SOUTH ELEVATION
SCALE: 1/4"=1'-0"



2 WEST ELEVATION
SCALE: 1/4"=1'-0"



3 EAST ELEVATION
SCALE: 1/4"=1'-0"



4 NORTH ELEVATION
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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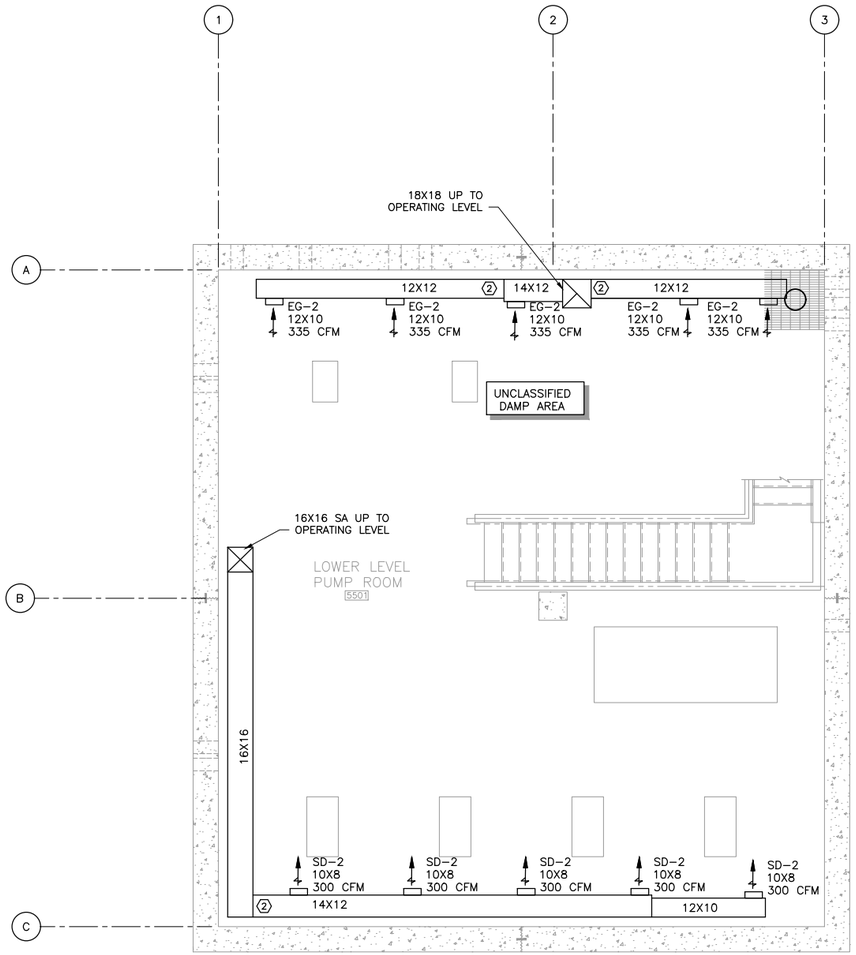
CITY OF NEVADA
NEVADA, IOWA

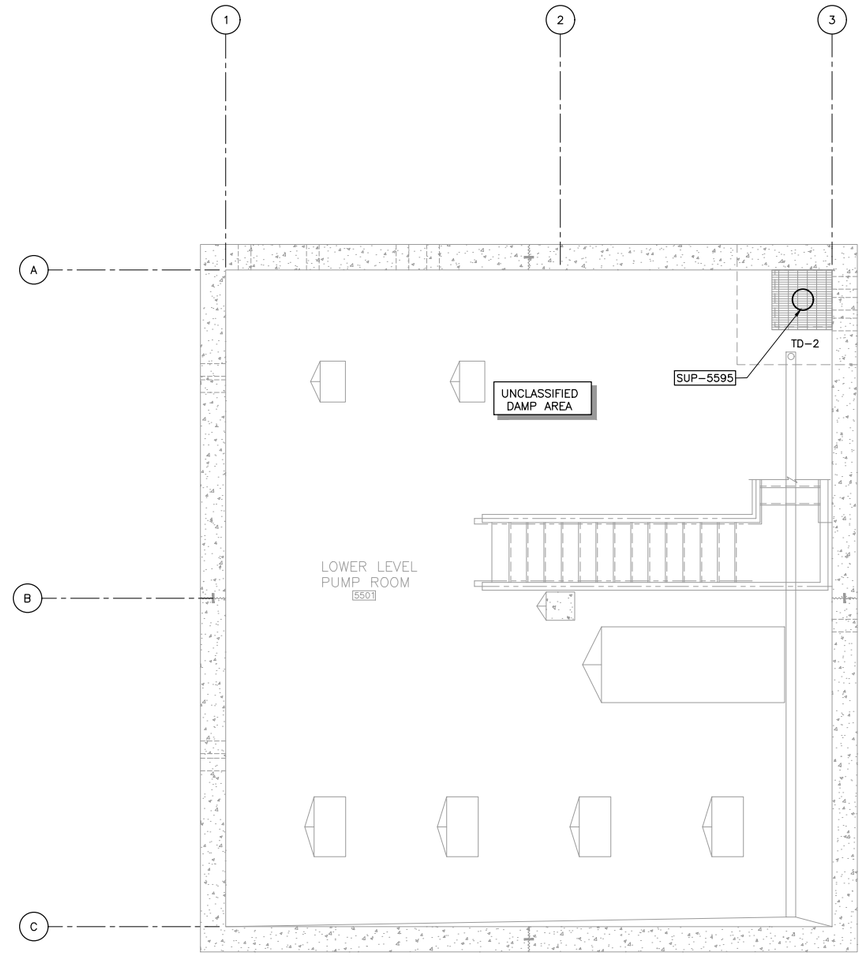
SOLIDS PROCESSING BUILDING – 550
ARCHITECTURAL
EXTERIOR ELEVATIONS

SHEET NO.
A.551

Xrefs: xgl-1-dh01; XA-550-E01



1 LOWER LEVEL HVAC PLAN
SCALE: 1/4"=1'-0"



1 LOWER LEVEL PLUMBING PLAN
SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES:

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION, DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. SUPPLY AND EXHAUST DUCTWORK SHALL BE STAINLESS STEEL.
3. SUPPLY AND EXHAUST DUCTWORK SHALL BE GALVANIZED STEEL.

PRELIMINARY
NOT FOR CONSTRUCTION

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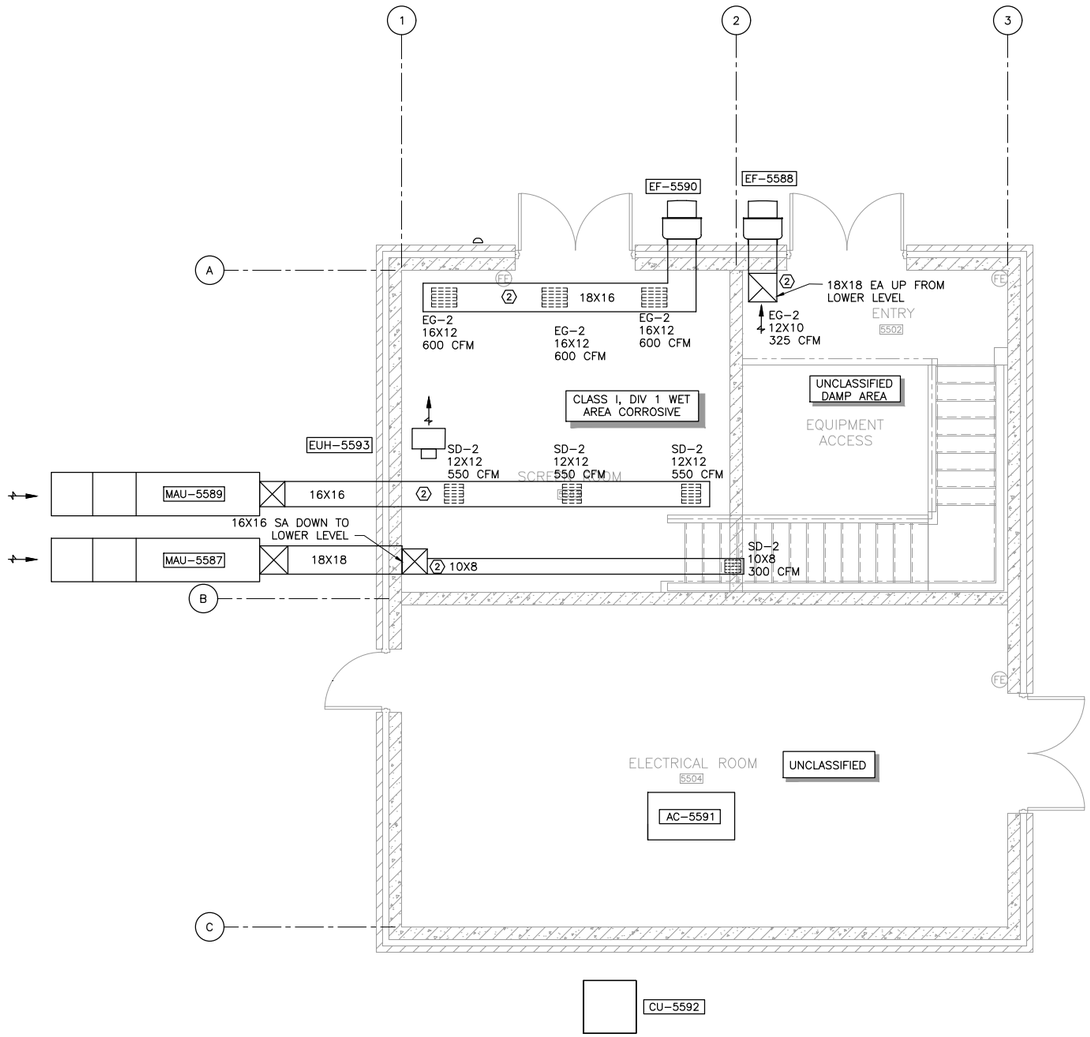
NEVADA, IOWA

SOLIDS PROCESSING BUILDING – 550
MECHANICAL
LOWER LEVEL PLUMBING AND HVAC PLAN

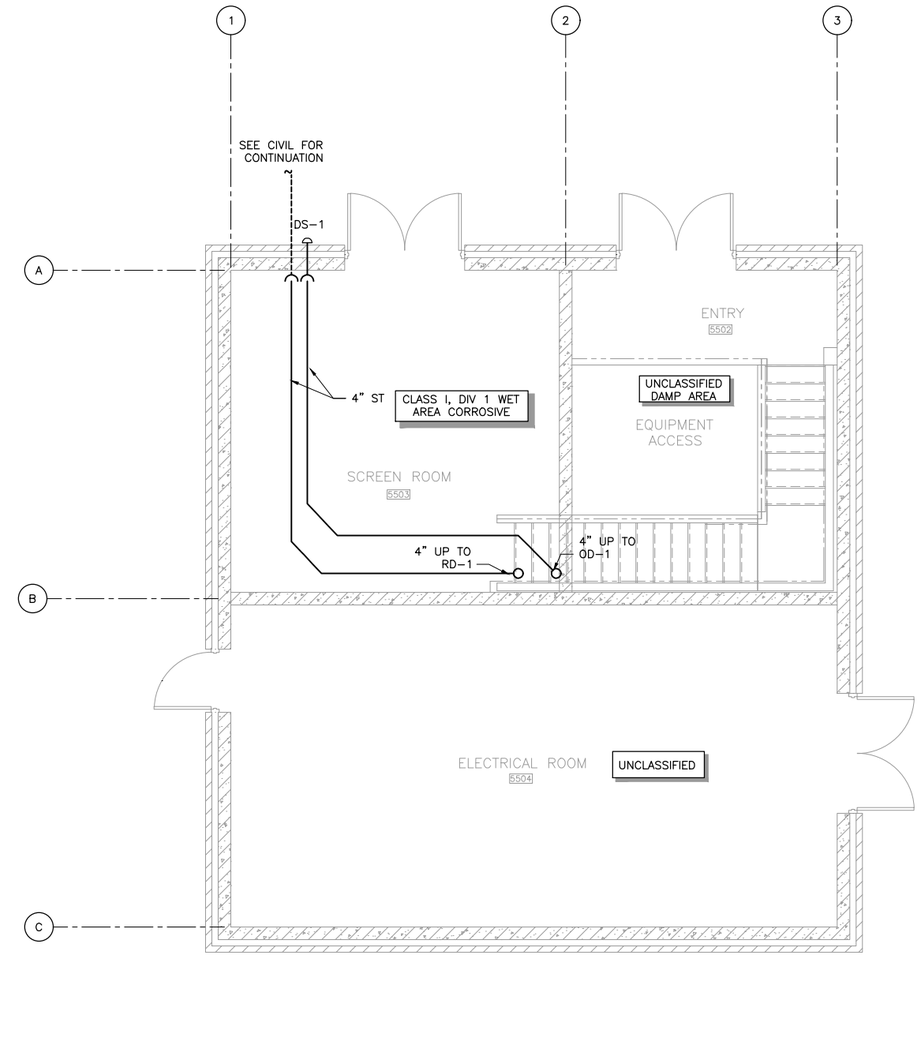
SHEET NO.
M.550

Xrefs: xgl-1-dh01; XS-550-P00; XS-550-GRID; XMHP-550-P00



1 OPERATING LEVEL HVAC PLAN

SCALE: 1/4"=1'-0"



2 OPERATING LEVEL PLUMBING PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:

1. MECHANICAL EQUIPMENT ON ROOF SHALL BE INSTALLED NOT LESS THAN 10'-0" FROM ROOF EDGE.
2. CONTRACTOR SHALL VERIFY ALL DUCTWORK ROUTING PRIOR TO FABRICATION. FINAL LOCATION OF DUCTWORK SHALL BE COORDINATED WITH NEW STRUCTURE, PIPING, ELECTRICAL, LIGHTING, ETC.
3. PROVIDE BALANCING DAMPERS ON ALL DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS

KEY NOTES: ⟨-⟩

1. SUPPLY AND EXHAUST DUCTWORK SHALL BE ALUMINUM CONSTRUCTION, DAMPERS SHALL BE ALUMINUM CONSTRUCTION. DUCTWORK HANGERS, HANGER RODS, ETC. SHALL BE STAINLESS STEEL.
2. SUPPLY AND EXHAUST DUCTWORK SHALL BE STAINLESS STEEL.
3. SUPPLY AND EXHAUST DUCTWORK SHALL BE GALVANIZED STEEL

PRELIMINARY
NOT FOR CONSTRUCTION

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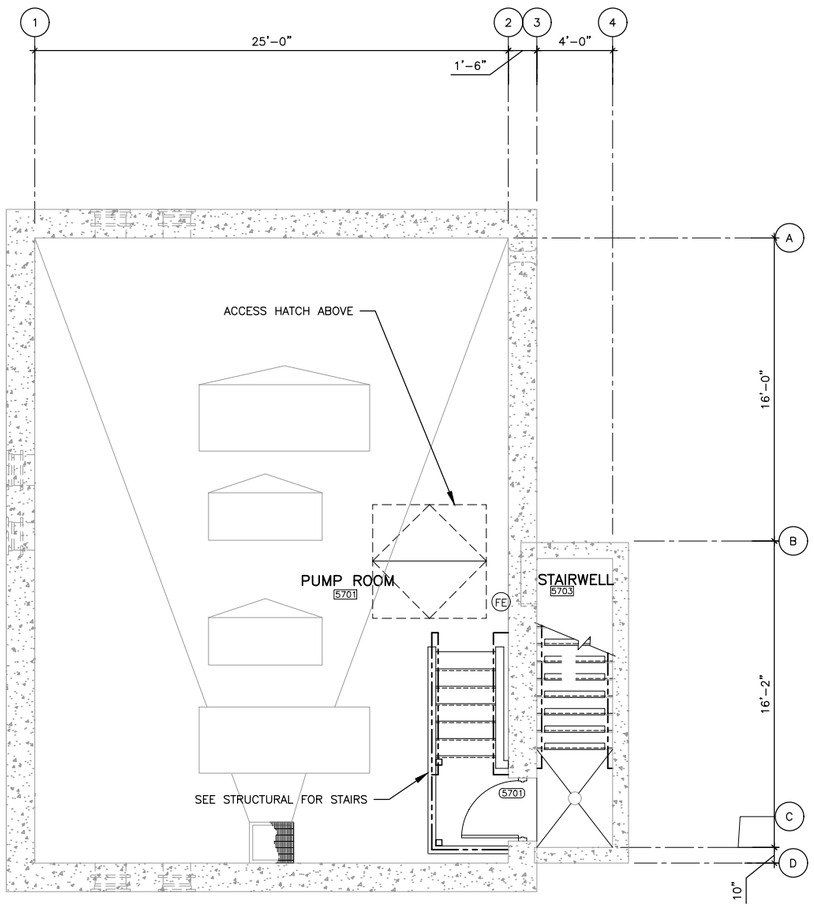
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

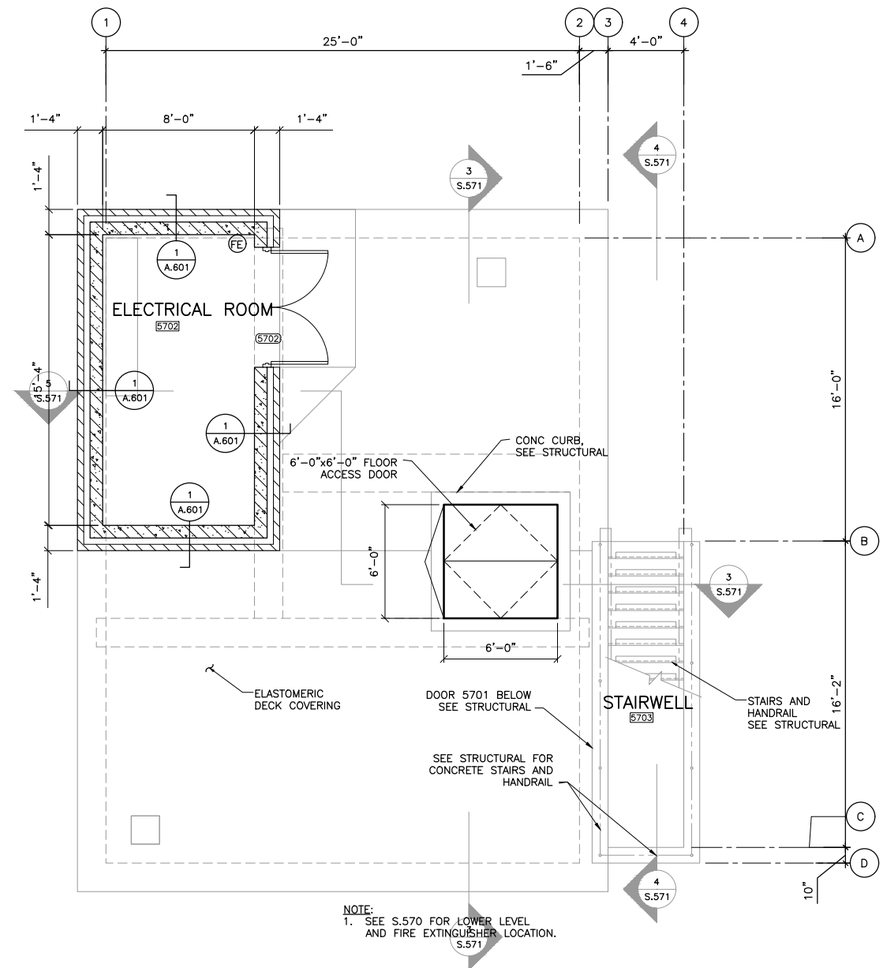
SOLIDS PROCESSING BUILDING – 550
MECHANICAL
OPERATING LEVEL PLUMBING AND HVAC PLAN

SHEET NO.
M.551

Xrefs: xgt-1-dh01; XA-550-P01; XS-550-GRID; XMHP-550-P01



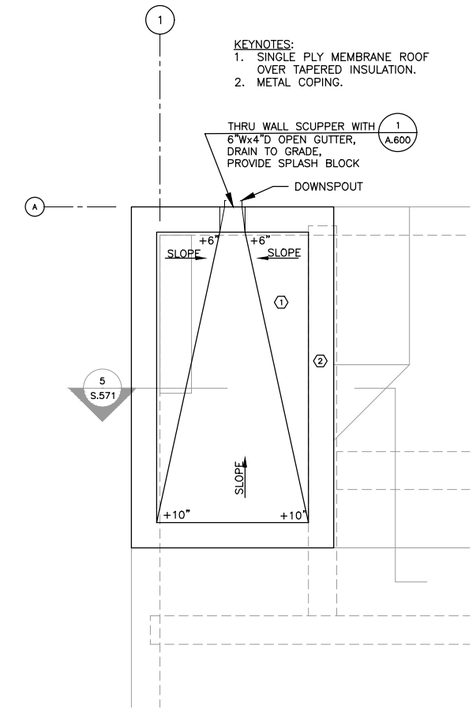
1 LOWER LEVEL PLAN
SCALE: 1/4"=1'-0"



NOTE:
1. SEE S.570 FOR LOWER LEVEL AND FIRE EXTINGUISHER LOCATION.

2 OPERATING LEVEL PLAN
SCALE: 1/4"=1'-0"

KEYNOTES:
1. SINGLE PLY MEMBRANE ROOF OVER TAPERED INSULATION.
2. METAL COPING.



