PLANNING AND ZONING COMMISSION
TENTATIVE AGENDA

Wednesday, May 6, 2020
4:00 PM

Originating from Public Meeting Room - Story County Administration (900 6th Street) – Nevada, Iowa*

THIS MEETING IS OPEN TO THE PUBLIC PURSUANT TO CHAPTER 21 IOWA CODE.

SPECIAL NOTE TO THE PUBLIC: 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 will be provided via conference call to listen and participate in the meeting. Members of the public who would like to call in: Dial 918-221-0224 Enter 2225929465# when prompted for the access code **We ask that you mute your phone if possible. Audio recordings of all Board meetings will be posted on our website www.storycountyiowa.gov shortly after the meeting is concluded. You may access these recordings at any time by clicking on the Meetings and Agendas button on the home page.

1. CALL TO ORDER; REGULARLY SCHEDULED COMMISSION MEETING
2. ROLL CALL/QUORUM DETERMINED
3. APPROVAL OF AGENDA
4. APPROVAL OF MINUTES

   Documents:

   MINUTES 040120.PDF

5. PUBLIC COMMENT
   This is the time for members of the public to offer comments concerning matters not scheduled to be heard before the Planning and Zoning Commission.
6. PUBLIC HEARINGS

   6.I. Discussion And Consideration Of REZ01-20 And SUB06-20 Prairie Valley Major Subdivision Preliminary Plat, Rezoning And C2C Comprehensive Plan Future Land Use Map Amendments - Amelia Schoeneman

   Documents:

   STAFF REPORT.PDF
   REZONING AND C2C REQUESTS.PDF
   PRELIMINARY PLAT.PDF
   REZONING PLAT.PDF
   TRAFFIC STUDY.PDF
   EASEMENTS.PDF
   RESTRICTIVE COVENANTS.PDF
   OWNERSHIP MANAGEMENT AGREEMENT.PDF
   UTILITY AND FIRE LETTERS.PDF
   STORMWATER MANAGEMENT PLAN.PDF
   ARCHAEOLOGICAL STUDY.PDF
   PRAIRIE SURVEY.PDF

7. NEW BUSINESS

7.I. Ames Urban Fringe Plan – Learning About Main Components Of Plan, And Discussing Concerns, Strengths And Weaknesses Of The Plan – Jerry Moore

Documents:

STAFF MEMO.PDF
AUFP.PDF
AUFP LANDUSE FRAMEWORK MAP LANDUSE FRAMEWORK MAP.PDF
28E AGREEMENT.PDF
ENVIRONMENTAL HEALTH COMMENTS.PDF

8. COMMENTS
   Staff
   Commission

9. ADJOURNMENT

*Story County strives to ensure that its programs and activities do not discriminate on the basis of race, color, national origin, sex, age or disability. Persons requiring assistance, auxiliary aids or services, or accommodation because of a disability may contact the county's ADA coordinator at (515)382-7204.

**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
PLANNING AND ZONING COMMISSION

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

DATE: April 1, 2020

CALL TO ORDER: 4:01 PM
PLACE: Public Meeting Room
Administration Building

Marvin Smith, Chair (Phone)	2023
Jonathan Sherwood, Vice Chair (Phone)	2020
Kathy Mens (Phone)	2022
*PJ McBride	2021
Doug Moore (Phone)	2020
Cheryl Moss (Phone)	2020
Gina McAndrews (Phone)	2024

*Absent

Special Note: 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 call to listen and participate in the meeting. Planning and Zoning Commission members were present by conference call.

STAFF PRESENT: Jerry Moore, Director; Marcus Amman Planner (phone); Stephanie Jones, Recording Secretary

PUBLIC PRESENT: Randy Cummings, Carrol McCracken, Jake Strom

APPROVAL OF AGENDA (MCU)

APPROVAL OF MINUTES Motion by Mens, Second by D. Moore, to approve the March 4, 2020 minutes.

Voting Aye: Smith, Sherwood, Mens, Moore, Moss, McAndrews
Voting Nay: None
Absent: McBride

PUBLIC COMMENTS: None

PUBLIC HEARINGS

CUP02-20 Izaak Walton League Shelter

Marcus Amman provided background information, presented a summary of the Staff Report stating that Izaak Walton League is proposing construction of a 18'x12' shelter at the trap and

skeet range and the Conditional Use Permit request also includes existing storage buildings associated with the existing gun club, to include the indoor range, and campground use as put forth in case CUP02-20. The shelter is to provide protection from sun or rain for spectators. The shelter is not expected to increase any spectators.