3 ROOF PLAN
SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
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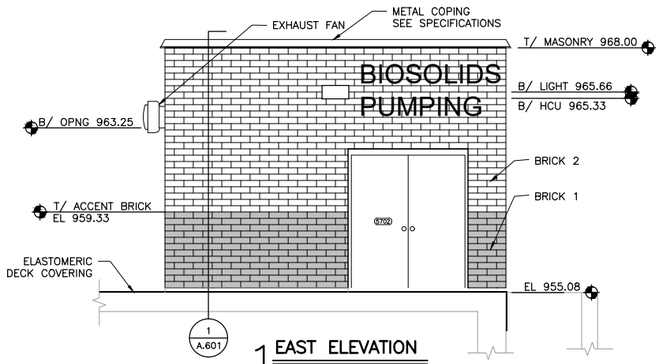
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

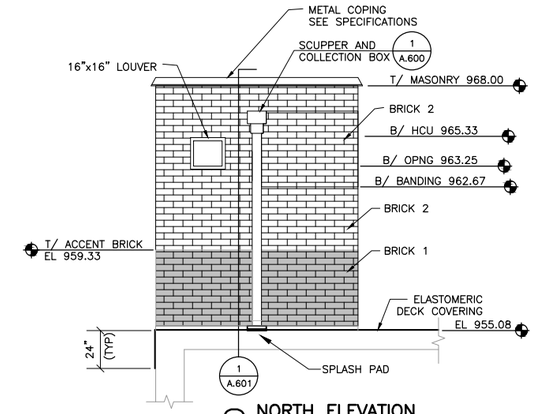
BIOSOLIDS PUMPING BUILDING – 570
ARCHITECTURAL
OPERATING LEVEL PLANS

SHEET NO.
A.570

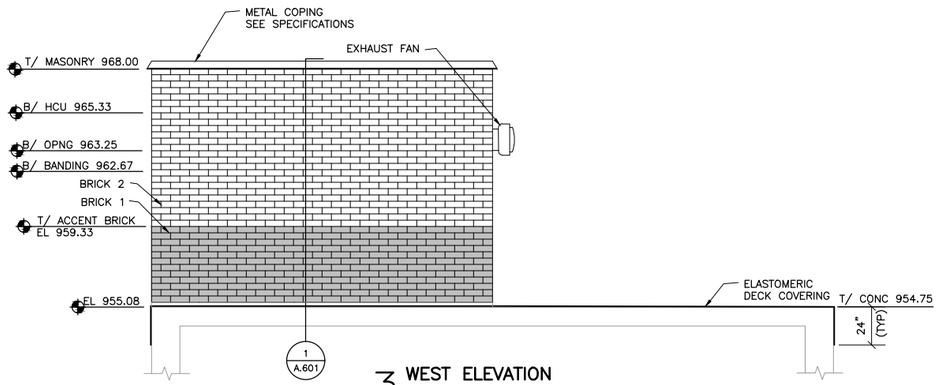
Xrefs: xgt-1-dh01; XA-570-P01; XS-570-P01; XA-570-P02 ROOF PLAN; XS-570-GRID; XS-570-P00



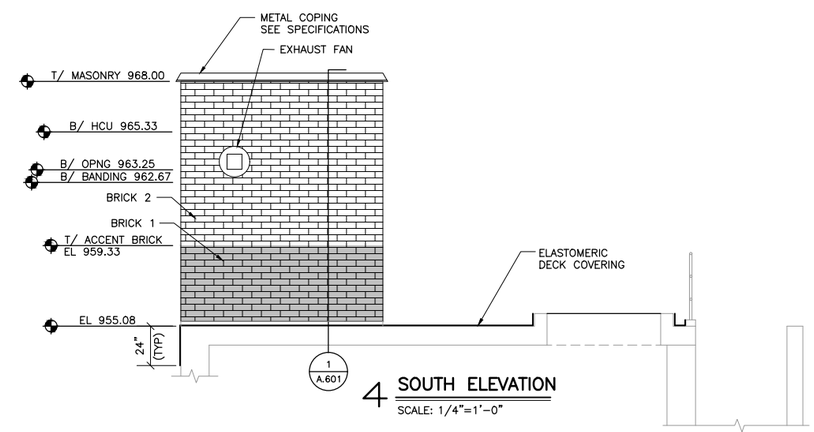
1 EAST ELEVATION
SCALE: 1/4"=1'-0"



2 NORTH ELEVATION
SCALE: 1/4"=1'-0"



3 WEST ELEVATION
SCALE: 1/4"=1'-0"



4 SOUTH ELEVATION
SCALE: 1/4"=1'-0"

NOTES:
SEE A.600 SERIES FOR DOOR AND WINDOW TYPES AND DETAILS.
COORDINATE LOCATIONS OF HEAT TAPE ELECTRICAL WITH DOWNSPOUT LOCATIONS (TYP)

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: CMB	JOB DATE: 2020	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: DJH	JOB NUMBER: 160473		
CAD DATE: 7/31/2020 12:24:19 PM			
CAD FILE: J:\2016\160473\CAD\Dwgs\A\A.571 EXTERIOR ELEVATIONS.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

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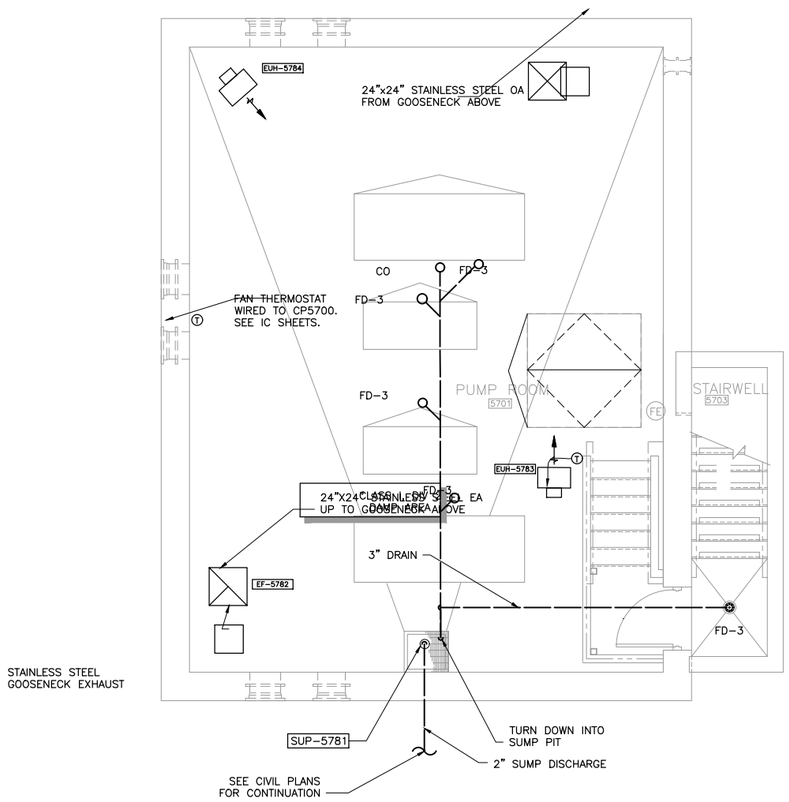
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

BIOSOLIDS PUMPING BUILDING – 570
ARCHITECTURAL
EXTERIOR ELEVATIONS

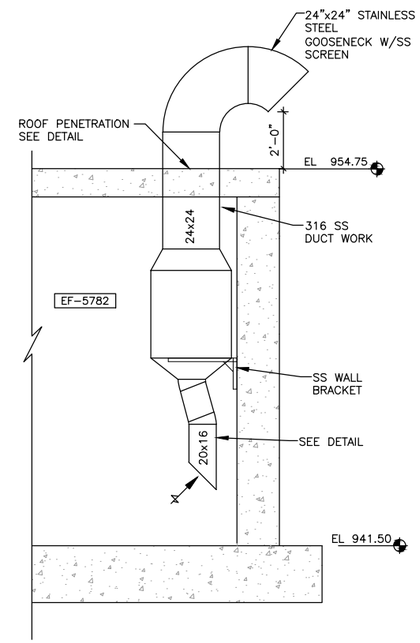
SHEET NO.
A.571

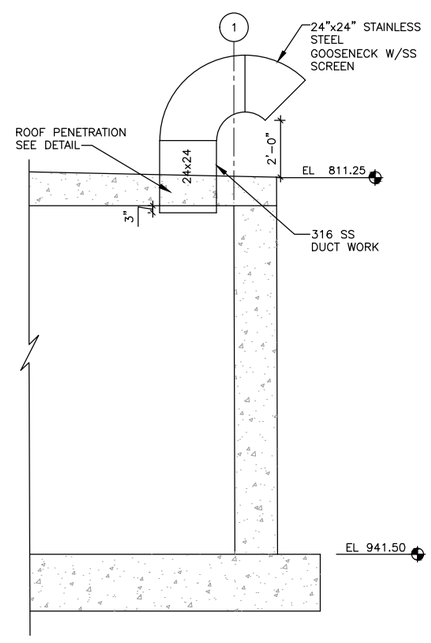
Xrefs: xgl-1-dh01; XA-570-E01

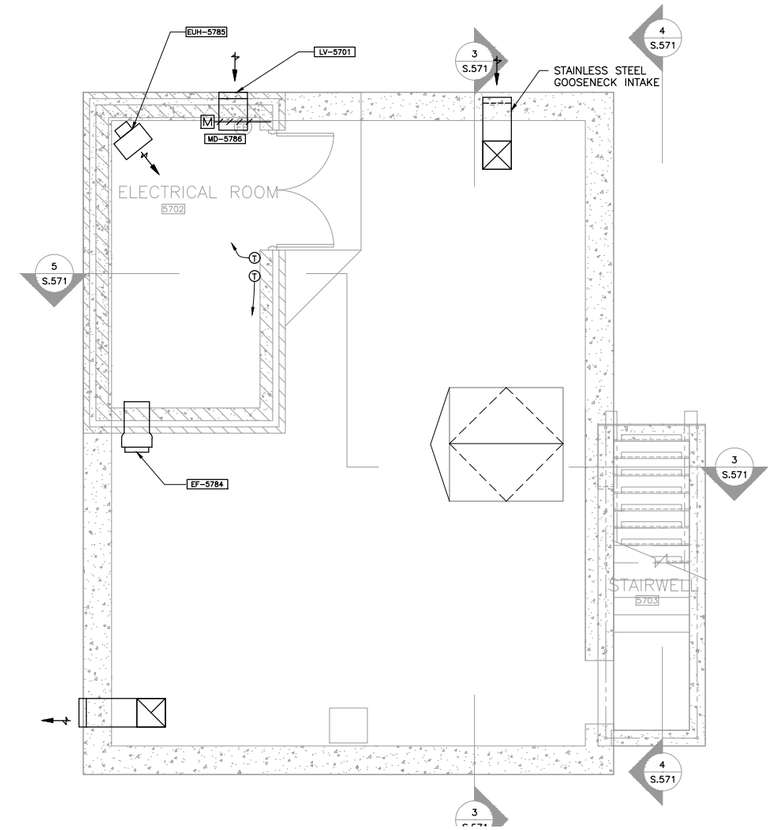


1 LOWER LEVEL HVAC PLAN

SCALE: 1/4"=1'-0"







2 LOWER AND UPPER LEVEL HVAC PLAN

SCALE: 1/4"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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APPROVED: DAS	JOB NUMBER: 160473		
CAD DATE: 7/29/2020 11:22:43 AM			
CAD FILE: J:\2016\160473\CAD\Dwgs\M\M.570 LOWER AND OPERATING LEVEL HVAC PLAN.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

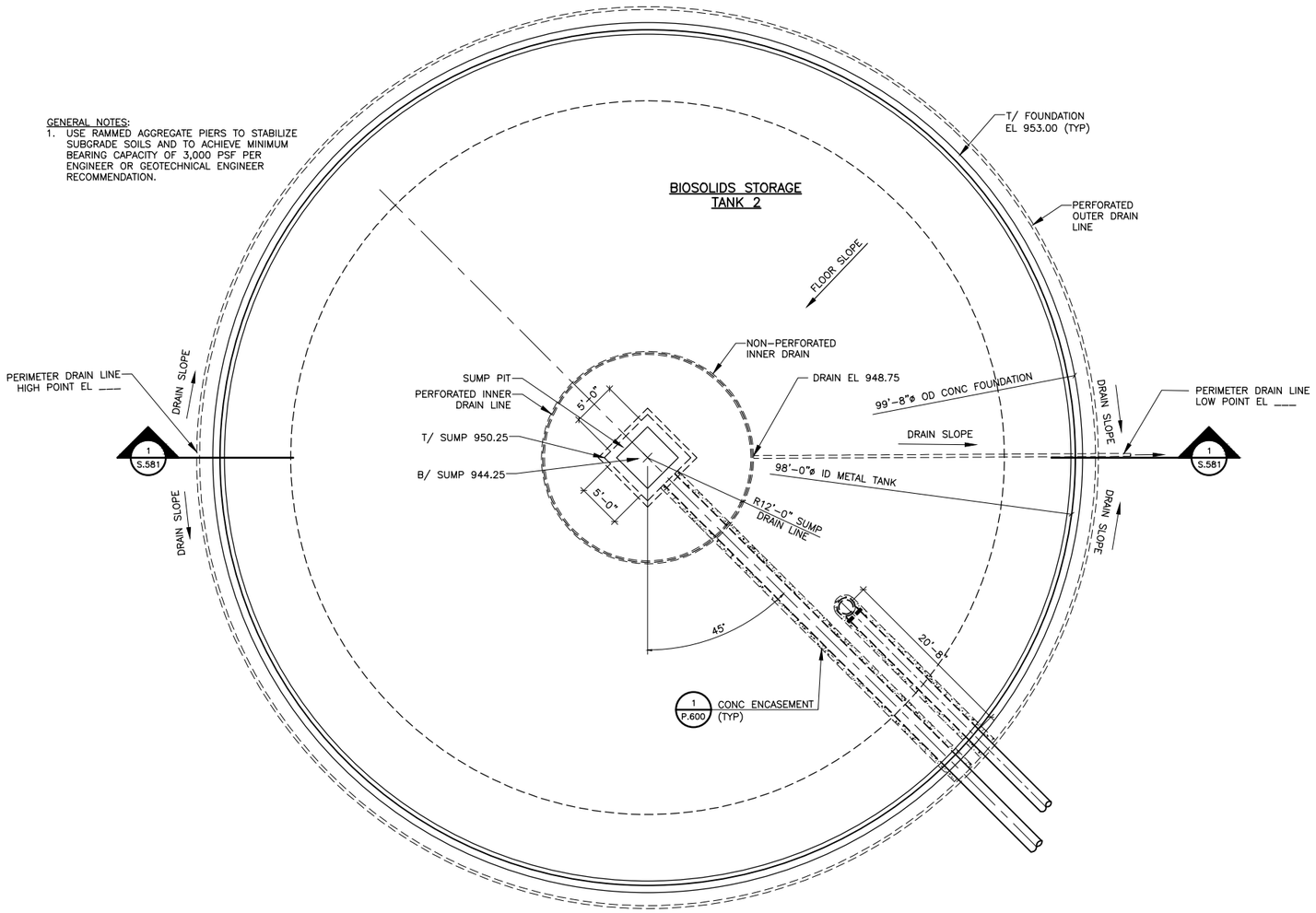
NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

BIOSOLIDS PUMPING BUILDING – 570
MECHANICAL
LOWER AND OPERATING LEVEL HVAC PLAN

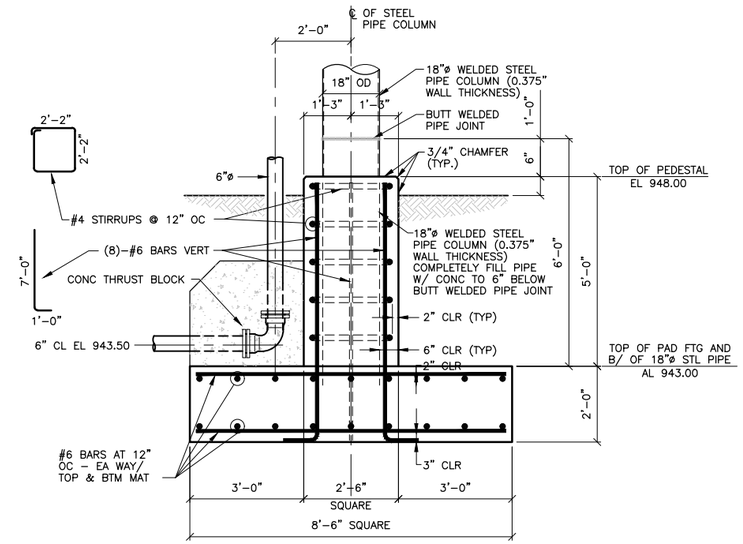
SHEET NO.
M.570

Xrefs: xgl-1-dh01; xs-570-p00; XS-570-P01; XA-570-P01; XMHP-570-P00; XMHP-570-P01

GENERAL NOTES:
1. USE RAMMED AGGREGATE PIERS TO STABILIZE SUBGRADE SOILS AND TO ACHIEVE MINIMUM BEARING CAPACITY OF 3,000 PSF PER ENGINEER OR GEOTECHNICAL ENGINEER RECOMMENDATION.



1 LOWER LEVEL SUCTION PLAN
SCALE: 1/8"=1'-0"



2 LOADOUT PIPE DETAIL
SCALE: 1/2"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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NO.	DATE	BY	REVISION DESCRIPTION

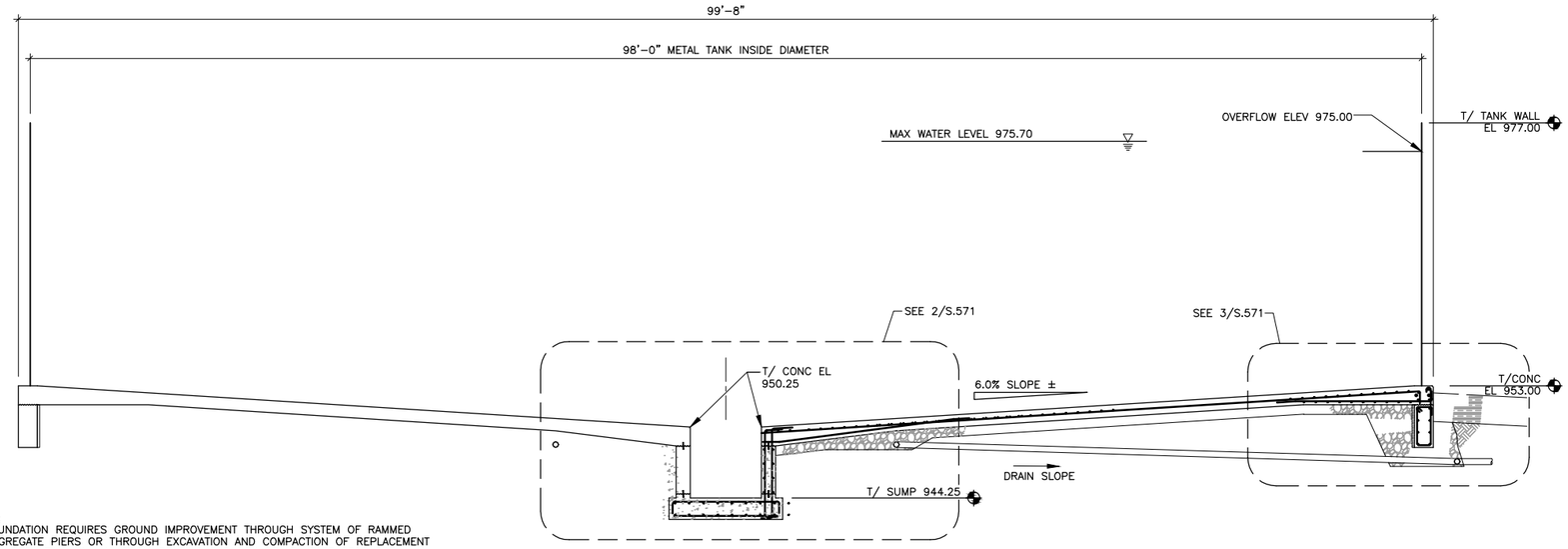
HRGreen.com
HRGreen

NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

BIOSOLIDS STORAGE TANKS – 580
STRUCTURAL
FOUNDATION PLAN

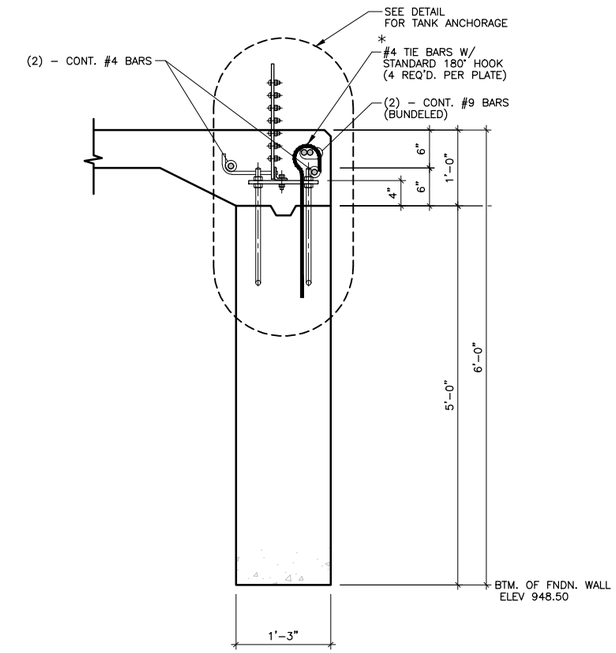
SHEET NO.
S.580

Xrefs: xgt-1-dh01; XS-580-P00; XS-580-D00

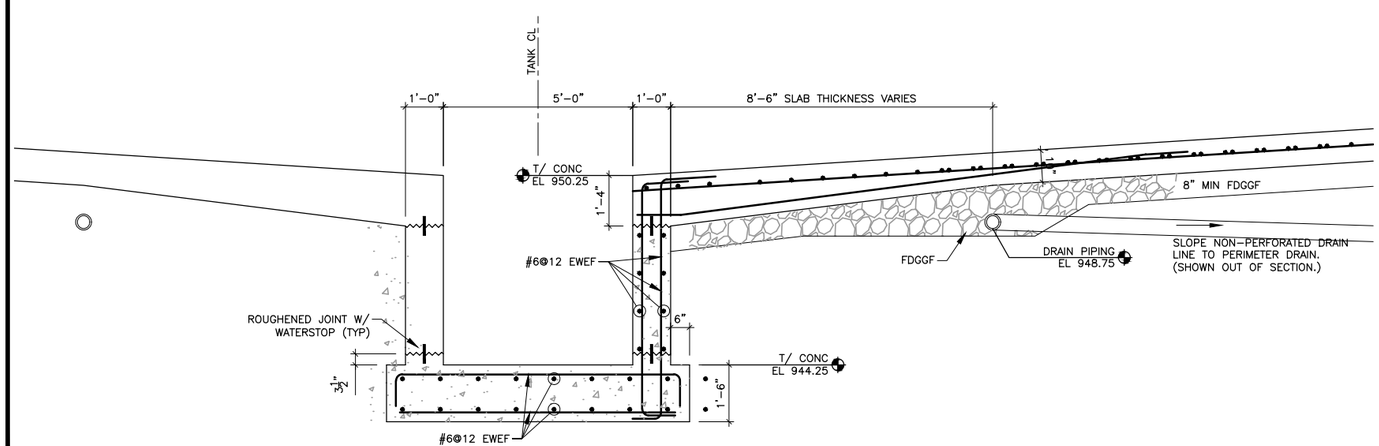


NOTES:
1. FOUNDATION REQUIRES GROUND IMPROVEMENT THROUGH SYSTEM OF RAMMED AGGREGATE PIERS OR THROUGH EXCAVATION AND COMPACTION OF REPLACEMENT FILL RESULTING IN A UNIFORM BEARING CAPACITY OF AT LEAST 2500 PSF.
2. DRAINAGE SYSTEM IS REQUIRED WITH A MINIMUM OF 8" OF FREE DRAINING GRADED GRANULAR FILL MATERIAL (FDGGF) BENEATH ALL CONCRETE SLABS AND FOUNDATIONS AT 1% SLOPE TO PERIMETER DRAINS AND FROM THERE TO SITE DRAINAGE SYSTEM AT 1% SLOPE.

1 SECTION
SCALE: 3/16"=1'-0"



4 TANK CONNECTION DETAIL
SCALE: 1"=1'-0"



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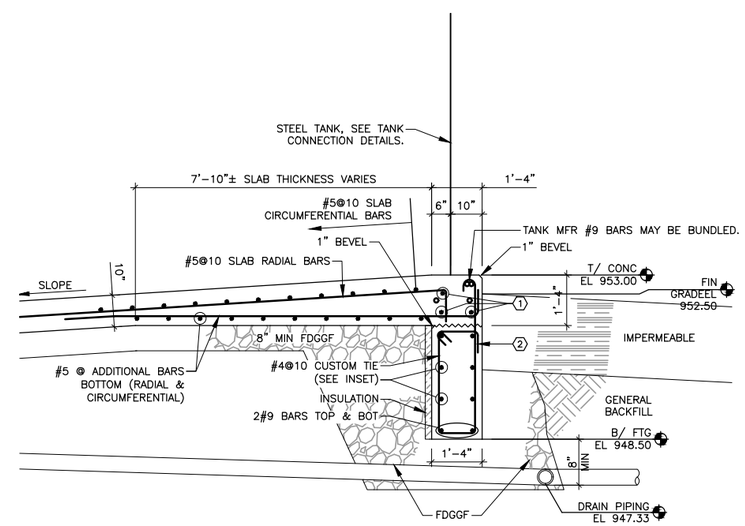

3 PERIMETER SECTION
SCALE: 1/2"=1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

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NO.	DATE	BY	REVISION DESCRIPTION

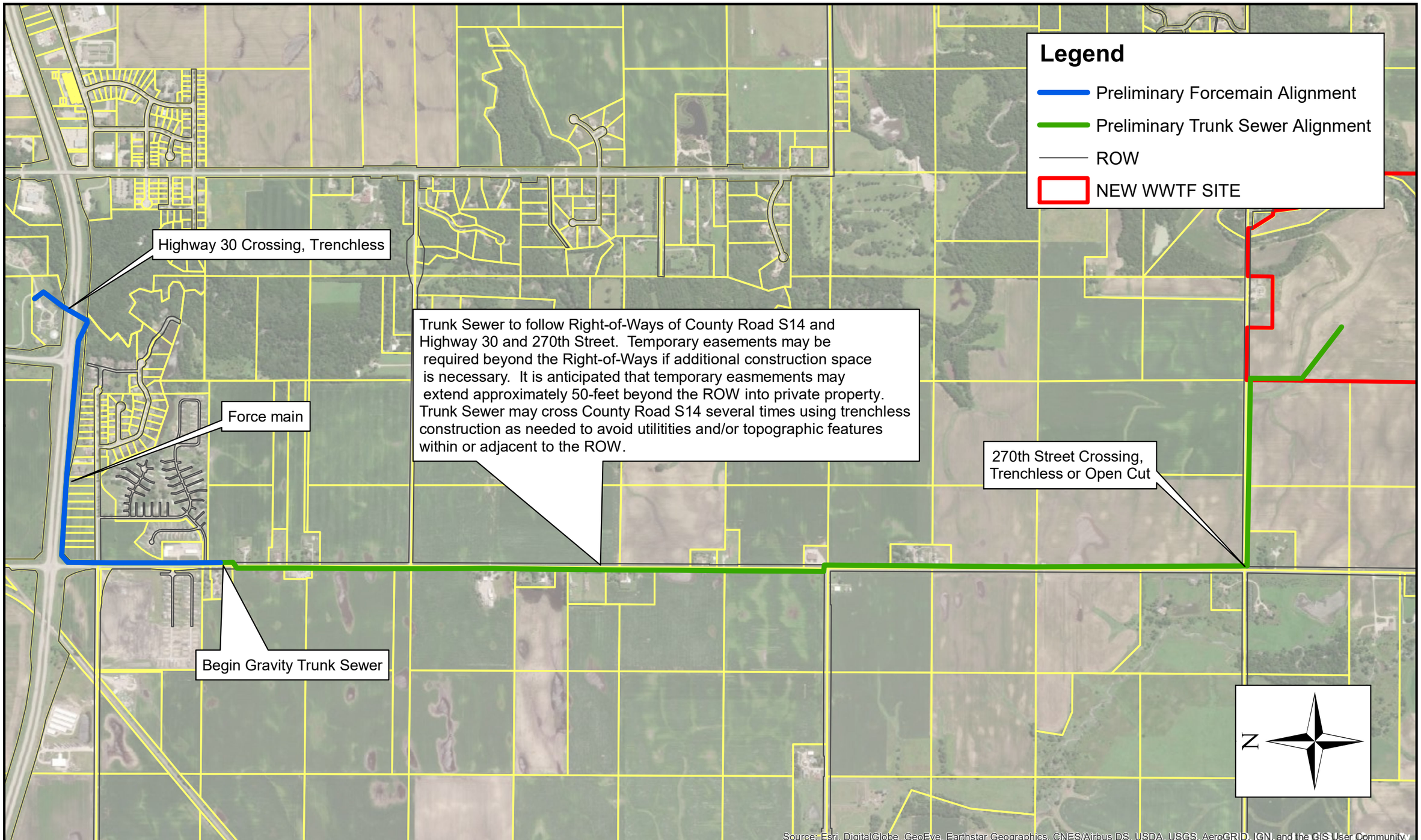
HRGreen.com
HRGreen

NEVADA WWTF IMPROVEMENTS
CITY OF NEVADA
NEVADA, IOWA

BIOSOLIDS STORAGE TANKS - 580
STRUCTURAL
SECTIONS

SHEET NO.
S.581

Xrefs: xgt-1-dh01; XS-580-500



Drawn By: MROTH Job Date: 2020
Approved: X.X.X. Job Number: XXXXXXX
GIS Date: 10/1/2020 4:31:30 PM
GIS File: Preliminary Trunk Sewer-Revised_alignment

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen

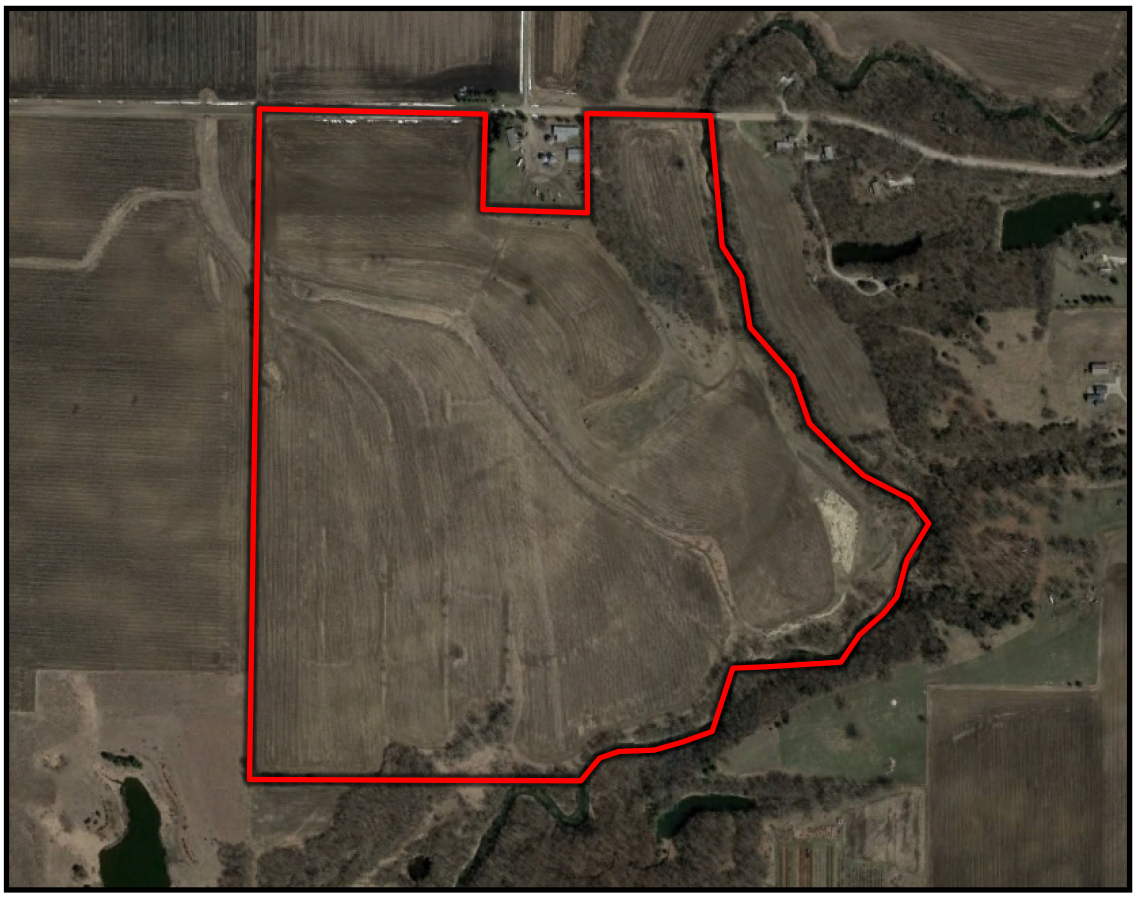
NEVADA WWTF
NEVADA, IOWA
2020

GENERAL
PRELIMINARY TRUNK SEWER ALIGNMENT

SHEET NO.
00

HRG PLOT: 4:31:52 PM 10/1/2020 BY: mroth FILE: J:\2016\160473\Design\GIS\MXD\CUP Exhibit\Preliminary Trunk Sewer-Revised_alignment.mxd

CONSULTING REPORT



CITY OF NEVADA

PROPOSED WWTP

STORY COUNTY, IA

BH Appraisal Services LLC

Land & Farm Valuation
Consulting Services

Brad Hayes

Owner/Certified General Appraiser

Phone: (641) 757.9808

Email: brad@bhappraisals.com

P.O. Box 573, Panora, Iowa 50216

October 14, 2020

HR Green, Inc.

ATTN: Mr. Larry Stevens

5525 Merle Hay Road, Suite 200

Johnston, IA 50131

Dear Mr. Stevens,

Per your request, I have researched public market data and visited with market participants in regards to the proposed Waste Water Treatment Plant that is to be constructed at a location approximately three miles south of the City of Nevada. I have concluded that such use of the proposed Waste Water Treatment Plant will not diminish or impair established property values in adjoining or surrounding property.

Thank you for the opportunity to develop this report. If you have any questions, please feel free to contact me.

Sincerely,

Bradley E. Hayes

Brad Hayes
Certified General Appraiser

BH Appraisal Services, LLC

P.O. Box 573

Panora, IA 50216

Brad@BHAppraisals.com

Phone: (641) 757-9808

SCOPE OF WORK

The purpose of this assignment is to determine if the proposed Waste Water Treatment Plant will diminish or impair established property values in adjoining or surrounding property.

I, Brad Hayes, have conducted the following research:

I visited with property owners in central Iowa whom live near Waste Water Treatment Plants and/or Sanitary Landfills in rural areas. Per my conversations, the owners indicated that there were no significant adverse effects caused by the facilities on the use and enjoyment of their property.

I researched Story County records and found two residential acreages that are located in close proximity to the current Nevada Waste Water Treatment Plant. These two residences are located approximately 1,450' and 1,340' from the Waste Water Treatment Plant. Per the Story County records, these two residences were constructed after the Waste Water Treatment Plant was constructed and in operation. This indicates that presence of the Waste Water Treatment Plant did not deter the construction of new rural residential acreages. In addition to the two acreages, single-family residential subdivisions were constructed in areas located southwest and southeast of the current waste water treatment plant. These subdivisions were constructed after the Waste Water Treatment Plant was constructed and in operation.

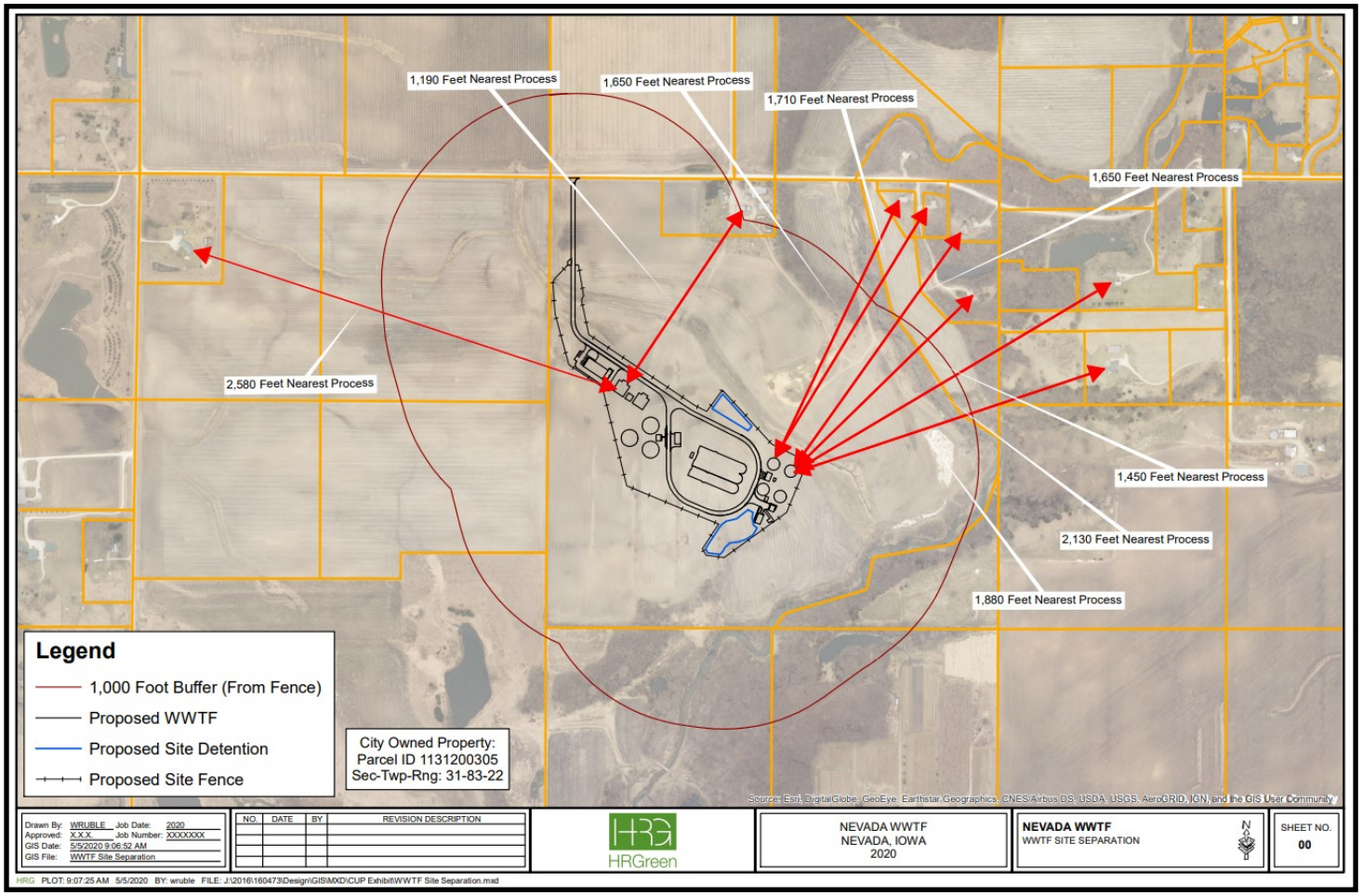
I recently conducted a market study on residential properties in the City of Indianola which is the county seat of Warren County. This included researching MLS sales data of residential properties in the City of Indianola that are located near the Waste Water Treatment Plant, near the City Landfill, and properties that are not located in close proximity to such facilities. This data set included a total of 113 residential home sales and the average value of residential properties located near the Waste Water Treatment Plant and City Landfill was bracketed by the average value of residential properties that are not located near such facilities. Although Indianola is a community that is located in a different area of the State, this information is leveraged as support for the appraiser's conclusion.

I visited with local realtors and appraisers. Per our discussions, the proposed Waste Water Treatment Plant will not diminish or impair established property values given the location and distance of separation between the plant and the surrounding residences. The majority of the adjoining and surrounding property is in agricultural production and/or consists of residential acreages. Per the project specifications provided to the appraiser by HR Green, Inc. in regards to the proposed Waste Water Treatment Plant, the proposed facility will not have any adverse effects on the adjoining or surrounding property that would supersede the typical agricultural operational thresholds in the area.

COMPENTENCY PROVISION

Brad Hayes is a Certified General Real Property Appraiser currently certified in the State of Georgia, Idaho, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oregon, South Carolina, South Dakota, and Washington. Brad Hayes has a Bachelor's Degree in both Real Estate and Finance from the University of Northern Iowa and has also taken appraisal courses through the Appraisal Institute and American Society of Farm Managers & Rural Appraisers (ASFMRA). The appraiser has the knowledge, education, and expertise to value this type of property.

MAP - DISTANCE OF SEPARATION



PHOTOGRAPHY

APPRAISER CERTIFICATION

I, Brad Hayes, certify, to the best of my knowledge and belief:

1. The statements of fact contained in this report are true and correct and no important facts have been withheld.

2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions and are my personal, impartial and unbiased professional analysis, opinions, and conclusions.

3. I have no present or prospective interest in the property that is the subject of this report and I have no personal interest with respect to the parties involved.

4. I have performed no services, as an appraiser or in any other capacity, regarding the property that is the subject of this report within the three year period immediately preceding acceptance of this assignment.

5. I have no bias with respect to the property that is the subject of this report or to the parties involved with this assignment.

6. My engagement in this assignment was not contingent upon developing or reporting predetermined results.

7. My compensation for completing this assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this report.

8. The reported analyses, opinions and conclusions were developed, and this report has been prepared in conformity with the requirements of the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute.

9. The use of this report is subject to the requirements of the Appraisal Institute relating to review by its duly authorized representatives.

10. As of the date of this report, I have completed the Standards and Ethics Education Requirements for Candidates of the Appraisal Institute.

11. I have made a personal inspection of the property that is the subject of this report.

12. No one provided significant real property appraisal assistance to the appraiser(s) signing this certification.

Bradley E. Hayes

Brad Hayes
Certified General Appraiser

APPRAISER QUALIFICATIONS

Brad Hayes is a Certified General Real Property Appraiser currently certified in the State of Georgia, Idaho, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, Oregon, South Carolina, South Dakota, and Washington.

Brad has a Bachelor's Degree in both Real Estate and Finance from the University of Northern Iowa and has also taken appraisal courses through the Appraisal Institute and American Society of Farm Managers & Rural Appraisers (ASFMRA). Brad works with attorneys, lenders, and land owners on projects that are primarily located throughout Iowa.

Brad resides in west-central Iowa, where he grew up, and is actively involved in his family's cow/calf operation.

Professional Affiliations:

American Society of Farm Managers and Rural Appraisers (ASFMRA)

ASFMRA Young Professionals Network (YPN)

Candidate for Designation of the Appraisal Institute

Realtors Land Institute

Young Professionals in Agriculture

Iowa Cattlemen's Association

Iowa Farm Bureau

Brad Hayes
Certified General Appraiser

BH Appraisal Services, LLC

P.O. Box 573

Panora, IA 50216

Brad@BHAppraisals.com

Phone: (641) 757-9808

APPRAISER QUALIFICATIONS

IOWA REAL ESTATE APPRAISER EXAMINING BOARD

Bradley E. Hayes

having passed all examinations and complied with all other requirements prescribed by statute and The Real Estate Appraiser Examining Board, is hereby granted this Certificate as a

CERTIFIED GENERAL REAL PROPERTY APPRAISER

In the State of Iowa

In Witness Whereof, this Certificate is granted under the Seal of said Board

this 3rd day of *January 2017* Certificate Number *CG03183*

Chair

Vice Chair

Fields of Opportunities

STATE OF IOWA

IOWA DEPARTMENT OF COMMERCE
PROFESSIONAL LICENSING AND REGULATION

This is to certify that the below named has been granted a certification as: Certified General Appraiser.

Certification Number: CG03183 Expires: June 30, 2022

Status: Active

Brad Hayes
BH Appraisal Services, LLC
2821 Highway 44, P.O. Box 573
Panora, Iowa 50216

Staff Report

Story County
Board of Adjustment

Date of Meeting:
October 21, 2020

Case Number CUP07-20
Cambridge Waste Water Outfall Pipe

APPLICANT: Steve Van Dyke/City of Cambridge
225 S Water Street
Cambridge, IA 50046

STAFF PROJECT MANAGER: Marcus Amman, Planner

SUMMARY: The City of Cambridge is proposing the construction of a new waste water outfall pipe from their existing lagoon system. The current outfall pipe does not meet the distance requirements for ammonia and E. Coli mixing measurements. The proposed outfall pipe would allow for the city to meet IDNR ammonia and E. Coli mixing requirements at a distance of 2,000 feet from the closest creek. The proposed pipe will be directionally bored to the new outlet location on the south side of the Heart of Iowa bridge that goes over the South Skunk River on property owned by Story County Conservation. The Story County Planning and Zoning Commission are recommending that the Story County Board of Adjustment approves the Conditional Use Permit with a condition with a 7-0 vote.