Smith asked the commissioners individually if they had questions, and there were none. Randy Cummings had no questions, but thanked staff for their help.

Moss asked if the campground is in use by groups such as Boy Scouts and if ranges are in use at the same time for safety purposes. Jake Strom stated that by nature the camping area is 1/4 mile away from the shotgun or riffle/pistol range and the shooting direction is pointed away from the campground. Strom stated that the shooting ranges are very well defined so it is not easy to walk into a shooting range.

Smith stated that the ranges are below grade so would be shooting away from where campground is.

Moss asked if the accessory building is rented to groups or donated. Strom stated that one Boy Scout Troop and one Cub Scout Pack is able to use the facility free of charge. Any other groups such as Girl Scouts or 4-H do have to pay a rental fee to use.

MOTION: The Story County Planning and Zoning Commission acts on approval and makes a recommendation to the Board of Adjustment for approval of the Conditional Use Permit for the Izaak Walton League proposed shelter and existing storage buildings associated with the existing gun club, to include the indoor range, and campground use as put forth in case CUP02-20, with the following conditions:

1. The applicant shall apply for zoning permits for all existing structures where there are no zoning permits on county record.

2. Adjoining of parcels 0536100420, 0536200305, & 0536400140 to create one parcel with no internal property lines

Motion: Mens
Second: Moore
Voting Aye: Mens, D. Moore, Sherwood, Smith, Moss, McAndrews
Voting Nay: None
Not Voting: None
Absent: McBride
Vote: (6-0)

COMMENTS

STAFF: Jerry Moore thanked the Commission for their patience as we work through public meetings electronically due to Covid-19. Moore stated that the Coop/Cog has been activated by the Board of Supervisors, as well as the Emergency Operations Center. J. Moore stated that the BOS are looking into other options than conference calls for meetings. Staff is teleworking from home, as are most of the other county departments, with a few people still reporting to the Administration Building. Our department is continuing to receive applications electronically and through postal mail, and adjusting very well. J. Moore stated that likely plans should be made for an electronic meeting in May as well. Mens stated that she feels the meeting went great today. Moss stated that she appreciates efforts but feels the internet coverage is important for

the county and it's a good example of how important good internet service is. J. Moore stated that today is Census Day and 43% of the households have self-enumerated.

COMMISSION: Doug Moore gave thanks to Stephanie Jones for organizing the electronic meeting.

ADJOURNMENT: 4:50 PM

_____
Approval of Minutes

_____
Title and Date

Staff Report

Story County
Planning and Zoning Commission

Date of Meeting:
May 6, 2020

APPLICANT: Quarry Estates, LLC
619 East Lincoln Way
Ames, Iowa

STAFF PROJECT MANAGER: Amelia Schoeneman, Planner

Case Number REZ01-20 and SUB06-20 is a rezoning and Cornerstone to Capstone (C2C) Comprehensive Plan Future Land Use Map amendment request and a Major Subdivision Preliminary Plat request for the property located at the southeast corner of the intersection of 500th Avenue and 170th Street in the Northwest Quarter of Section 7 of Franklin Township. The subject property is currently zoned R-1 Residential and A-1 Agricultural. The requested amendment to the Official Zoning Map of Story County, Ordinance 288, is to the GB-C Greenbelt-Conservation District for portions of the subject property determined to be environmentally sensitive and that contain floodplain. The request includes a C2C Comprehensive Plan Future Land Use Map amendment from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area for the environmentally sensitive areas and floodplain. The requested major subdivision preliminary plat for the Prairie Valley Subdivision is proposed to include 70 lots for single-family dwellings, five lots to be dedicated to Story County and Story County Conservation including the environmentally sensitive areas, and seven outlots (not buildable for a dwelling) to be owned and managed by a homeowner association. Story County Planning and Development Staff recommend approval of the rezoning and C2C Comprehensive Plan Future Land Use Map amendment request and a Major Subdivision Preliminary Plat request with conditions.

Property Information

PROPERTY OWNER
Quarry Estates, LLC
619 East Lincoln Way
Ames, Iowa

GENERAL PROPERTY LOCATION
The Northwest Quarter of Section 7 of Franklin Township located at the southeast corner of the intersection of 500th Avenue and 170th Street.

PARCEL IDENTIFICATION NUMBERS
05-07-100-105, 05-07-100-200, 05-07-100-400, and 05-07-100-305

GROSS PROPERTY AREA
160 acres

SIZE OF AREA TO BE OCCUPIED BY DEVELOPMENT LOTS
Approximately 56 acres, including streets.