Property Information

PROPERTY OWNERS

Story Country
Story County Conservation Board
56269 180th ST
Ames, IA 50010

GENERAL PROPERTY LOCATION

Section: 22 Township: 82 Range: 23 SW SW

SITE ADDRESS

East of Center Street
Cambridge, IA 50046

PARCEL IDENTIFICATION NUMBER(S)

14-22-300-600 28.79-Gross Acres

CURRENT ZONING

A-1, Agricultural District

CURRENT LAND USE

The current land use at the proposed site is agricultural conservation and is part of the Heart of Iowa Trail. The property is mainly surrounded by agricultural uses to the south and east. Directly west of this parcel, is another parcel owned by Story County and is also part of the Heart of Iowa Trail. The parcel to the north contains the Cambridge Waste Water treatment plant that the outfall pipe will transport treated water from to the South Skunk River.

FUTURE LAND USE MAP DESIGNATION

Agricultural Conservation

CITIES WITHIN TWO MILES

Cambridge

Floodplain

Yes, applicant will need a county Floodplain Permit to construct the proposed outfall pipe in the flood plain.

The following items were submitted by the applicant: CUP Application, Site Plan, narrative describing need of the outfall pipe, proposed specifications, and responses to County Staff review comments.

Background

This Conditional Use Permit addresses a proposed new 18” outfall pipe for the City of Cambridge wastewater lagoon system. The City of Cambridge, Iowa operates a continuous discharge aerated lagoon wastewater treatment facility. This system treats sewage from Cambridge, primarily

originating from domestic sources. In addition, the system also treats "Inflow and Infiltration (I&I)", which is essentially non-sewage water that leaks into the sanitary collection system from leaky pipes, surface drain connections, sump pump connections and other sources. The aerated lagoon type of treatment employed at Cambridge has no issues handling the additional flow from these I&I sources, so this is not considered to a significant problem.

With the aerated lagoon type of treatment system, wastewater is treated over a long period of time in very large earthen lagoons. Aeration is provided by mechanical blowers and a network of diffusers on the bottom of the lagoons. The aeration helps to mix the contents of the lagoons and provides oxygen to the micro-organisms that break down the waste thereby cleaning the water. After treatment, the cleaned effluent is discharged to the South Skunk River via an existing outfall pipe.

The treatment system is located on the east side of town near the South Skunk River. The original wastewater system, including collection system and controlled discharge lagoons, were constructed in the early 1970's. One of the two original lagoons was converted to a three cell aerated lagoon in 2002. Since that time, the treatment system has performed very well; reliably and consistently meeting the effluent limitations established in the discharge permit issued by Iowa Department of Natural Resources (IDNR), according to the City's engineering consultant Fox Engineering.

The plant was not designed to meet any specific effluent ammonia limitations. The purpose of this project is to make improvements to the wastewater treatment facilities to enhance their reliability, increase capacity, to adequately treat for Ammonia and E. Coli in order to safely and reliably operate the City of Cambridge's wastewater system for the next 20 years. Four different options were considered for this project, with the outfall pipe being the most cost effective option for the City of Cambridge. An easement of approximately 6,500 sqft for this project has been granted from Story County Conservation and was recorded on 06/29/2020. The total estimated area that will be disturbed for construction of the outfall sewer is 0.58 acres, which is approximately 2% of the 28.79 parcel area. . The proposal is set to impact 2% of the natural area of the parcel, below the 15% threshold that would require any mitigation per the Story County Land Development Regulation.

Positive environmental effects will be improved treatment of the wastewater from the City of Cambridge, compliance with effluent discharge permit limits, reduced discharge of the pollutants ammonia and E. coli to the receiving stream, and improved water quality in the receiving stream.

The City of Cambridge did not receive a letter that initiated the need for this project. Their existing NPDES stated that there were new requirements that were not in place previously. IDNR issues wastewater dischargers like Cambridge updated NPDES permits approximately every five years. When Cambridge's permit was renewed in 2014, it included new ammonia limits and disinfection limits that their earlier permits did not have. This new permit initiated the need for this project.

Moving forward, the procedure and schedule for compliance with the IDNR requirements will be:

1. Complete construction of the project.
2. Complete an "in field" stream mixing zone study to document how well the effluent mixes with the river.
3. IDNR reviews and approves the mixing study report.
4. IDNR completes a new Waste Load Allocation (WLA) based on the mixing zone study results. The WLA will identify the ammonia limits needed to protect aquatic life in the river.

5. IDNR issues a new NPDES discharge permit to Cambridge with the new ammonia limits (which are set by the WLA).
6. For the life of the facility, the City is required to test the effluent weekly and report the results to IDNR monthly in order to document compliance with the NPDES permit requirements.

Bulk Standards

The outfall pipe will be directionally bored southeast of the waste water lagoon system. The proposed outfall pipe is unlikely be seen by anyone not on the South Skunk River. The purpose of this outfall pipe is to allow for the Cambridge waste water treatment facility to meet the DNR requirements for ammonia and E. Coli. The existing outfall pipe does not allow for the proper distance for the treated water to mix with the river due to the location of the existing perennial creek. The distance from the injection of the treated water to where the measurements are taken is 2,000 feet, unless another body of water joins the river. There is a perennial stream within 500 feet of the existing outfall pipe. This does not allow for enough mixing distance to meet the DNR ammonia and E. Coli requirements.

The property is located just southeast of the City of Cambridge limits, adjacent to the parcels that contain the waste water lagoon system. The property on which the proposed outfall pipe is to be constructed is 28.79 gross acres and owned by the Story County Conservation Board. The parcel to the south is in agricultural production and is 21.23 acres. The floodplain encompasses the proposed parcel, the parcel to the south, and the waste water lagoon system.

The proposed outfall pipe is slated to have the design completed in October of 2020. The project would go for public bidding in December of 2020. Construction would be slated to occur between March and December of 2021. The actual construction of the project is slated for four weeks. This timeline allows for the contractor's schedule as well as weather conditions to be taken into account.

Compatibility

The new 18" outfall pipe will be compatible with the development and use of adjacent properties. Because it is in the floodplain, future development of any adjacent areas is extremely unlikely. Wastewater treatment effluent is normally discharged into nearby streams or rivers as proposed with this project, so this is considered to be a normal feature along waterways. Access to the area is very limited to the public, so the improvements are expected to be relatively unnoticed when complete. The new outfall sewer will be buried. For the most part, it will not be noticeable after construction is complete. The only evidence of its existence from ground surface will be the three buried manholes and the outlet headwall structure. The manholes will be four feet inside diameter and constructed of precast concrete per SUDAS standards. Each manhole will have a 26-inch diameter cast iron cover, which is typical for municipal sewer construction. Each cover will be bolted down to prevent removal or blow off during a flood event, and each will be installed with the top flush with ground surface. The small outlet headwall structure will be constructed of cast in place concrete as shown in the drawings.

Transition

The proposed outfall pipe is being directionally bored below ground. No transition is proposed or needed. No buffering is needed.

Traffic

It is anticipated that Cambridge Staff will access the outfall site approximately one time per year on foot (no vehicles) to observe the headwall structure and check for damage or erosion concerns. Access would be via the existing permanent easement. No other access requirements are anticipated. The Heart of Iowa Trail will not be impacted by construction of the project.

Parking

During the construction of the outfall pipe, parking will take place on the subject property using existing access points to the property. No parking or equipment storage will take place in the right of way. No new parking or loading is proposed for this project.

Lighting

There are no signs or lighting is proposed.

Environmental Protection

The project will provide improved conditions from an environmental protection standpoint for safe recreational use of the river, with improved treatment and disinfection of the wastewater. The completed project will have no negative impacts on noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds. The total estimated area that will be disturbed for construction of the outfall sewer is 0.58 acres, which is approximately 2% of the 28.79 parcel area. Because the total estimated disturbed area for construction of the project is less than one acre, an NPDES General Permit No. 2 for Storm Water Discharge Associated with Industrial Activity or Construction Activities is not required. The Story County erosion control requirements of 88.05 (4) will be followed.

Proposed Outfall Pipe

Throughout construction and after, no significant environmental impacts are expected. This proposed outfall pipe is not anticipated to impact the supply or quality of light or air to the surrounding properties as it will be below grade. The outfall pipe is also not anticipated to impact any property values in the area and will not be seen except for where the pipe meets the river. The proposed site is located in a floodplain.

Analysis

A. Applicable Regulations: Chapter 90.04: Standards for Approval

The Planning and Zoning Commission shall review the proposed development for conformance to the following development criteria:

1. **Compatibility.** The proposed buildings or use shall be constructed, arranged and operated so as to be compatible with the character of the zoning district and immediate vicinity, and

not to interfere with the development and use of adjacent property in accordance with the applicable district regulations. The proposed development shall not be unsightly, obnoxious, nor offensive in appearance to abutting or nearby properties.

Applicant Comment: The new 18" outfall pipe will be compatible with the development and use of adjacent properties. Because it is in the floodplain, future development of any adjacent areas is extremely unlikely. Wastewater treatment effluent is normally discharged into nearby streams or rivers as proposed with this project, so this is considered to be a normal feature along waterways. Access to the area is very limited to the public, so the improvements are expected to be relatively unnoticed when complete. The new outfall sewer will be buried. For the most part, it will not be noticeable after construction is complete. The only evidence of its existence from ground surface will be the three buried manholes and the outlet headwall structure. The manholes will be four feet inside diameter and constructed of precast concrete per SUDAS standards. Each manhole will have a 26-inch diameter cast iron cover, which is typical for municipal sewer construction. Each cover will be bolted down to prevent removal or blow off during a flood event, and each will be installed with the top flush with ground surface. The small outlet headwall structure will be constructed of cast in place concrete as shown in the drawings.

Staff Comment: Wastewater treatment facilities are a conditional use in the A-1 District. The requirement for a conditional use permit is based on the provision of Chapter 90 Table 90-1 of the Story County Code of Ordinances. Wastewater treatment facilities do not have supplemental standards. The property on which the proposed structure is to be constructed is 28.79-gross acre parcel owned by the Story County Conservation Board with the existing Heart of Iowa Trail on it. The property is located just outside of the City of Cambridge limits, adjacent to the parcels that contain the waste water lagoon system. The parcel to the south is in agricultural production and is 21.23 acres. The floodplain encompasses the proposed parcel, the parcel to the south, and the waste water lagoon system. The proposed outfall pipe will not be seen unless on the river.

2. **Transition.** The development shall provide for a suitable transition, and if necessary, buffer between the proposed buildings or use and surrounding properties.

   Applicant Comment: There are no proposed buildings or surrounding properties that will be impacted by the improvements.

   Staff Comment: The proposed outfall pipe is being directionally bored below ground. No transition is proposed or needed. No buffering is needed.

3. **Traffic.** The development shall provide for adequate ingress and egress, with particular attention to vehicular and pedestrian safety and convenience, traffic flow and control, and emergency access.

   Applicant Comment: It is anticipated that Cambridge Staff will access the outfall site approximately one time per year on foot (no vehicles) to observe the headwall structure and check for damage or erosion concerns. Access would be via the existing permanent easement. No other access requirements are anticipated. The Heart of Iowa Trail will not be impacted by construction of the project.

Staff Comment: The traffic impact of the proposed structure is expected to be minimal. There is no proposed increase of traffic as a part of this new outfall pipe. The Heart of Iowa Trail is not going to be impacted.

4. **Parking and Loading.** The development shall provide all off-street parking and loading areas as required by this Ordinance, and adequate service entrances and areas. Appropriate screening shall be provided around parking and service areas to minimize visual impacts, glare from headlights, noise, fumes or other detrimental impacts.

   Applicant Comment: There will be no parking or loading requirements associated with this project.

   Staff Comment: During the construction of the outfall pipe, parking will take place on the subject property using existing access points to the property. No parking or equipment storage will take place in the right of way. No new parking or loading is proposed for this project.

5. **Signs and Lighting.** Permitted signage shall be in accordance with the applicable district regulations and shall be compatible with the immediate vicinity. Exterior lighting, if provided, shall be with consideration given to glare, traffic safety and compatibility with property in the immediate vicinity.

   Applicant Comment: There are no signs or lighting required or planned for this project.

   Staff Comment: There are no signs or lighting is proposed.

6. **Environmental Protection.** The development shall be planned and operated in such a manner that will safeguard environmental and visual resources. The development shall not generate excessive noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.

   Applicant Comment: The project will provide improved conditions from an environmental protection standpoint for safe recreational use of the river, with improved treatment and disinfection of the wastewater. The completed project will have no negative impacts on noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds. The total estimated area that will be disturbed for construction of the outfall sewer is 0.58 acres, which is approximately 2% of the 28.79 parcel area. Because the total estimated disturbed area for construction of the project is less than one acre, an NPDES General Permit No. 2 for Storm Water Discharge Associated with Industrial Activity or Construction Activities is not required. The Story County erosion control requirements of 88.05 (4) will be followed.

   Positive environmental effects will be improved treatment of the wastewater from the City of Cambridge, compliance with effluent discharge permit limits, reduced discharge of the pollutants ammonia and E. coli to the receiving stream, and improved water quality in the receiving stream.

Staff Comment: No vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds, are anticipated. The proposal is set to impact 2% of the natural area of the parcel, below the 15% threshold that would require any mitigation per the Story County Land Development Regulation.

If the Board concludes that all the above development criteria will be met, it must recommend approval of the application unless it concludes that, if completed as proposed, there is a strong probability the development will:

1. **Not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.**

   Staff Comment: The proposed outfall pipe will be over 150 feet from the north property line, with all other distances being greater. The proposed outfall pipe has a flap gate where the waste water will meet the river to protect from flood waters backing into the system or animals getting into the system. The outfall pipe will allow for the city to meet the IDNR ammonia and E. Coli requirements and continue to operate.

2. **Impair an adequate supply (including quality) of light and air to surrounding properties.**

   Staff Comment: The proposed outfall pipe will be below grade.

3. **Unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.**

   Staff Comment: No traffic impacts are expected from this project. No increase to hazards are expected.

4. **Diminish or impair established property values on adjoining or surrounding property.**

   Staff Comment: The Story County Assessor's Office raised no concerns with this item from the review of the requested Conditional Use Permit application. No impacts on property values are anticipated.

5. **Not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.**

   Staff Comment: The C2C plan is oriented toward preserving the county's rural character and high value agricultural land, protecting environmentally-sensitive areas, and identifying areas for future growth and development. The proposed outfall pipe will help the city be able to meet the IDNR requirements and allow for more waste water to be treated.

B. Burden of Persuasion.

1. **The burden of persuasion as to whether the development, if completed as proposed, will comply with the requirements of this Chapter is at all times on the applicant.**
2. **The burden of presenting evidence to the Board of Adjustment sufficient enough for it to conclude that the application does not comply with the requirements of this Chapter is upon the person or persons recommending such a conclusion, unless the information presented by the applicant warrants such a conclusion.**

Commentary

The following comments are part of the official record of the proposed **City of Cambridge Wastewater Outfall Pipe CUP07-20**. <u>If necessary, conditions of approval may be formulated based off these comments.</u>

Conceptual Review – September 17, 2020
Comments from the Assessor's Office
No comment
Comments from the Auditor's Office
No comment
Comments from the Engineer's Office
No comment
Comments from the Emergency Management's Office
No comment

Comments from the Interagency Review Team and applicant responses:

Planning and Development

1. For the Conditional Use Permit Application submittal, please provide written responses to each item in Ch. 90.04 Standards of Approval. *Provided*
2. Please confirm that on the proposed outfall pipe is planned to be located in unincorporated Story County. *Yes*
3. Please provide details about what will be treated, the treatment method and process, explain the quality of water discharged, impacts to South Skunk River, and IDNR requirements*. Provided*
4. Explain the high I/I flows identified in the narrative and will any of the proposed work effect this? *Project will not effect I/I*
5. Explain further about the A1, B(WW-2) stream designation and how the "mixing zone" area where the outfall pipe is planned will impact the stream.
    i. *B(WW-2) - Waters in which flow or other physical characteristics are capable of supporting a resident aquatic community that includes a variety of native nongame fish and invertebrate species. The flow and other physical characteristics limit the maintenance of warm water game fish populations. These waters generally consist of small perennially flowing streams.*
    ii. *A1 - Waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities sufficient to pose a health hazard. Such activities would include, but*

not be limited to, swimming, diving, water skiing, and water contact recreational canoeing.

6. Has annexation of the proposed work area been discussed with the City of Cambridge and Story County Conservation? *No, Story County Conservation is not in support of annexing the parcel into the City of Cambridge.*
7. When would work commence? *March-December 2021*
8. How long will the project take? *4 weeks*
9. Will the Heart of Iowa Trail be impacted during construction? If so is there a proposed detour? *Not being impacted.*
10. A Floodplain Permit will be required for the proposed work. Conditions of the U.S. Army Corps of Engineers and Iowa Department of Natural Resources including providing a No Rise Certificate from an Iowa Licensed Engineer will be required. Understood Also please comply with Chapter 80 Story County Flood Plain Management Program. Specifically Ch 80.12 (3) A. No use shall cause any increase in the one percent annual chance or greater flood level… C. No use shall affect the capacity of conveyance of the channel or floodway of any tributary to the main stream, drainage ditch or any other drainage facility or system. D. Utilities if permitted, shall meet the applicable development standards of the Floodway Fringe District and shall be constructed or aligned to present the minimum possible resistance to flood flows. Ch 80.13 (3) F Waste Water treatment facilities shall be provided with a level of flood protection equal to or greater than three (3) feet above the one percent annual chance or greater flood elevation. The base flood elevation near the proposed outfall pipe is 851'. Will the manhole covers be flush with the grade and water tight seals to protect against inundation of flood water? Flap gate information provided.
11. What is the annual expected maintenance to the outflow pipe? *Once a year*
12. Will you obtain an NPDES permit for the construction or will the proposed project be covered under the existing NPDES permit? Please provide a copy of the permit. Otherwise, Story County has requirements for erosion control for areas less than one acre disturbed found in Chapter 88.05 (4). *New NPDES is not required, will follow county requirements.*
13. The proposed construction area is in the Natural Resource Area. If over 15% of the natural areas are disturbed, mitigation requirements in Chapter 88.05 apply. Please confirm construction of the outflow pipe route will be directional bored in lieu of open trench. *Directional bored, little impact expected to natural resource area*
14. What is the estimated amount of natural areas to be disturbed? *2%*
15. Is there any other improvements to the water treatment plat planned in the next five years? If so what are they? *No improvements are planned.*
16. The CUP application submittal will be reviewed by County staff, the Planning and the Zoning Commission will make a recommendation to the Board of Adjustment at public meetings. The deadline for a CUP submittal for the October 7, 2020 Planning and Zoning Meeting is September 21, 2020. The Board of Adjustment would act on the CUP at their October 21, 2020 meeting.

Public notices were mailed to adjacent property owners within ¼ mile of the proposed site on September 30th, 2020.

Comments from the General Public:
Planning and Development received a phone call about the project on October 16th. Caller was concerned that the pipe would be on their property. Explained where the pipe is planned to go. Caller was satisfied.

Comments from the Planning and Zoning Commission October 7, 2020 meeting:

Marcus Amman presented the Staff Report. Amman stated the request for the outfall pipe will allow for the City of Cambridge to meet the Iowa Department of Natural Resources mixing requirement for Ammonia and E. Coli. Currently the outfall pipe is within 2,000 feet of a perennial stream and does not meet the mixing requirements. The new pipe will place be downstream of the perennial stream and will allow for the city to meet the mixing requirements.

Schneider had a question about if signs stating that treated waste water is being mixed in to the stream have been considered. There was questions about people or dogs getting to the river from the Heart of Iowa Trail. Amman stated that it would be very difficult to get from the trail to the river given the elevation of the trail and the brush that surrounds the trail. Steve Van Dyke from Fox Engineering (the applicant) also stated that there is no requirements for signs for this use.

The Planning and Zoning recommends the Board of Adjustment approve the Conditional Use Permit with a vote of 7-0.

Points to Consider for the Conditional Use Permit Request

1. Applicant addressed the need for the proposed outfall pipe. The purpose of the project is to make improvements to the wastewater treatment facilities to enhance their reliability, increase capacity, and to adequately treat for Ammonia and E. Coli in order to safely and reliably operate the City of Cambridge's wastewater system for the next 20 years.
2. The outfall pipe will allow the City of Cambridge to meet IDNR requirements.
3. The outfall pipe will be buried, the only portion that will be visible is where the pipe meets the river.
4. An easement has been granted for construction and maintenance of the outfall pipe by Story County Conservation to the City of Cambridge.
5. There is no traffic anticipated for this project.
6. No impacts to the Heart of Iowa Trail are anticipated.
7. No environmental impacts are expected.

Conditions of Approval

Chapter 90.05: Recommendations on Applications

<u>Planning and Zoning Commission Recommendation:</u>
Story County Planning and Zoning Commission recommends approval of the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20 with the following condition:

- **The applicant shall provide ammonia and E. coli mixing study results to the Planning and Development Department after construction and mixing study is completed.**

Alternatives

The Story County Board of Adjustment may consider the following alternatives:

1) The Story County Board of Adjustment approves the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, as submitted.

2) **The Story County Board of Adjustment approves the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, with conditions.**

3) The Story County Board of Adjustment denies the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20.

4) The Story County Board of Adjustment remands the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, back to the applicant for further review and/or modifications, and directs staff to place this item on a future Story County Planning and Zoning Commission agenda.

DATE: September 17, 2020

TO: Story County Planning and Development

RE: Wastewater Treatment Improvements
Cambridge, Iowa
FOX PN 2473-14A

COMMENTS:

The City of Cambridge, Iowa operates a continuous discharge aerated lagoon wastewater treatment facility. This system treats sewage from Cambridge, primarily originating from domestic sources. In addition, the system also treats "Inflow and Infiltration (I&I)", which is essentially non-sewage water that leaks into the sanitary collection system from leaky pipes, surface drain connections, sump pump connections and other sources. The aerated lagoon type of treatment employed at Cambridge has no issues handling the additional flow from these I&I sources, so this is not considered to a significant problem.

With the aerated lagoon type of treatment system, wastewater is treated over a long period of time in very large earthen lagoons. Aeration is provided by mechancial blowers and a network of diffusers on the bottom of the lagoons. The aeration helps to mix the contents of the lagoons and provides oxygen to the micro-organisms that break down the waste (BOD, TSS and ammonia described later), thereby cleaning the water. After treatment, the cleaned effluent is discharged to the South Skunk River via an existing outfall pipe.

The treatment system is located on the east side of town near the South Skunk River. The original wastewater system, including collection system and controlled discharge lagoons, were constructed in the early 1970's. One of the two original lagoons was converted to a three cell aerated lagoon in 2002. Since that time, the treatment system has performed very well; reliably and consistently meeting the effluent limitations established in the discharge permit issued by Iowa Department of Natural Resources (IDNR).

The IDNR classifies rivers and streams that receive treated wastewater from municipal wastewater treatment facilities based upon specific "designated uses". These designated uses are determined based on field investigations and other information. After IDNR proposes the designated uses for each individual stream, the EPA must approve of them before they are formally put into place. The South Skunk River at Cambridge is designated as Class B(WW-2) and A1, and descriptions of these two designated uses are summarized below:

- <u>Warm water - Type 2 (Class "B(WW-2)").</u> Waters in which flow or other physical characteristics are capable of supporting a resident aquatic community that includes a variety of native nongame fish and invertebrate species. The flow and other physical characteristics limit the maintenance of warm water game fish populations. These waters generally consist of small perennially flowing streams.

- Primary contact recreational use (Class "A1"). Waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities suffcient to pose a health hazard. Such activities would include, but not be limited to, swimming, diving, water skiing, and water contact recreational canoeing.

Each designated use has specific water quality requirements associated with it. The IDNR uses the water quality standards in their calculations for determining the limits for effluent parameters for the treatment system. These limits are then enacted in the treatment facility's National Pollution Discharge Elimination (NPDES) permit, which is issued by IDNR. With the proposed project completed, the following NPDES effluent permit limits are expected to apply to the Cambridge wastewater facility:

- Biochemical Oxygen Demand (BOD): The BOD test is a widely recognized procedure used to evaluate the organic strength of wastewater. It is also widely used to evaluate the efficiency of various treatment processes and to estimate the effects of pollution on receiving streams. This test is a measure of the quantity of dissolved oxygen required by bacteria to decompose organic materials in wastewater over a specified time period and at a specified temperature.

  BOD test results are usually reported in milligrams per liter (mg/l) of oxygen consumed at the end of a five-day test period that is conducted at a constant temperature of 20 degrees C. These results are referred to as the 5-day BOD (BOD5).

  The BOD5 of raw (untreated) wastewater from domestic sources will normally range from approximately 150 mg/l to 250 mg/l. Industrial discharges can cause higher or lower results. Excessive infiltration/inflow can cause lower results.

  The effluent limits for BOD for the Cambridge treatment facility will be 40 mg/L (average over seven days) and 25 mg/L (average over a month).

- Total Suspended Solids (TSS): The undissolved substances in wastewater that can be retained on a laboratory filter are referred to as TSS. It is a major parameter in evaluating wastewater strength and in determining efficiency of treatment processes. It is also used to estimate effects of pollution on receiving streams. Suspended solids test results are reported in terms of milligrams per liter.

  The effluent limits for TSS for the Cambridge treatment facility will be 120 mg/L (average over seven days) and 80 mg/L (average over a month).

- Ammonia: Ammonia is a gas that is very soluble in water and is the form of nitrogen most responsible for toxicity effects in aquatic life. Ammonia toxicity increases with higher temperatures and higher pH values. As a result, effluent ammonia standards vary throughout the year.

  The toxic impacts of ammonia are mainly based on concentration: more dilute concentrations would have lower toxic effects. IDNR has specific rules that they use to determine what concentrations of ammonia are safe to discharge. Under these rules, the effluent ammonia concentration is not required to meet the water quality standards right out of the pipe. Instead, they allow for the beneficial impact of dilution as the effluent is mixed with the stream. This

mixing occurs in a section of the stream referred to as the "Mixing Zone", which is typically 2,000 feet long. There are conditions which can shorten the allowed length of the Mixing Zone, such as the confluence of a perrenial stream with the river (as is the case for Cambridge - see below for more details).

Anticipated ammonia limits for Cambridge are summarized in the following table. Actual ammonia levels discharged are expected to range between 1 mg/L (summer) and 15 mg/L (winter):

Anticipated Ammonia Limitations

Month	Average Month Limit, mg/L	Peak Day Limit, mg/L
January	99.5	99.5
February	58.3	58.3
March	17.2	17.2
April	21.6	21.6
May	34.4	34.4
June	33.4	33.4
July	142.3	142.3
August	108.0	108.0
September	82.5	82.5
October	49.9	49.9
November	32.3	32.3
December	112.8	112.8

- Escherichia Coli (E. coli) Bacteria: Coliform bacteria are organisms that grow in huge numbers in the intestines of all warm blooded animals, including humans. Their presence may be indicative of the presence of disease causing pathogens.

  Coliform bacteria are measured as the "most probable number" of colonies per 100 mL sample (#/100 mL). The measure of coliform bacteria in the final effluent is a means for determining effectiveness of disinfection facilities. E. Coli is a type of coliform bacteria that is tested to determine compliance with disinfection requirements.

  The effluent limits for E. Coli for the Cambridge treatment facility will be 126 #/100 mL. Disinfection is only required from March 15 through October 15, as recreational use of the river would not be expected during cold weather periods.

- pH: pH is a term used to express the intensity of the acid or alkaline condition of a sample. The pH scale is usually represented as ranging from 0 to 14, with pH 7 representing absolute neutrality.

  The effluent limits for pH for the Cambridge treatment facility will be 6.2 to 9.0

Cambridge's current NPDES discharge permit was renewed by IDNR in May 2014. The renewed permit includes new, relatively low, ammonia limits that the existing facility cannot meet. Several alternatives were considered for addressing this situation. Initially, the City planned to install a new diffuser across the South Skunk River. The river diffuser would efficiently mix the treatment plant effluent with the entire river flow, thereby rapidly diluting the ammonia concentration. By changing the discharge in this way, IDNR would increase the ammonia limits to a level that the facilty could easily meet, thereby avoiding the excessive cost of treatment upgrades.

With a height of about 1.7 feet, the river diffuser would act similarly to a low head dam. As a result, a flood study was required to document no impact on flood levels. As part of this effort, several agencies were contacted for review and comment. These included US Fish and Wildlife, IDNR Fisheries, and the IDNR River Program. IDNR Fisheries expressed concern that fish would not be able to pass the diffuser during low river flows. IDNR River Program indicated that they have been working to remove low head dams on the South Skunk River to improve recreation and safety conditions. Various options were explored for mitigating these concerns, but ultimately it was found to be difficult to address the concerns while also achieving the effluent dispersion purpose of the diffuser.

A second alternative was considered to avoid the need for a river diffuser. This alternative consists of moving the discharge point further south. The existing outfall pipe discharges just upstream of the confluence of the South Skunk River and a perennial stream. Due to the rules IDNR uses when calculating ammonia limits, this drastically shortens the length of the river that can be counted towards diluting the plant effluent (mixing zone). By moving the discharge location just downstream of the perennial stream, the mixing zone would be allowed to be set at 2,000 feet long, which is the normal standard value. When taking this into account, IDNR would increase the ammonia limits to a level that the facility can meet.

Ultimately, it was decided to move forward with relocating the outfall sewer. IDNR and the City of Cambridge agreed that this would be the best alternative for meeting discharge requirements while not impacting the safe recreational use of the river or fish movement.

Because it is slated to receive State Revolving Loan (SRF) funding, the project has gone through an extensive environmental review process. The results of this effort are summarized in the attached Environmental Information Document. The report concluded that the project would have "no significant impact".

The outfall sewer will be constructed using excavated trench methods. It will be completely buried except at the discharge point. A concrete headwall will be installed at the discharge point to protect the pipe from flood damage, and a flap gate will be installed to serve as an animal guard and prevent backflow from the river.

The outfall sewer will be constructed on land owned by the Story County Conservation Board. The parcel is located in unincorporated Story County just outside city limits. There have been no discussions or consideration of potentially annexing the parcel into the City of Cambridge. The City and Conservation Board entered into an easement agreement to allow construction of the outfall. This easement was recorded with Story County on May 29, 2020.

In addition to the outfall relocation, the project will include construction of a new ultraviolet light disinfection system. Cambridge's wastewater is currently not disinfected, so this improvement will improve safety for recreational use of the river. In addition, baffle curtains will be installed in the lagoons to further improve treatment efficiency and effluent quality.

The following addresses the criteria listed in 90.04 1.:

A. Compatibility:

- The new outfall sewer will be compatible with the development and use of adjacent properties. Because it is in the floodplain, future development of any adjacent areas is extremely unlikely. Wastewater treatment effluent is normally discharged into nearby streams or rivers as proposed with this project, so this is considered to be a normal feature along waterways. Access to the area is very limited to the public, so the improvements are expected to be relatively unnoticed when complete.
- The new outfall sewer will be buried. For the most part, it will not be noticeable after construction is complete. The only evidence of its existence from ground surface will be the three buried manholes and the outlet headwall structure.
- The manholes will be four feet inside diameter and constructed of precast concrete per SUDAS standards. Each manhole will have a 26-inch diameter cast iron cover, which is typical for municipal sewer construction. Each cover will be bolted down to prevent removal or blow off during a flood event, and each will be installed with the top flush with ground surface.
- The small outlet headwall structure will be constructed of cast in place concrete as shown in the Drawings. A very similar structure to what is proposed is shown in the following picture:

B. Transition: There are no proposed buildings or surrounding properties that will be impacted by the improvements.

C. Traffic: It is anticipated that Cambridge Staff will access the outfall site approximately one time per year on foot (no vehicles) to observe the headwall structure and check for damage or erosion concerns. Access would be via the existing permanent easement. No other access requirements are anticipated. The Heart of Iowa Trail will not be impacted by construction of the project.

D. Parking and Loading: There will be no parking or loading requirements associated with this project.

E. Signs and Lighting: There are no signs or lighting required or planned for this project.

F. Environmental Protection:

- The project will provide improved conditions from an environmental protection standpoint for safe recreational use of the river, with improved treatment and disinfection of the wastewater.
- The completed project will have no negative impacts on noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds.
- The total estimated area that will be disturbed for construction of the outfall sewer is 0.58 acres, which is approximately 2% of the 28.79 parcel area.
- Because the total estimated disturbed area for construction of the project is less than one acre, an *NPDES General Permit No. 2 for Storm Water Discharge Associated with Industrial Activity or Construction Activities* is not required. The Story County erosion control requirements of 88.05 (4) will be followed.

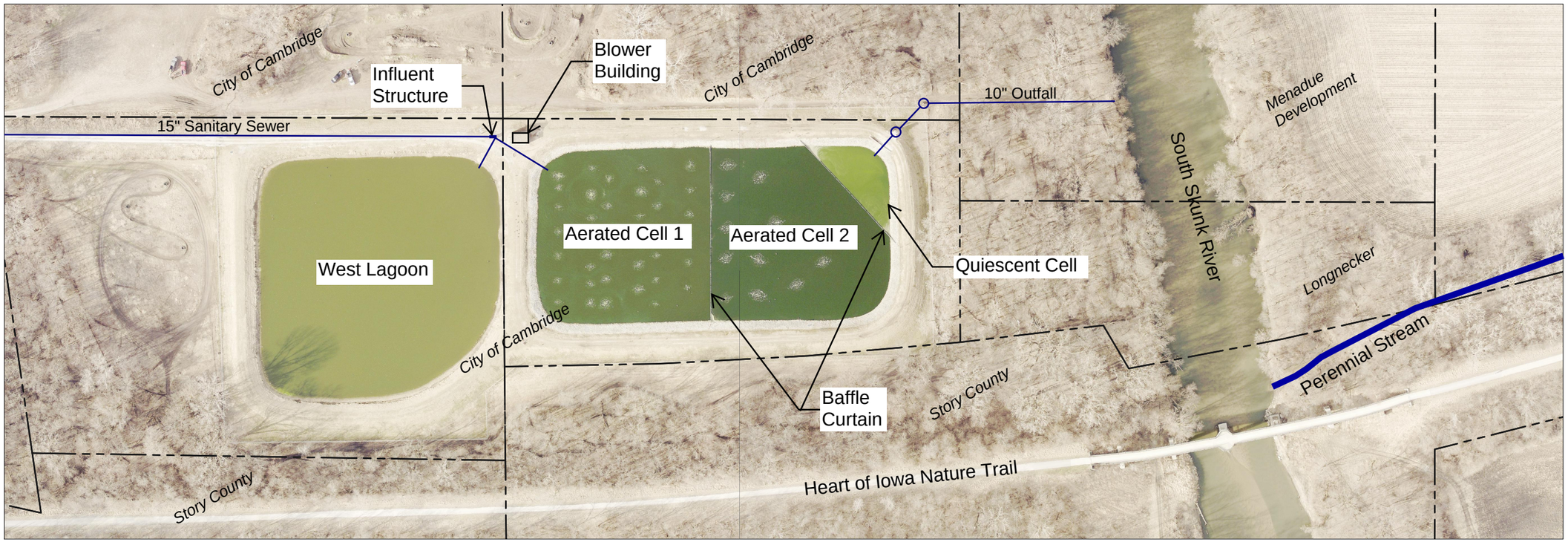
The anticipated schedule for the project is summarized below:

Complete Design	October 2020
Public Bidding	December 2020
Construction	March 2021 - December 2021

The actual amount of time required for construction of the outfall sewer is estimated at four weeks. The timing of construction during the period listed above will depend on weather and the contractor's desired schedule for the project as a whole.

No other improvements to the Cambridge Wastewater Treatment Facility are anticipated over the next five years.

Steve Van Dyke, P.E.



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DATE	REVISION	BY	DATE
	DESIGNED:	SAV	01/18
	DRAWN:	SRS	01/18
	CHECKED:		
	LAST UPDATE: 01/02/19		

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

SITE
CAMBRIDGE WASTEWATER TREATMENT PLANT
CAMBRIDGE, IA

PROJECT NO.
2473-14A

SHEET
3.2

DRAWING FILENAME
K:\proj\2000\2473-14A Cambridge Wastewater\Drawings\Civil\2473-14A_Base.dwg
PLOT STYLE TABLE
FoxGreyScale AERIAL.ctb
LAYER MNGR NAME
LAYOUT NAME
A

Story County Planning and Development
900 6th Street, Nevada, Iowa 50201
(515) 382-7245 — pzweb@storycountyiowa.gov — www.storycountyiowa.gov

CONDITIONAL USE PERMITS

1. Property Owner*

(Last Name) Story County Conservation Board
(First Name)
(Address) 56461 180th Street
(City) Ames (State) IA (Zip) 50010
(Phone) 515-232-2516 (Email) mcox@storycountyiowa.gov

2. Applicant (if different than owner)

(Last Name) City of Cambridge
(First Name)
(Address) 225 S Water Street
(City) Cambridge (State) IA (Zip) 50046
(Phone) 515-220-4541 (Email) cityofcambridge@huxcomm.net

3. Property Address

Parcel ID Number(s) 14-22-300-600

4. Certification and Signature

I/we certify that the information and exhibits submitted are true and correct to the best of my knowledge and that in filing this application I am acting with the knowledge, consent and authority of the owners of the property. Pursuant to said authority, I hereby permit County officials to enter upon the property for the purpose of inspection.

***Acknowledgement of property owner is required and may occur via email or by signature of this application.**

Property Owner Signature _____ **Date** 9/17/20 **Applicant Signature** _____ **Date** 9/17/20

There are 3 types of CUP Modifications: insignificant, minor, and major. The Director of Planning and Development makes the determination of the type. Insignificant modifications are reviewed by the director. Minor modifications are reviewed by the Board of Adjustment. Major modifications are considered new conditional use applications and follow the same review process as a new conditional use permit application.

☑ New Conditional Use Permit

Proposed Conditional Use: Public Water Supply and Sewage Treatment Facilities

Submittal Requirements:

- ☑ Attend conceptual review meeting (prior to submittal of CUP application, see conceptual review application and deadline on Planning and Development website)
- ☑ Filing Fee (required prior to processing): $275
- ☑ Site development plan
- ☑ Written narrative explaining justification for proposed conditional use permit and conformance to the standards for approval in Section 90.04 of the Story County Code of Ordinances.

☐ Conditional Use Permit Modification

Previous CUP and Number: _____

Submittal Requirements:

- ☐ Filing Fee (required prior to processing) : $50 (If determined to be a minor modification by the Planning and Development Director, the fee amount is $175.)
- ☐ Site development plan
- ☐ Written narrative explaining modification of approved conditional use permit and response to the standards for approval in Section 90.04 of the Story County Code of Ordinances.

Receipt No. 570364
Receipt Amount $275

PLANS OF PROPOSED IMPROVEMENTS FOR

CAMBRIDGE WASTEWATER IMPROVEMENTS

CAMBRIDGE, IA

2020

CIVIL LEGEND

LINEWORK

EXISTING	PROPOSED	
		BUILDING
		CONCRETE PAVING
		ASPHALT PAVING
		SIDEWALK
		PROPERTY LINE
		EASEMENT
		BUILDING SETBACK LINE
x x x	x x x	FENCE –BARBED WIRE
o	o	FENCE –CHAIN LINK
		FENCE –VINYL
		FENCE –WOOD
		FENCE –SILT
W	W	WATER MAIN
		STORM SEWER / CULVERT
		STORM SEWER SUBDRAIN
SAN	SAN	SANITARY SEWER
FM	FM	FORCE MAIN
OHE	OHE	ELECTRIC –OVERHEAD
UGE	UGE	ELECTRIC –UNDERGROUND
OT		TELEPHONE –OVERHEAD
T		TELEPHONE –UNDERGROUND
FO		FIBER OPTIC
G	G	NATURAL GAS
		TREE LINE
		CROP LINE
		RAIL ROAD TRACK
881 880	880 881	GROUND SURFACE CONTOURS
		LIMITS OF CONSTRUCTION

SYMBOLS

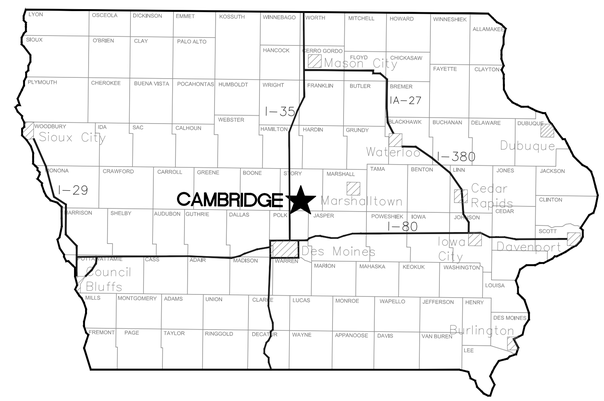
EXISTING	PROPOSED		EXISTING	PROPOSED	
		BOLLARD			STORM SEWER INTAKE, SW-501/ 502
		BUSH			
		CABLE TV PEDESTAL			STORM SEWER INTAKE, SW-503/ 504
		CONTROL/ TRAVERSE POINT			
		CURB STOP			STORM SEWER INTAKE, SW-505
		ELECTRICAL PEDESTAL			
		ELECTRICAL MANHOLE			STORM SEWER INTAKE, SW-506
		ELECTRICAL TRANSFORMER			
		FIBER OPTIC PEDESTAL			STORM SEWER INTAKE, SW-507/ 508
		GAS METER			
		GAS VALVE			STORM SEWER INTAKE, SW-509/ 510
		FIRE HYDRANT			STORM SEWER INTAKE, SW-511
		JUNCTION BOX			STORM SEWER INTAKE, SW-512/ BEEHIVE
		LIGHT POLE			
		MAIL BOX			STORM SEWER INTAKE, SW-513
		MANHOLE (UNKNOWN)			STORM SEWER, FLARED END SECTION
		PROPERTY CORNER –FOUND			
		POWER POLE			STORM SEWER MANHOLE
		RIGHT OF WAY RAIL			STORM SEWER SUBDRAIN CLEANOUT
		SANITARY CLEANOUT			TELEPHONE MANHOLE
		SANITARY MANHOLE			TELEPHONE PEDESTAL
		SECTION CORNER –FOUND			TRAFFIC POLE
		SIGN			WATER MANHOLE
		STUMP			WATER METER
		TREE –DECIDUOUS			WATER VALVE
					WITNESS POST
		TREE –EVERGREEN			YARD HYDRANT

ABBREVIATIONS

FG –	FORM GRADE (GUTTER)	FL –	FLOWLINE	BOP –	BEGINNING OF PROJECT
TOC –	TOP OF CURB	INV –	INVERT	EOP –	END OF PROJECT
TOW –	TOP OF WALK	PL –	PROPERTY LINE	PC –	POINT OF CURVATURE
FFE –	FINISH FLOOR ELEVATION	ROW –	RIGHT OF WAY	PT –	POINT OF TANGENCY
TOB –	TOP OF BANK	PUE –	PUBLIC UTILITY EASEMENT	PI –	POINT OF INTERSECTION
TOE –	TOE OF SLOPE	CL –	CENTER LINE		

INDEX OF SHEETS

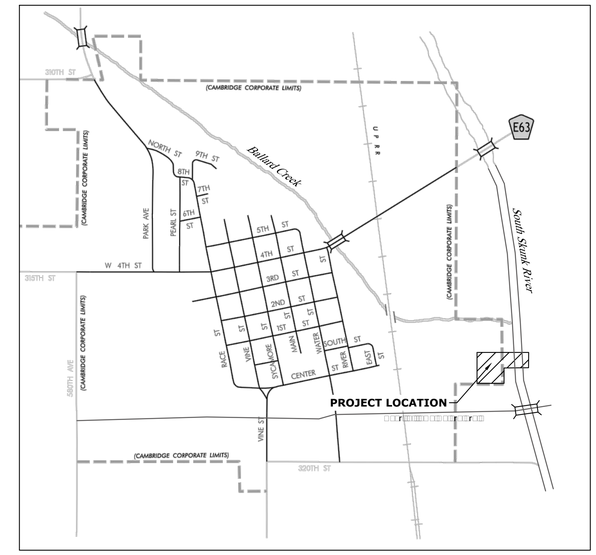
No.	Description
G.1	COVER SHEET/ LOCATION MAP/LEGEND
P.1	DETAILS
P.2	OUT FALL PLAN AND PROFILE



LOCATION MAP

NORTH

NOT TO SCALE



IOWA ONE CALL

1-800-292-8989

www.iowaonecall.com

811 Know what's below. Call before you dig.

GENERAL NOTE: ALL UTILITIES ARE ONLY GENERALLY LOCATED. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND EXPOSING ALL UTILITIES THAT MAY INTERFERE WITH CONSTRUCTION BEFORE CONSTRUCTION BEGINS.