SIZE OF REZONING AREA
74.06 acres

LEGAL DESCRIPTION OF AREA TO BE REZONED
A part of the Northwest Quarter of Section 7, Township 84 North, Range 24 West of the 5th P.M., Story County, Iowa, being more particularly described as follows: Beginning at the intersection of the south line of said Northwest Quarter with the east right of way line of 500th Avenue; thence following said right of way line N00°15'07"W, 1317.30 feet; thence N89°50'35"E, 5.00 feet; thence N00°15'07"W, 1257.30 feet; thence N89°51'55"E, 368.10 feet, parallel with and 60.00 feet South of the north line of said Section 7; thence S21°57'36"W, 141.13 feet; thence S40°17'31"W, 377.36 feet; thence S00°08'36"E, 48.94 feet; thence N90°00'00"E, 139.99 feet; thence S84°55'23"E, 388.88 feet; thence S23°07'56"E, 70.08 feet; thence S21°48'37"W, 169.43 feet; thence S38°11'07"E, 649.09 feet; thence N16°19'21"E, 153.03 feet; thence N28°05'47"E, 191.55 feet; thence S88°52'52"E, 61.21 feet; thence S60°10'21"E, 397.32 feet; thence S11°10'40"E, 284.95; thence N77°59'18"E, 218.91 feet; thence N89°52'48"E, 134.02 feet; thence S50°34'40"E, 76.03 feet; thence S12°47'45"E, 81.88 feet; thence S04°06'56"W, 395.78 feet; thence S21°24'37"W, 42.71 feet; thence S54°25'15"W, 173.64 feet; thence S73°57'26"W, 84.74 feet; thence S18°38'06"E, 377.48 feet; thence S10°44'59"E, 177.21 feet to the south line of

said Northwest Quarter; thence S89°49'14"W, 1864.64 feet to the point of beginning, containing 74.06 acres.

CURRENT ZONING
R-1 Transitional Residential and A-1 Agricultural

FUTURE LAND USE MAP DESIGNATION
The *Story County Cornerstone to Capstone (C2C) Comprehensive Plan* currently designates this property as Agricultural Conservation Area and Rural Residential Area. Portions are also designated as Natural Area.

CITIES WITHIN TWO MILES
Gilbert

DISTRICTS
School - Gilbert
Utilities- Xenia, Alliant Energy, Midland Power
Emergency - Gilbert Fire & Rescue
Watershed - Squaw Creek
Drainage Districts - Drainage District # 8, Drainage District #67, &
Drainage District #95

SUBMITTAL DOCUMENTS
Documents submitted for review include the preliminary plat, a management/ownership agreement with Story County Conservation, restrictive covenants, draft easements, a traffic study, a stormwater management plan, a rezoning and C2C Comprehensive Plan Future Land Use Map amendment request (including a narrative and rezoning plan), letters from utility and emergency service providers, environmentally sensitive areas study, and an archaeological study.

Proposed Use and Background

Current Land Use

The subject property includes four original quarter quarters, less road right-of-way, for a total area of 160 acres. The property contains approximately 66 acres of pastureland, which stretches from the northwest corner of the property to the southeast corner and varies between steeps slopes and flat areas. This area was used for grazing cattle. Squaw Creek runs southwest through the very southwestern corner of the property. Approximately 41 acres, including a majority of the southwest quarter quarter and the northwestern 7 acres of the property (the southeast corner of the 500th Avenue and 170th Street intersection) have been enrolled in the Conservation Reserve Program (CRP) and planted in long term prairie. These are the lowest areas of the property and also contain FEMA designated floodplain. Approximately 40 acres of the subject property is located within the FEMA designated floodplain—along the western edge of the subject property and over a majority of the southwest quarter quarter. The northeast 25 acres of the subject property is currently in hay production, and to the south, approximately 19 acres along the eastern edge of the property was planted as corn. There is a steep ravine that is located near the center of the property and falls south and west from the highest point of the property. This ravine turns into a drainage way, which extends south from the center of the property. The drainage way is surrounded by vegetation including tree cover.