ENGINEER:

FOX ENGINEERING

414 SOUTH 17TH STREET, SUITE 107

AMES, IOWA 50010

PHONE: 515 233-0000

FAX: 515 233-0103

FOX engineering

LICENSED PROFESSIONAL ENGINEER STEVEN A. VAN DYKE 16044 IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

STEVEN A. VAN DYKE, P.E. DATE

License number 16044

My license renewal date is December 31, 2021.

Pages or sheets covered by this seal:

CAMBRIDGE WASTEWATER IMPROVEMENTS

DRAWING FILENAME: K:\Proj\2000\2473-14A Cambridge Wastewater\Drawings\Civil\2473-14A_Base.dwg

PLOT STYLE TABLE: FoxGrayScale.ctb

LAYER MNGR NAME

LAYOUT NAME: G.1

DATE	REVISION	BY	DATE
		DESIGNED: ELT	
		DRAWN: ELT	
		CHECKED:	
		LAST UPDATE: 02/07/20	

FOX engineering

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: 515 233-0000
FAX: 515 233-0103

COVER SHEET

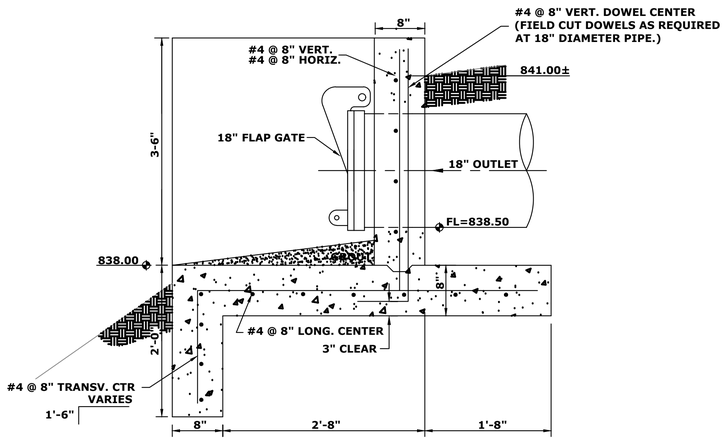
CAMBRIDGE WASTEWATER IMPROVEMENTS

CAMBRIDGE, IA

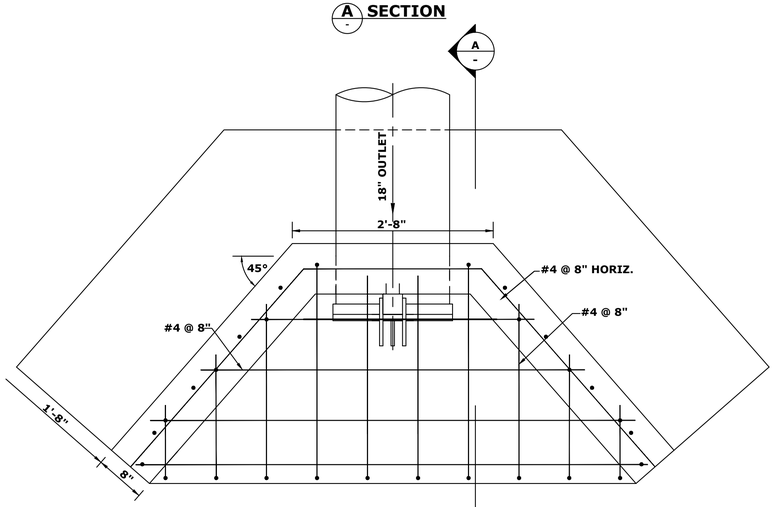
2020

PROJECT NO. 2473-14A

SHEET G.1



A SECTION



PLAN VIEW

1 OUTLET HEADWALL DETAIL

1" = 1'-0"

NORTH

DATE	REVISION		BY	DATE
		DESIGNED:	ELT	01/20
		DRAWN:	ELT	01/20
		CHECKED:		
		LAST UPDATE: 02/07/20		

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

DETAILS
CAMBRIDGE WASTEWATER IMPROVEMENTS
CAMBRIDGE, IA
2020

PROJECT NO.
2473-14A

SHEET
P1

DRAWING FILENAME
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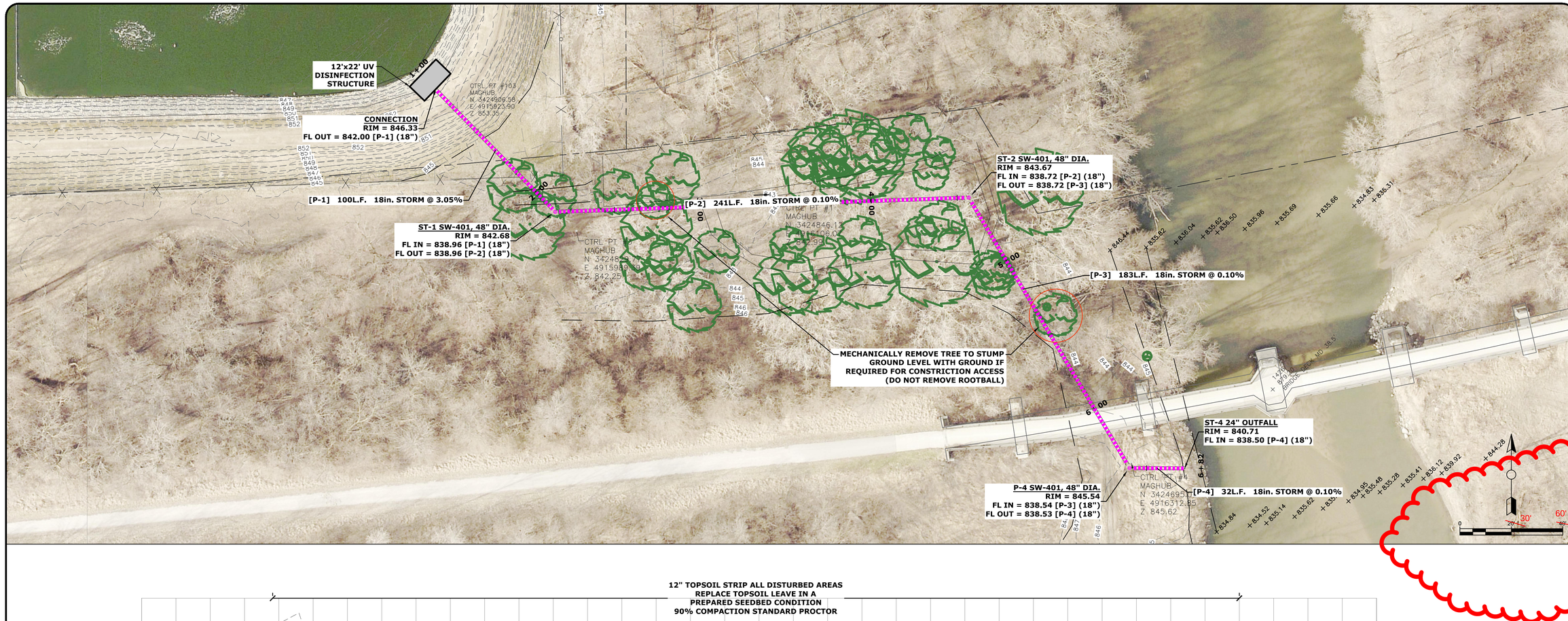
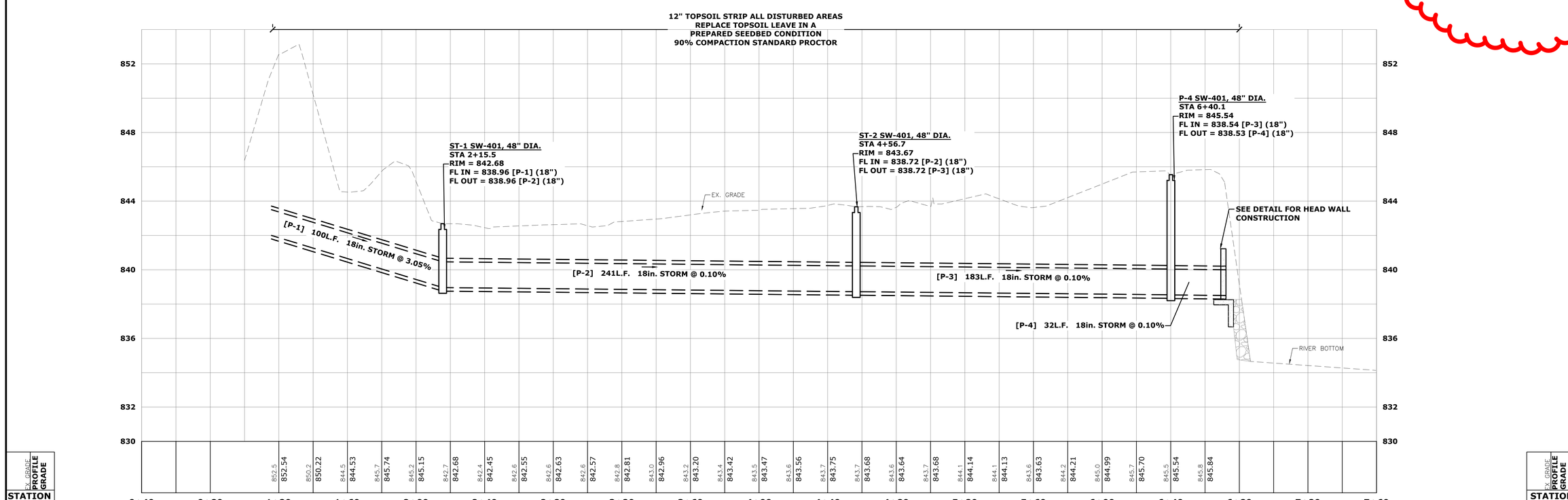
PLOT STYLE TABLE
FoxGreyScale.ctb

LAYER MNGR NAME

LAYOUT NAME
P1





DATE	REVISION	DATE	BY
		DESIGNED:	ELT 01/20
		DRAWN:	ELT 01/20
		CHECKED:	
		LAST UPDATE:	02/07/20

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0103
FAX: (515) 233-0103
FOX engineering

OUT FALL PLAN AND PROFILE

CAMBRIDGE WASTEWATER IMPROVEMENTS
CAMBRIDGE, IA
2020

PROJECT NO.
2473-14A

SHEET
P2

DRAWING FILENAME
K:\proj\2000\2473-14A Cambridge Wastewater\Drawings\Civil\2473-14A_Base.dwg
PLOT STYLE TABLE: FoxGrayScale.ctb
LAYER MNGR NAME
LAYOUT NAME: P2

Details for the flap gate we will use are attached. This information was from an earlier project, but the same size, specifications and design will apply. The gate will designed for 20 feet of water pressure from the river.

ENGINEERING STANDARDS	Whipps, inc. 370 South Athol Rd, Athol MA 01331	DATE 07/16/18	DRAWN BY KS
		S.O. NUMBER **27439**	
STAINLESS STEEL FLAP GATES		DRAWING NUMBER **A-274-392**	REV **A**

WELDING TO AWS D1.6

FLAP

- MIN THICKNESS 1/4" ALL PARTS
- MAX BENDING STRESS 15,000 PSI
- MAX BENDING DEFLECTION < 1/360 OF SPAN OR 1/16 INCH WHICH EVER IS LESS

FRAME

- MIN THICKNESS 1/4" ALL S.S. PARTS

MATERIAL STANDARDS

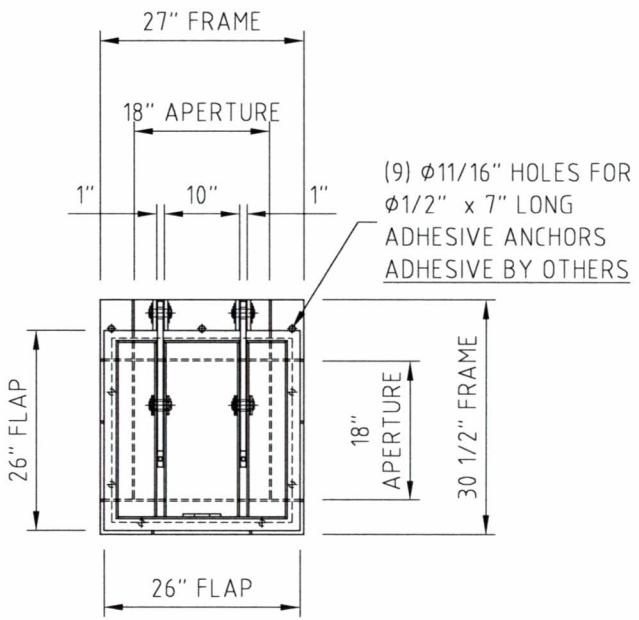
FLAP	ASTM A240 TYPE 304L STAINLESS STEEL
FLAP STIFFENERS	ASTM A240 TYPE 304L STAINLESS STEEL
FRAME	ASTM A240 TYPE 304L STAINLESS STEEL
HINGE ARMS	ASTM A240 TYPE 304 STAINLESS STEEL
1" DIA. HINGE PINS	ASTM A276 TYPE 304 STAINLESS STEEL
HINGE BUSHINGS	ASTM D4020 UHMWPE
GATE FRAME SEAL	MOLDED POLYURETHANE
GATE FASTENERS	ASTM A276 TYPE 304 STAINLESS STEEL
GATE ANCHORS	ASTM A276 TYPE 316 STAINLESS STEEL

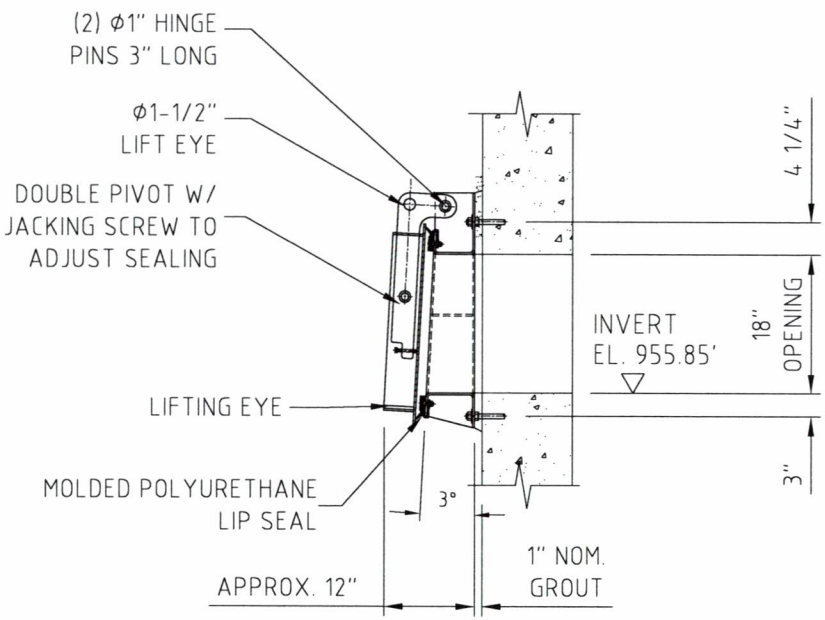
WHIPPS INC MANUFACTURES ALL STAINLESS STEEL FORMED SECTIONS FROM ASTM A240 PLATE.
ASTM A276 RELATES TO STAINLESS STEEL BAR (OPERATING STEM) & TUBE SECTIONS ONLY

Ref Plan Sheet: C8

FOR FLAP DETAIL SEE: BC-452-2062-S2
FOR FRAME DETAIL SEE: BC-452-2062-S3
FOR HINGE ARM DETAIL SEE: BC-452-2062-S4

ALL FRAME SECTIONS 1/4" THICK TYPICAL
OUTER FLAP STIFFENERS: 4" x 1/4" FLAT TYPICAL
VERTICAL FLAP STIFFENERS: 4" x 1/4" FLAT TYPICAL
HORIZONTAL FLAP STIFFENERS: 4" x 1/4" FLAT TYPICAL





Rev.	Date	Eng.	Chk.
A	Original Issue	07/16/18	KS
Rev.	Rev. Record		

Whipps, Inc.
370 SOUTH ATHOL RD.
ATHOL, MA 01331

DO NOT SCALE THIS DRAWING
Work to Dimensions
Linear Dimensions are Inches
Requested Concrete Opening Tolerances
Height & Width ±1/4"
Squareness ±3/8 Diagonal
THIRD ANGLE PROJECTION

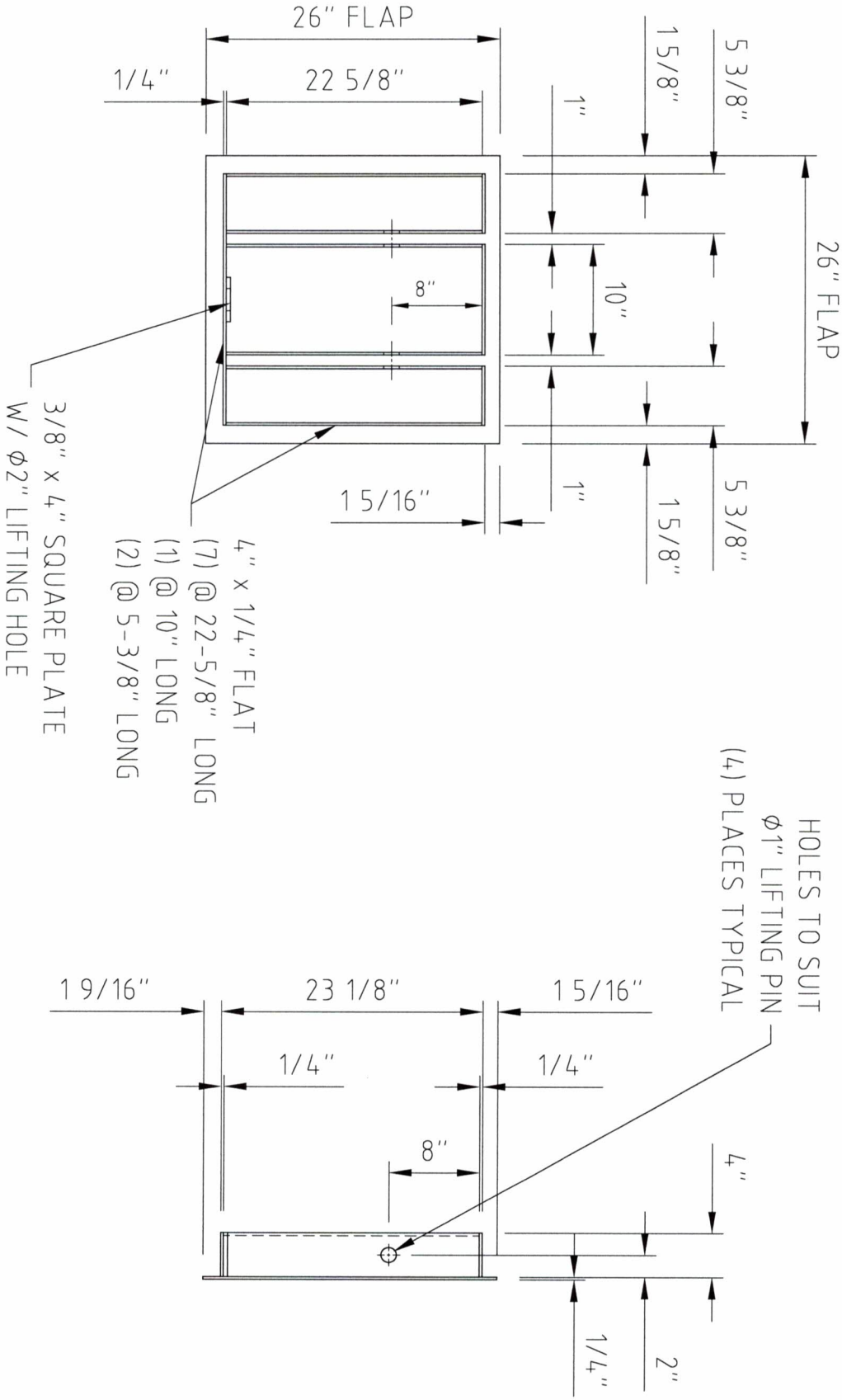
Quantity: 1	Scale: 1:25		
Tag No's:			
Item No.: L5	Seating	Unseating	
Design Head	20'	0'	
Leakage Rate GPM/ft of seal	0.1	-	

Title: SERIES 452 FLAP GATE
INSTALL 18" x 18"

Project: GILBERT, IA

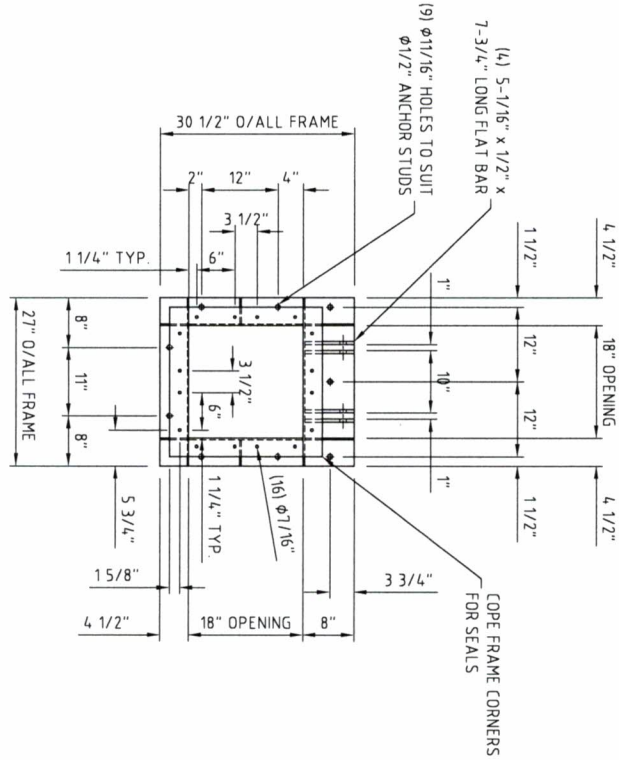
Location: CELL #1 CONTROL STRUCTURE

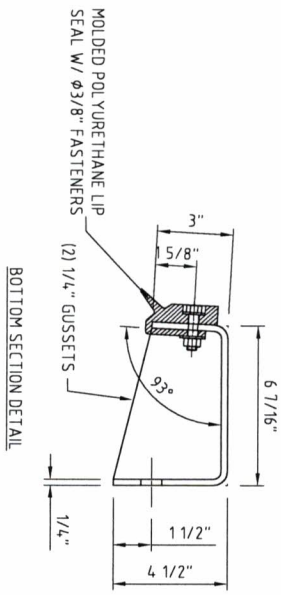
Drg. No.: BC-452-2062 | S.O. No.: 27439



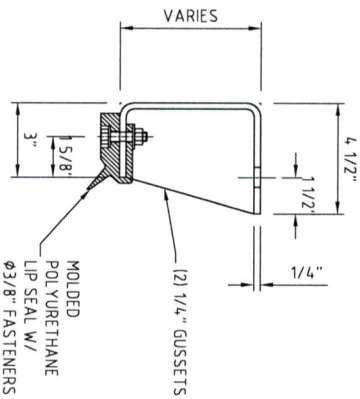
Title 18" x 18" SERIES 452 FLAP DETAIL	Quantity: 1	Scale: 1:20	DO NOT SCALE THIS DRAWING Work to Dimensions Linear Dimensions are Inches				
Material: STAINLESS STEEL 304L			Requested Concrete Opening Tolerances Height & Width ±1/4" Squareness ±3/8 Diagonal	A	Original Issue	07/16/18	KS
Drg. No. BC-452-2062-S2	S.O. No. 27439		THIRD ANGLE PROJECTION	Rev.	Rev. Record	Date	Eng. Chk.

Whipps, inc.
370 SOUTH ATHOL RD
ATHOL, MA 01331

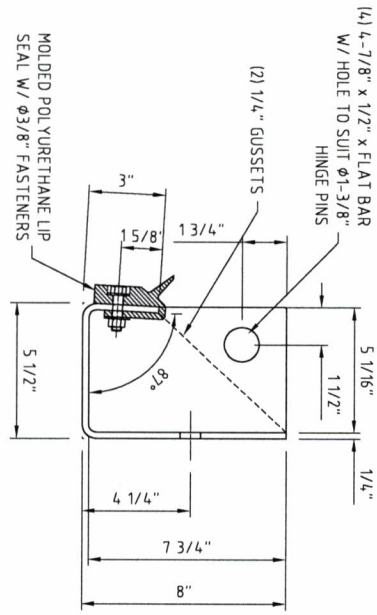




BOTTOM SECTION DETAIL



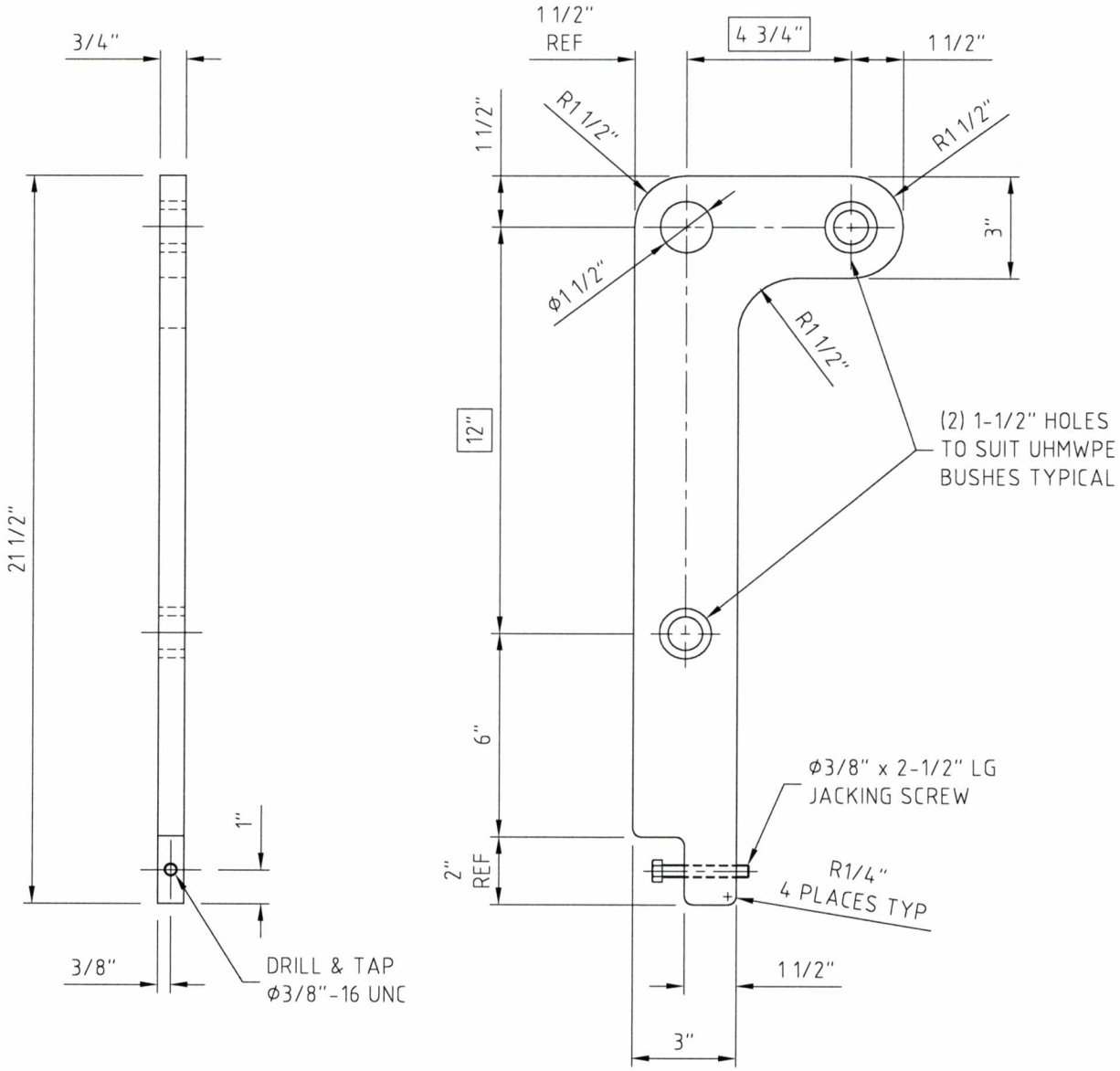
SIDE SECTION DETAIL



TOP SECTION DETAIL

Title: 20" x 20" SERIES 452 FRAME DETAIL	Quantity: 1	Scale: 1:20	DO NOT SCALE THIS DRAWING Work to Dimensions Linear Dimensions are Inches		
Material: STAINLESS STEEL 304L			Requested Concrete Opening Tolerances Height & Width ±1/4" Squareness ±3/8 Diagonal	A	Original Issue	07/16/18	KS
Drg. No. BC-452-2062-S3	S.O. No. 27439		THIRD ANGLE PROJECTION	Rev.	Rev. Record	Date	Eng.	Chk.

Whipps, inc.
370 SOUTH ATHOL RD
ATHOL, MA 01331



Title SERIES 452 FLAP GATE HINGE ARM DETAIL	DO NOT SCALE THIS DRAWING Work to Dimensions Linear Dimensions are Inches				
	Scale: 1:5	A	Original Issue	07/16/18	KS
Material STAINLESS STEEL 304L		Rev.	Rev. Record	Date	Eng. Chk.
Drg No. BC-452-2062-S4 S.O. No. 27439	THIRD ANGLE PROJECTION	Whipps, inc.		370 SOUTH ATHOL RD. ATHOL, MA 01331	

ADHESIVE ANCHOR RECOMMENDATIONS

ADHESIVE SUPPLIED BY INSTALLER TO BE:

- **HILTI** HIT RE500 EPOXY ADHESIVE
- **ITW RAMSET / REDHEAD** EPCON CERAMIC 6 EPOXY ADHESIVE
- OR APPROVED EQUAL

Whipps Inc. Supplies the Threaded Rod, Nuts & Washers required for installation.

Unless otherwise noted, the embedment depth required for each size anchor will be

Anchor Diameter	Embedment Depth
1/2"	4-1/2"
5/8"	6"
3/4"	7"
7/8"	8"
1"	9"

Board of Adjustment

October 21st, 2020

CUP07-20 Cambridge Waste Water Outfall Pipe

Applicant

City of Cambridge

Steve Van Dyke Fox Engineering

Property Location

East of Center Street

Cambridge, IA 50046

14-22-300-600

Property Owner

Story County Conservation

Districts

A-1 Agriculture

Cambridge Fire

Story County Ambulance

Story County Sheriff

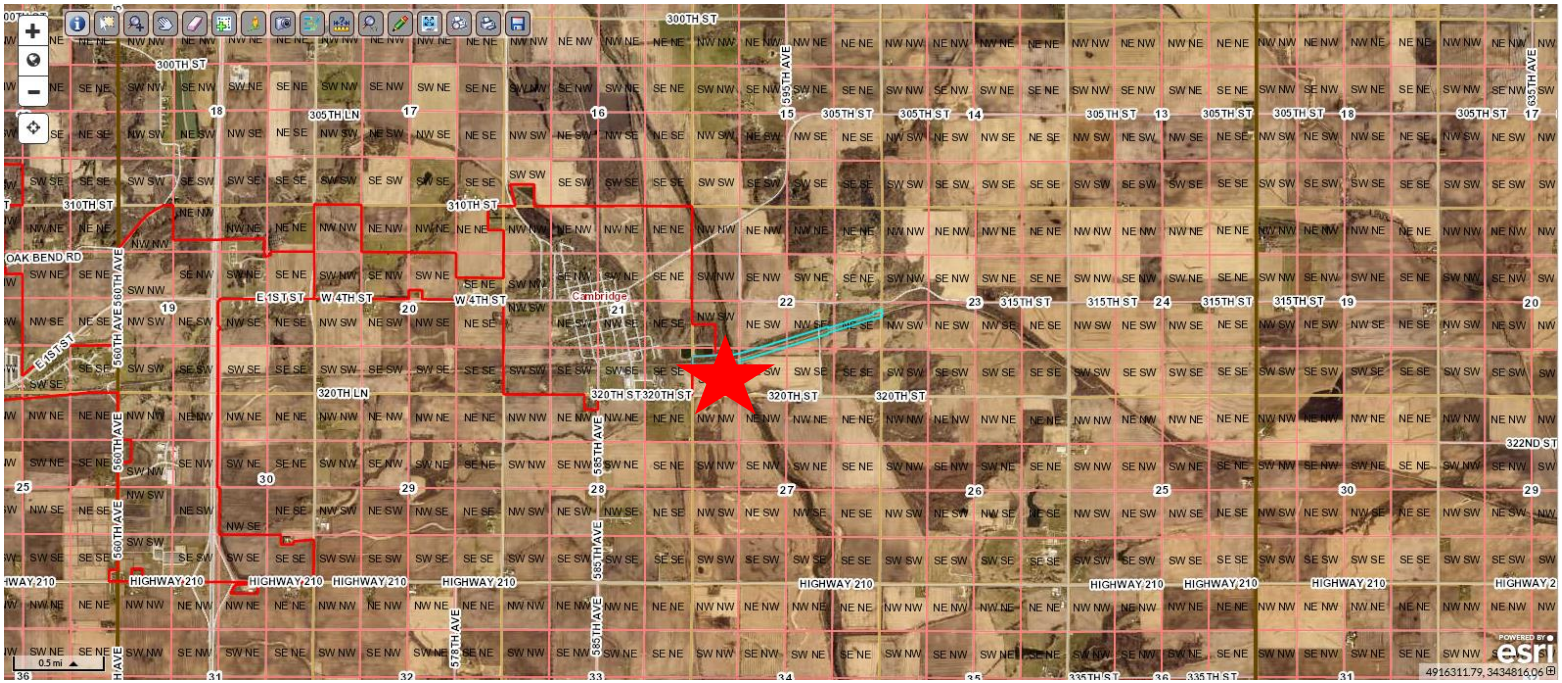
Nature of Request

- **New Conditional Use Permit Application**
- **Request includes:**
  - Proposed treated waste water outfall pipe

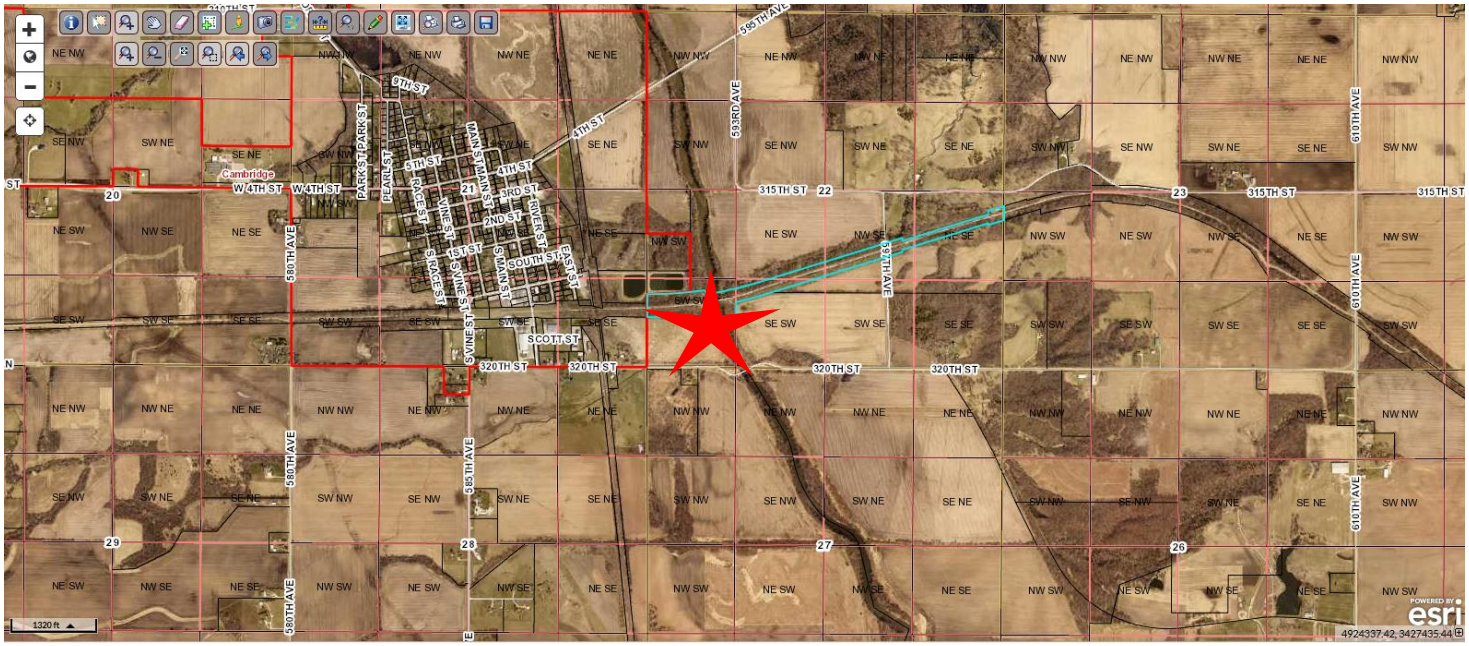
History

The City of Cambridge is proposing the construction of a new waste water outfall pipe from their existing lagoon system. The current outfall pipe does not meet the distance requirements for ammonia and E. Coli mixing measurements. The proposed outfall pipe would allow for the city to meet IDNR ammonia and E. Coli mixing requirements at a distance of 2,000 feet from the closest creek. The proposed pipe will be directionally bored to the new outlet location on the south side of the Heart of Iowa bridge that goes over the South Skunk River on property owned by Story County Conservation. The Story County Planning and Zoning Commission are recommending that the Story County Board of Adjustment approves the Conditional Use Permit with a condition.

Vicinity Map

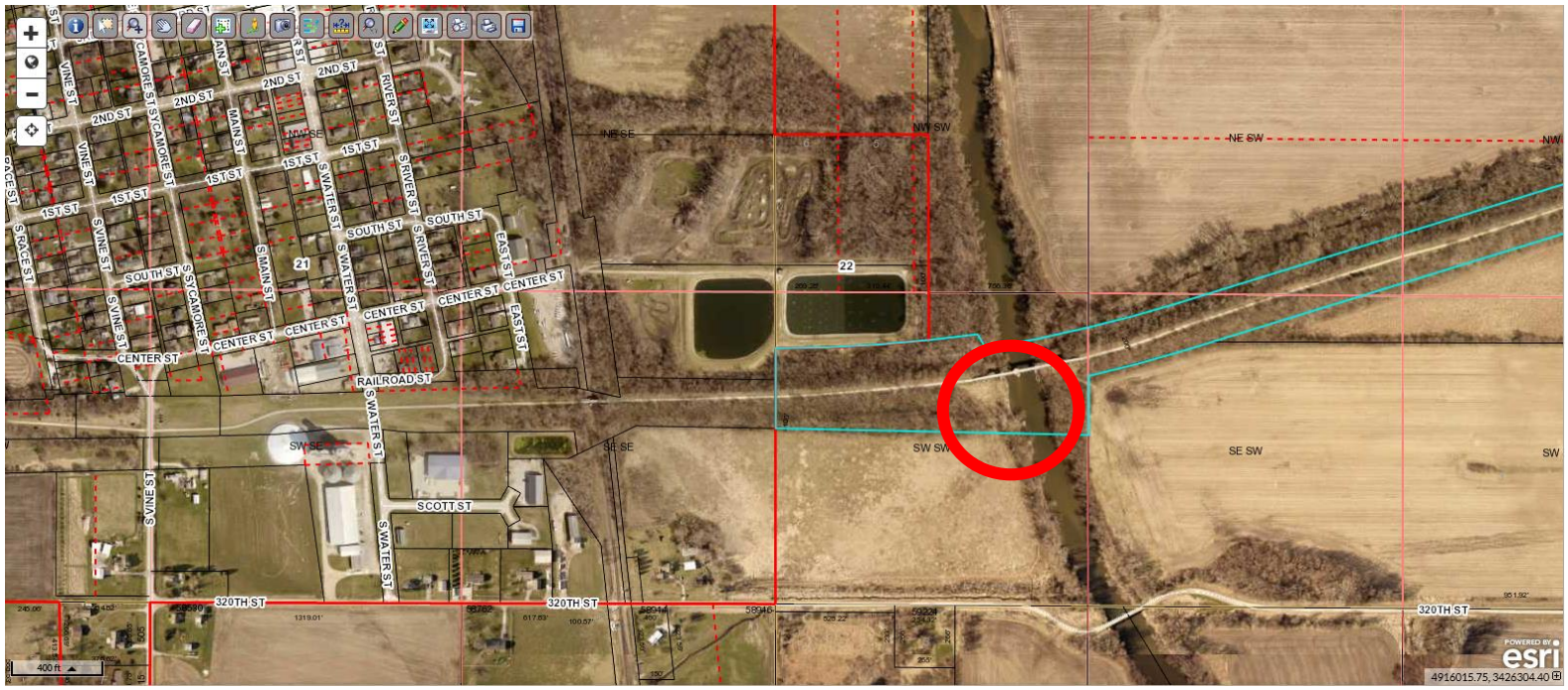


Proposed Site Location

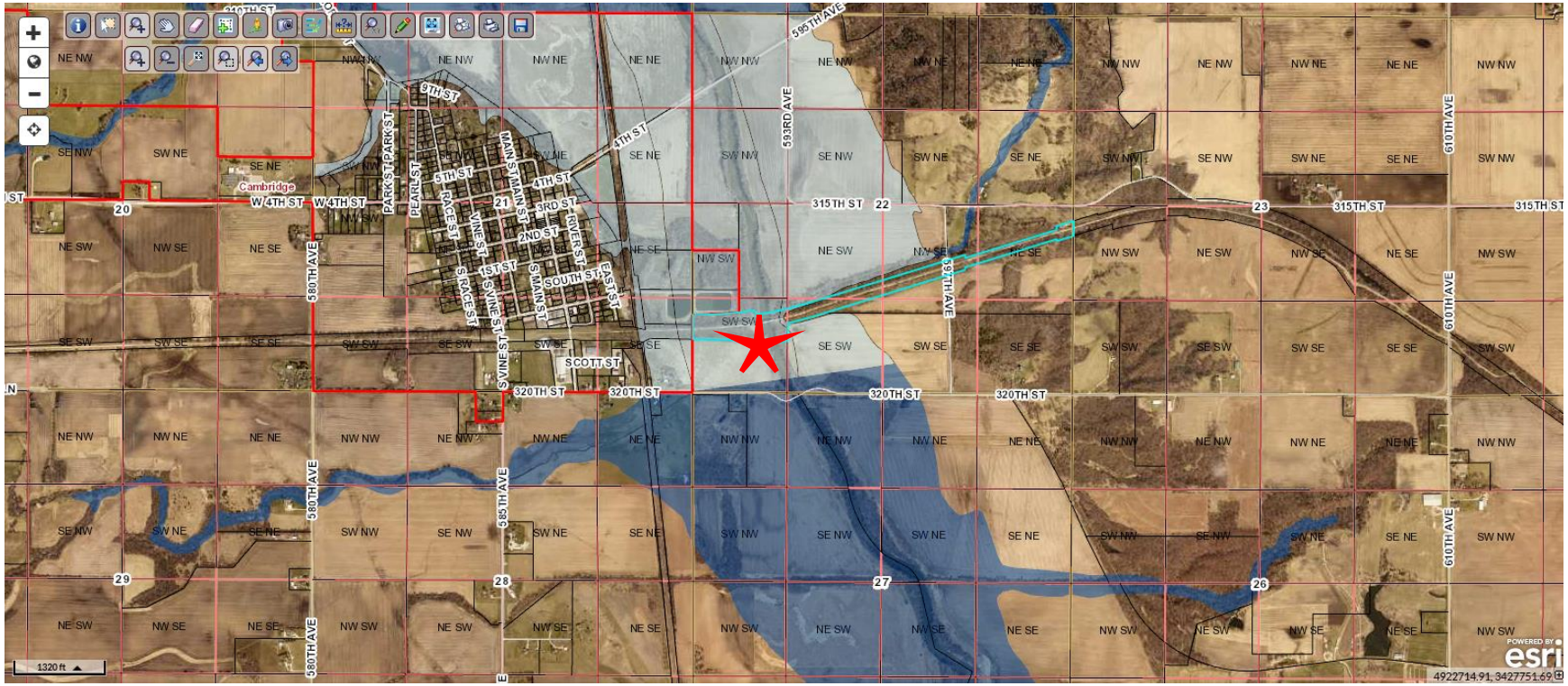


East side of Cambridge
Union Township
Section 22 SWSW

Proposed Site Location



FEMA Flood Plain



Heart of Iowa Trail Facing East

Heart of Iowa Trail Facing North

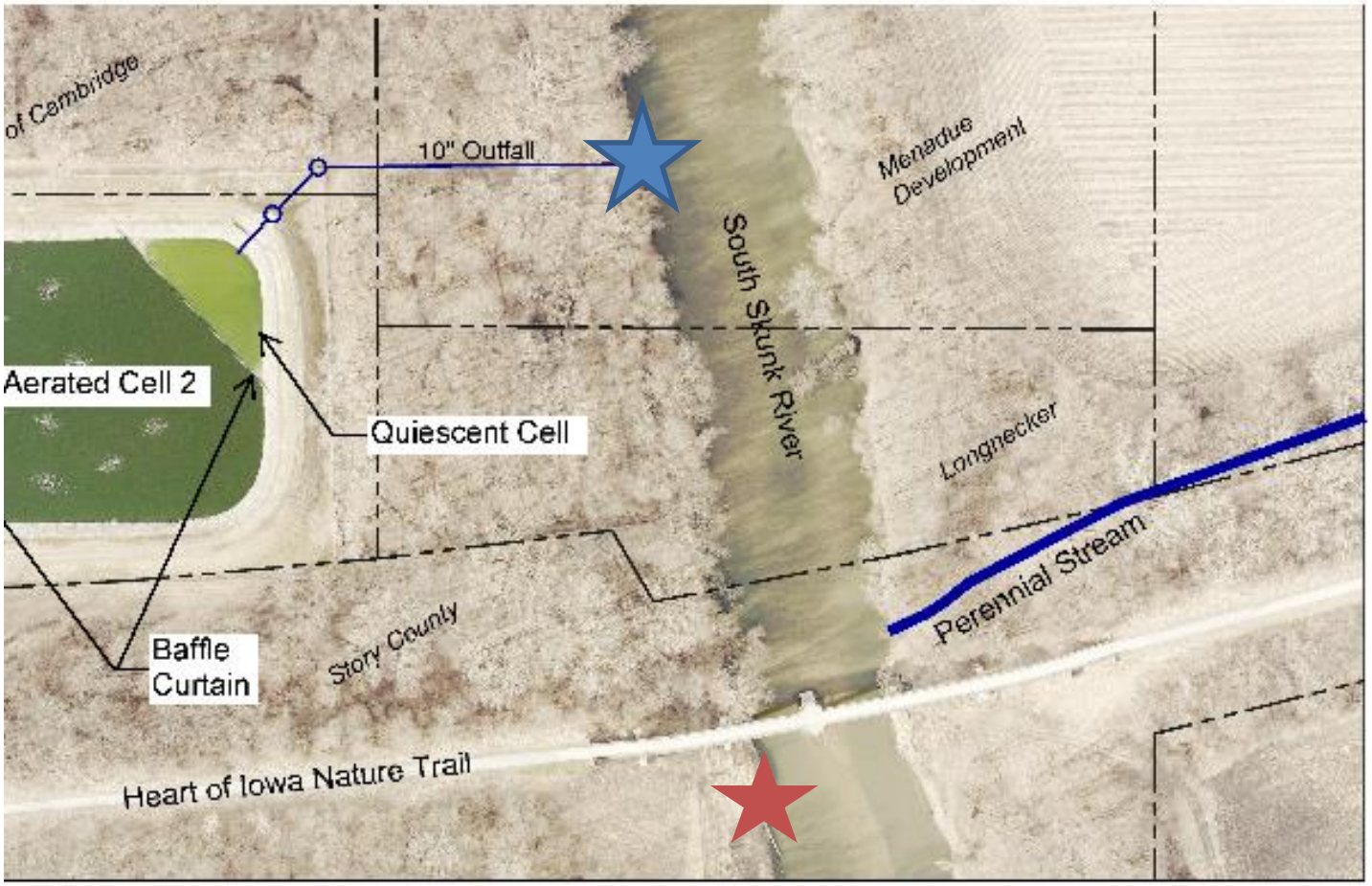
Heart of Iowa Trail Facing West

Heart of Iowa Trail Facing South

Approximate location of Outfall Pipe facing South

Approximate location of Outfall Pipe facing North

Location of Perennial Stream



Conditional Use Permit

STANDARDS OF APPROVAL

Compatibility

- **The new 18” outfall pipe will be compatible with the development and use of adjacent properties. Because it is in the floodplain, future development of any adjacent areas is extremely unlikely. Wastewater treatment effluent is normally discharged into nearby streams or rivers as proposed with this project, so this is considered to be a normal feature along waterways. Access to the area is very limited to the public, so the improvements are expected to be relatively unnoticed when complete.**
- **The new outfall sewer will be buried. For the most part, it will not be noticeable after construction is complete. The only evidence of its existence from ground surface will be the three buried manholes and the outlet headwall structure**

Transition

- **The proposed outfall pipe is being directionally bored below ground. No transition is proposed or needed. No buffering is needed.**

Traffic

- **It is anticipated that Cambridge Staff will access the outfall site approximately one time per year on foot (no vehicles) to observe the headwall structure and check for damage or erosion concerns. Access would be via the existing permanent easement. No other access requirements are anticipated. The Heart of Iowa Trail will not be impacted by construction of the project.**

Parking and Loading

- **During the construction of the outfall pipe, parking will take place on the subject property using existing access points to the property. No parking or equipment storage will take place in the right of way. No new parking or loading is proposed for this project.**

Signs and Lighting

- **There are no signs or lighting is proposed.**

Environmental Protection

- **The project will provide improved conditions from an environmental protection standpoint for safe recreational use of the river, with improved treatment and disinfection of the wastewater. The completed project will have no negative impacts on noise, vibration, dust, smoke, fumes, odor, glare, groundwater pollution or other undesirable, hazardous or nuisance conditions, including weeds. The total estimated area that will be disturbed for construction of the outfall sewer is 0.58 acres, which is approximately 2% of the 28.79 parcel area. Because the total estimated disturbed area for construction of the project is less than one acre, an NPDES General Permit No. 2 for Storm Water Discharge Associated with Industrial Activity or Construction Activities is not required. The Story County erosion control requirements of 88.05 (4) will be followed.**

Analysis

If the Commission concludes that all the above development criteria will be met, it must recommend approval of the application unless it

concludes that, if completed as proposed, there is a strong

probability the development will:

1. not adequately safeguard the health, safety and general welfare of persons residing or working in adjoining or surrounding property.
2. impair an adequate supply (including quality) of light and air to surrounding properties.
3. unduly increase congestion in the roads, or the hazard from fire, flood, or similar dangers.
4. diminish or impair established property values on adjoining or surrounding property.
5. not be in accord with the intent, purpose and spirit of the Land Development Regulations or County Cornerstone to Capstone (C2C) Plan.

Select Comments from the Interagency Review Team

Concept Review

Planning and Zoning Department:

1. For the Conditional Use Permit Application submittal, please provide written responses to each item in Ch. 90.04 Standards of Approval. *Provided*
2. Please confirm that on the proposed outfall pipe is planned to be located in unincorporated Story County. *Yes*
3. Please provide details about what will be treated, the treatment method and process, explain the quality of water discharged, impacts to South Skunk River, and IDNR requirements. *Provided*
4. Explain the high I/I flows identified in the narrative and will any of the proposed work effect this? *Project will not effect I/I*

Select Comments from the Interagency Review Team

Concept Review

Planning and Zoning Department:

5. Explain further about the A1, B(WW-2) stream designation and how the "mixing zone" area where the outfall pipe is planned will impact the stream.

   i. *B(WW-2) - Waters in which flow or other physical characteristics are capable of supporting a resident aquatic community that includes a variety of native nongame fish and invertebrate species. The flow and other physical characteristics limit the maintenance of warm water game fish populations. These waters generally consist of small perennially flowing streams.*

   ii. *A1 - Waters in which recreational or other uses may result in prolonged and direct contact with the water, involving considerable risk of ingesting water in quantities sufficient to pose a health hazard. Such activities would include, but not be limited to, swimming, diving, water skiing, and water contact recreational canoeing.*

6. Has annexation of the proposed work area been discussed with the City of Cambridge and Story County Conservation? *No, Story County Conservation is not in support of annexing the parcel into the City of Cambridge.*

Conceptual Review

September 17, 2020

Comments from the Assessor's Office

No comment

Comments from the Auditor's Office

No comment

Comments from the Engineer's Office

No comment

Comments from the Emergency Management's Office

No comment

Public Notice

Public notification letters were mailed to surrounding property owners within a quarter-mile of the site on October 1, 2020, regarding the Conditional Use Permit application.

Planning and Development received a phone call about the project on October 16th. Caller was concerned that the pipe would be on their property. Explained where the pipe is planned to go. Caller was satisfied.

Points to Consider

1. Applicant addressed the need for the proposed outfall pipe. The purpose of the project is to make improvements to the wastewater treatment facilities to enhance their reliability, increase capacity, and to adequately treat for Ammonia and E. Coli in order to safely and reliably operate the City of Cambridge's wastewater system for the next 20 years.
2. The outfall pipe will allow the City of Cambridge to meet IDNR requirements.
3. The outfall pipe will be buried, the only portion that will be visible is where the pipe meets the river.
4. An easement has been granted for construction and maintenance of the outfall pipe by Story County Conservation to the City of Cambridge.
5. There is no traffic anticipated for this project.
6. No impacts to the Heart of Iowa Trail are anticipated.
7. No environmental impacts are expected.

Planning and Zoning Commission October 7th Meeting

Marcus Amman presented the Staff Report. Amman stated the request for the outfall pipe will allow for the City of Cambridge to meet the Iowa Department of Natural Resources mixing requirement for Ammonia and E. Coli. Currently the outfall pipe is within 2,000 feet of a perennial stream and does not meet the mixing requirements. The new pipe will place be downstream of the perennial stream and will allow for the city to meet the mixing requirements.

Schneider had a question about if signs stating that treated waste water is being mixed in to the stream have been considered. There was questions about people or dogs getting to the river from the Heart of Iowa Trail. Amman stated that it would be very difficult to get from the trail to the river given the elevation of the trail and the brush that surrounds the trail. Steve Van Dyke from Fox Engineering (the applicant) also stated that there is no requirements for signs for this use.

Planning and Zoning Commission Recommendation

Planning and Zoning Commission recommends approval of the Conditional Use Permit for the proposed waste water outfall pipe with a condition based on a site review, comments received, the information provided in this staff report, and material provided by the applicant as put forth in case CUP07-20 with a 7-0 vote at their October 7th meeting. The recommended condition is:

- **The applicant shall provide ammonia and E. coli mixing study results to the Planning and Development Department after construction and mixing study is completed.**

Board of Adjustment Alternatives

The Story County Board of Adjustment may consider the following alternatives:

1. The Story County Board of Adjustment approves the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, as submitted.

2. **The Story County Board of Adjustment approves the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, with a condition.**

3. The Story County Board of Adjustment denies the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20.

4. The Story County Board of Adjustment remands the Conditional Use Permit for the City of Cambridge Wastewater Outfall Pipe CUP07-20, back to the applicant for further review and/or modifications, and directs staff to place this item on a future Story County Planning and Zoning Commission agenda.

Story County Planning and Development
Administration Building
900 6th Street, Nevada, Iowa 50201

Ph. 515-382-7245 Fax 515-382-7294
www.storycountyiowa.gov

MEMORANDUM

TO: Story County Board of Adjustment
FROM: Amelia Schoeneman, Interim Planning and Development Director
RE: Special Meeting of the Board of Adjustment for November 2020
DATE: October 21, 2020

The Board of Supervisors have scheduled a special meeting for a public hearing on a new ordinance regulating septic systems on November 18, 2020, at 6:30 PM. The meeting is scheduled for the public meeting room. The regular November meeting of the Board of Adjustment is scheduled for November 18, 2020, at 4 PM.

In the interest of allowing adequate time between the special Board of Supervisors meeting and the Board of Adjustment meeting, and ensuring the room is available, staff recommends holding a special November meeting at 3 PM on November 18, 2020. Staff is not aware of any cases that will be on the agenda and the deadline for a submittal is November 2.

PLEASE RECYCLE

Story County Planning and Development
Administration Building
900 6th Street, Nevada, Iowa 50201

Ph. 515-382-7245 Fax 515-382-7294
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MEMORANDUM

TO: Story County Board of Adjustment
FROM: Amelia Schoeneman, Interim Planning and Development Director
RE: Proposed amendment to the Board of Adjustment Rules of Procedure
DATE: October 21, 2020

Planning and Development staff is proposing to amend the Board of Adjustment Rules of Procedure to conform with HF 2512, the recent legislation limiting the board's membership to be eligible electors and reside within the area regulated by the County Zoning Ordinance (unincorporated area). The Rules of Procedure previously stated that a majority of members were required to live in the unincorporated area. The proposed amendment states that all members shall live in the unincorporated area. Planning staff recommends that the Board of Adjustment support amending the Rules of Procedure to be in conformance with state law.

PLEASE RECYCLE

STORY COUNTY BOARD OF ADJUSTMENT
RULES OF PROCEDURE

I. INTENT

These rules have been adopted to ensure:

A. The efficient and orderly conduct of business,
B. That all points of view are heard,
C. That the interests of both the appellant/applicant and the public are protected.

Any interpretation of these rules should be consistent with this intent.

II. ELECTION OF OFFICERS

A Board of Adjustment shall consist of five members, ~~a majority of whom~~ all of whom shall reside within the County but outside the corporate limits of any city, appointed by the Board of Supervisors. Terms shall be five years and vacancies shall be filled by the Board of Supervisors for the unexpired term of any member whose term becomes vacant. The Board shall elect a chair and vice-chair from among its members at the last scheduled meeting of the calendar year. The term for each position shall be from the first meeting to the last meeting of the next calendar year.

III. DUTIES OF OFFICERS

A. CHAIR

I. The chair shall:
   a. preside at all meetings of the Board and conduct hearings,
   b. decide all points of order and rule as necessary on questions relating to cases not specifically addressed by these rules for the orderly and fair conduct of hearings,
   c. administer oaths and compel the attendance of witnesses,
   d. work in conjunction with the Planning and Development Director in the preparation of agendas.
II. The Board may overrule the chair by a majority vote of the members present and voting.
III. The chair is a voting member of the Board and shall be counted for the purpose of determining a quorum.

B. VICE CHAIR

The Vice Chair shall assume the duties of the chair in his/her absence.

C. SECRETARY

The Planning and Development Director or his/her designee shall act as secretary to the Board. The secretary shall:

I. Record and maintain a permanent record of Board proceedings and minutes showing the date, time, location, members present and the action taken at each meeting. Minutes shall show the result of each vote taken.
II. Keep records of the Board's examinations and other official actions.
III. Accurately summarize the testimony of those appearing before the Board.
IV. Record names and addresses of all persons appearing before the Board.
V. Conduct correspondence of the Board.
VI. Provide notices of meetings as required by law.
VII. File records of Board action in the office of the Board, such records shall be public.
VIII. Be custodian of the files of the Board and keep all records.

IV. CASES TO BE DECIDED BY THE BOARD

A. Appeals of any order, requirement, decision or determination made by the Planning and Development Director in the enforcement of the Code of Ordinances. The Planning and Development Director, when making an order, requirement, decision or determination shall inform the affected party of his/her rights of appeal.
B. To hear and decide appeals where it is alleged that there is error of law in any order, requirement, decision or determination made by the Planning and Development Director in the enforcement of the Code of Ordinances.
C. To hear and decide applications for variance of height, area, setback, parking or density requirements to the extent necessary to permit the applicant a reasonable use of his/her property.
D. To hear and decide variances to the Floodplain as mapped by the Federal Emergency Management Agency (FEMA) and adopted by the Story County Board of Supervisors.
E. To hear and decide exceptions to the terms of the Code of Ordinances as contained in the Ordinance.
F. To hear and decide applications for Conditional Use Permits.

V. PROCEDURE FOR APPEAL/APPLICATION

A. Appeal/Application
   I. Must be presented in written form to the Planning and Development Director.
   II. Must clearly state the action being appealed and the relief sought, or the Conditional Use Permit being applied for. Additional information may be requested by the Planning and Development Director or the Board.
   III. Must be accompanied by a filing fee.
   IV. Must be filed with the Planning and Development Director within thirty days of the ruling complained of.
B. The Planning and Development Director shall:
   I. Deposit filing fee in County Rural Services fund and issue a receipt to the appellant/applicant.
   II. Assign a case number to the appeal/application.
   III. Gather all relevant documents together into a case file.
   IV. Determine date for hearing.
   V. Notify appellant/applicant and surrounding landowners.
   VI. Forward the application/appeal and relevant materials to the Board members along with agenda.
   VII. Provide notice of hearing.

VI. MEETINGS

A. All meetings are open to the public in accordance with Chapter 21, Code of Iowa, as amended.
B. Meetings shall be scheduled to occur within 40 days of an appeal being filed pursuant to the Story County Code of Ordinances, or when called by the Chair.
C. **Quorum:** Three members of the Board, including the Chair, shall constitute a quorum.
D. **Order of Business:** The agenda will be prepared and sent to the Board four to six days prior to the hearing date and shall include:
   I. Call to Order
   II. Roll Call
   III. Approval of Agenda
   IV. Minutes of Previous Meeting(s)
   V. Public Comment
   VI. Hearings
   VII. Other Business
   VIII. Board/Staff Comments
   IX. Adjournment

   The order is subject to the will of the Board.
E. Voting

I. Concurring vote of three members of the Board are required to reverse any order, requirement, decision, or determination of the Director or to decide in favor of the applicant in any matter acted upon by the Board as required under this ordinance.
II. Roll call vote is required on all resolutions.
III. Affirmative voice vote by a majority of members present and voting is acceptable in approval of minutes and motions pertaining to Board procedure.
IV. The order of roll call shall be rotated for each action.

F. **Ex-parte Contacts:** Any contact though e-mail, phone, in-person, or in such similar fashion that a Board member may have with a party involved, or potentially involved, in a matter before the Board and outside of the hearing process is known as an "ex-parte" contact. Any substantive information or facts that a Board member may receive during the course of those contacts that relates to the matter at hand shall be made a part of the public record so that it can be available for consideration or challenge by all interested parties. This shall be done by way of a public statement by the Board member prior to the presentation of the matter under consideration at the Board's meeting.

G. **Conflict of Interest:** A Board member shall abstain if the member believes there is a conflict of interest, particularly if the conflict is of a financial nature or otherwise. A member who elects to abstain from voting shall state the reason for the abstention prior to the presentation of the matter under consideration. During the presentation and discussion of the matter under consideration, a member who plans to abstain from voting should remove him/herself from the proceedings and from taking any action on the issue or attempting to persuade any other member of the Board to act in any specific direction. Board members may not receive any type of gift for their own personal use or enjoyment related to transaction of their official Board duties.

H. **Continuances:** The Board may postpone decision on a case until a later meeting to enable additional testimony to be heard, a site visit, or for other good cause by an affirmative vote of a majority of the members present and voting. The Board may reconsider the item at any time, however may not take final action on the item unless a quorum is present and such action receives a concurring vote of at least three member of the Board.

VII. HEARINGS

A. Notice of hearings shall be given according to the Code of Ordinances and Code of Iowa.

B. Hearings will be conducted in an orderly and courteous manner. No abusive, demeaning, or harassing statements or questions will be tolerated. Persons disrupting a meeting of the Board may be ejected.

C. Appellant/Applicant may appear on his/her own behalf or may be represented by an agent or counsel. In the absence of a personal appearance on behalf of the applicant the Board may proceed to dispose of the case on the evidence of forms and information provided before.

D. The Code of Ordinances gives the Board the power to compel testimony. Subpoenaed witnesses will be placed under oath; other witnesses, including the appellant/applicant, may be placed under oath.

E. **Order of Hearing**:

I. The Chair will open the hearing at the appropriate time according to the Agenda and make whatever opening statement he/she deems appropriate, including rules for the hearing and any time limits that will be imposed.
II. The Planning and Development Director or County Staff will present a report on the detailed information and observations regarding the request.
III. The appellant/applicant will be recognized to present his/her case, and may present any information and exhibits and call witnesses as necessary to justify the request. Testimony by witnesses will be in the form of narrative statements addressed to the Board. Appellant/Applicant may be assisted by legal counsel in delivery of their narrative.
IV. Any witnesses subpoenaed by the Board may be called to testify. They will be questioned only by the Board.
V. Members of the public are recognized to make statements. No particular order is required. All

interested parties shall be heard, except that repetitious testimony may be ruled out of order by the Chair. The Chair may place time limits on public testimony if deemed necessary.

VI. After all interested parties have been heard, the hearing shall be closed to public comment and the appellant/applicant will be recognized to make a closing statement.

VII. The Board shall then deliberate the case, formulate a resolution and vote thereon. No motion need be made to enable discussion, but any resolution must be moved and seconded and further discussion will be allowed before the vote. No comment by the appellant/applicant or the public will be recognized during deliberations by the Board, but the Board may question anyone present. The Board may examine subpoenaed witnesses at this time.

VIII. The Board shall not be bound by strict rules of evidence, but it may exclude irrelevant, immaterial, incompetent, or unduly repetitious testimony. All records, data, plats, drawings, plans and models shall be allowed as exhibits and retained as part of the case file. The Chair shall rule on questions relating to the admissibility of evidence, which may be overruled by a majority of the Board present and voting.

F. A copy of the Board's resolution accompanied by a cover letter from the Planning and Development Director is mailed to the appellant/applicant within fourteen days after the hearing.

VIII. REHEARINGS

A. A rehearing may occur at the will of the Board upon:

I. Request by the original appellant/applicant alleging new evidence, or

II. Action by the Board because of alleged fraud or misrepresentation at the original hearing.

A rehearing will be set by a motion by a Board member supported by a majority of the Board.

IX. APPEALS OF BOARD ACTIONS

Decisions of the Board are final and dissatisfied parties may appeal to District Court.

X. RECORDS

The Planning and Development Director shall keep the minutes of proceedings and all records of case. All records are public.

XI. INFORMAL ADVICE

The Board will not consider a request (informal or not) for advice on theoretical or actual situations which potentially may later come before the Board as an appeal or application.

XII. OFFICE

Correspondence to the Board shall be directed to the Story County Planning and Development Director.

XIII. AMENDMENTS TO PROCEDURAL RULES

These rules may be amended by an affirmative vote of three members of the Board. Amendments shall become effective at the meeting subsequent to the meeting in which the vote to amend was taken.

ADOPTED: February 16, 1982

AMENDED: July 17, 2002
March 5, 2008
May 6, 2009
November 5, 2014
December 18, 2019
October 21, 2020