Background and Proposed Use

2018 Rezoning of the Property to R-1 Transitional Residential

In December of 2018, the northwest, northeast, and southeast quarter quarters (120 acres) of the subject property were rezoned to the R-1 Transitional Residential District. As part of this request, the C2C Future Land Use Map designation for the northwest, northeast, and southeast quarter quarters was also amended to the Rural Residential Area. Maps of the current zoning and C2C Future Land Map designations (since the 2018 rezoning and C2C Future Land Use Map amendment) are provided in Figures 1 and 2. The southwest quarter quarter was not part of the request as the Land Evaluation and Site Assessment score was too high to permit a rezoning from the A-1 Agricultural District. Additionally, the southwest quarter is largely covered by floodplain, and no development was proposed for the area.

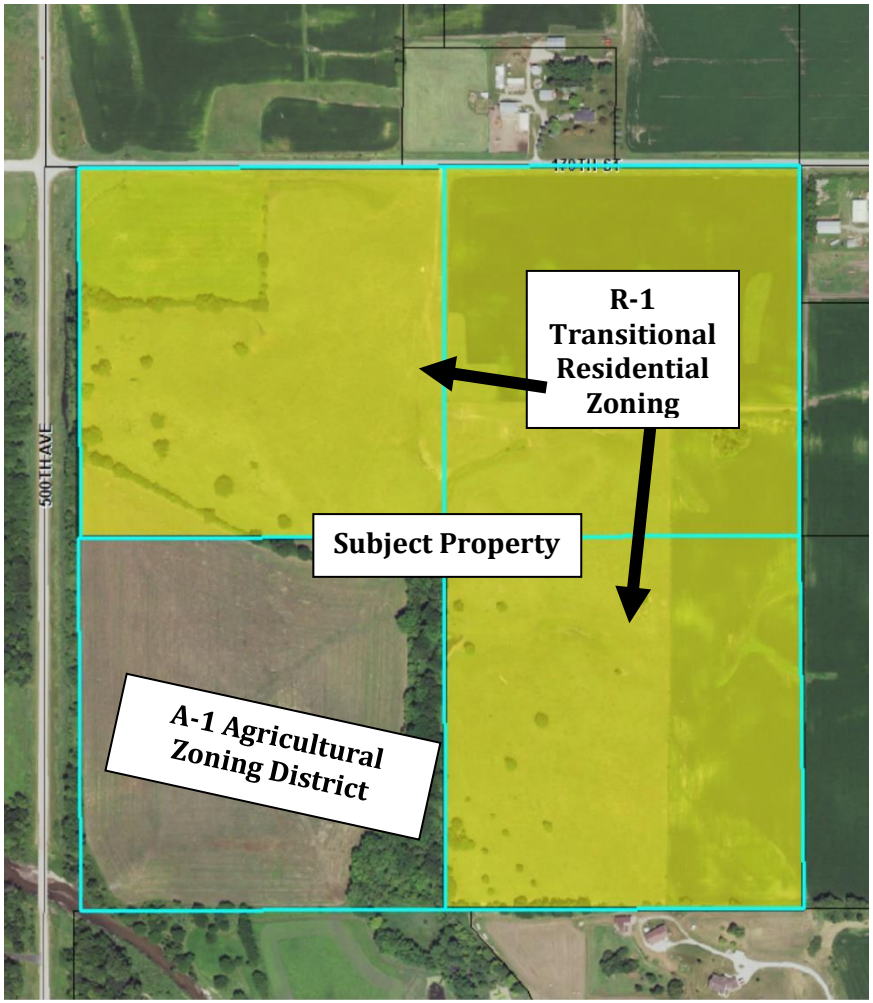


Figure 1: Story County Official Zoning Map for Subject Property

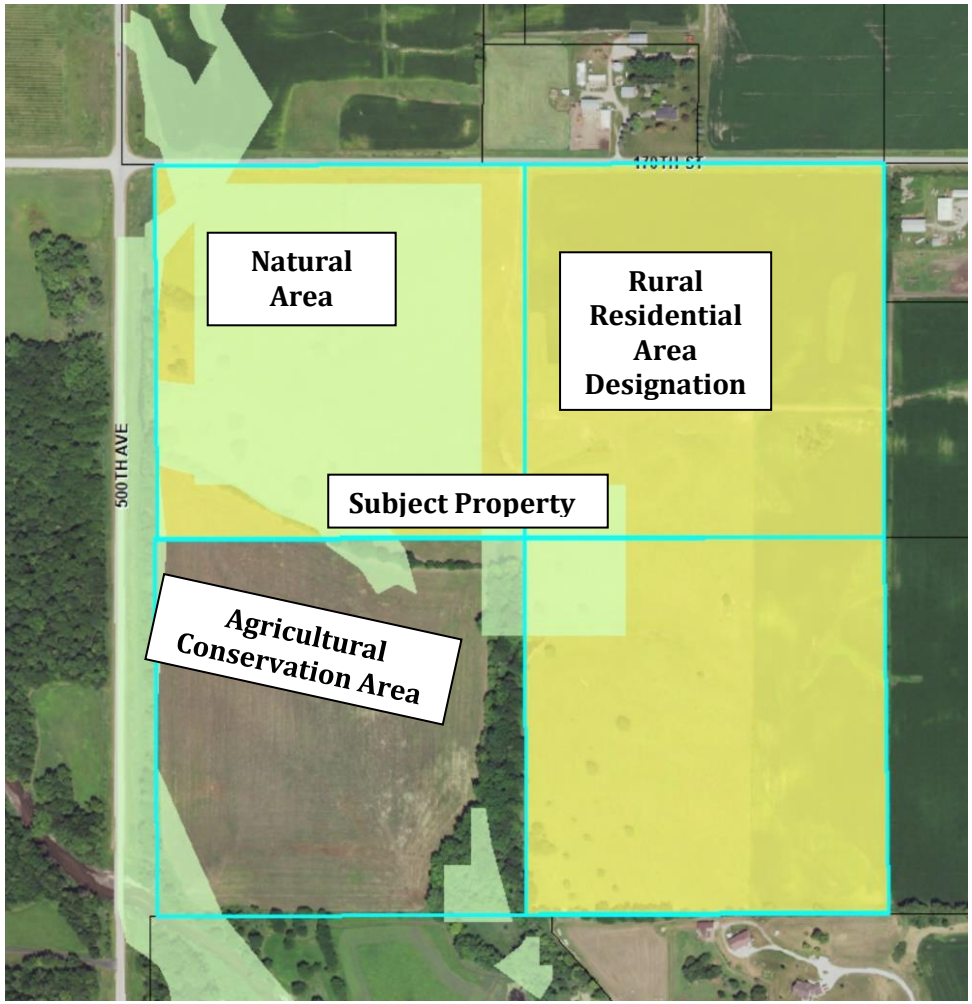


Figure 2: C2C Future Land Use Map for Subject Property

At the December 5, 2018, meeting, the Story County Planning and Zoning Commission made a motion to recommend approval of the staff recommendation to the Board of Supervisors. Staff's recommendation included a condition limiting the development to 56 lots, based on the density of other residential development in the area, and other conditions. This motion failed (vote 2-3) and was the recommendation provided to the Story County Board of Supervisors.

The Board of Supervisors ultimately approved the rezoning and C2C Plan amendment with conditions to ensure the standards of approval for a rezoning and for a C2C Plan amendment, including for compatibility with the surrounding area and protection of environmental resources, were met. The conditions on the rezoning are as follow:

1. The total number of development lots shall not exceed the total number of developable acres, up to a maximum of 70 developable acres (i.e. not to exceed 70 single-family dwellings)
2. The applicant shall work with Story County Environmental Health and Story County Planning and Development to identify areas on the subject property where it is possible to group septic system discharge for the purpose of limiting disruption to prairie remnants and other environmentally sensitive areas.
3. The applicant shall collaborate with Story County Conservation to identify and map the locations of environmentally sensitive areas, including the southwest of the northwest quarter quarter, on the subject property including but not limited to those identified in Condition 8 below.
4. The applicant shall request a Future Land Use Map Designation amendment for the environmentally sensitive areas, identified in Condition 3, from the requested Rural Residential Designation to the Agricultural Conservation Designation at the time of the proposed subdivision plat and rezoning submittal (see Condition 5). The environmentally sensitive areas identified in Condition 3 shall be further designated as Natural Resource Area on the C2C Future Land Use Map.
5. In order to ensure the long-term protection of the environmentally sensitive areas and the floodplain areas, an application to rezone the southwest quarter of the northwest quarter of Section 7 and all environmentally sensitive areas, identified in Condition 3, from the A-1 Agricultural District and the R-1 Transitional Residential District to the GB-C Greenbelt Conservation District shall be submitted by the property owner/applicant with the proposed subdivision plat. A management and/or ownership agreement with Story County Conservation shall be made and submitted at the time of the rezoning in order to best preserve and maintain the identified environmentally sensitive areas located on this property.
6. In accordance with Principle 4 of the Rural Residential Area C2C Future Land Use Map Designation, a buffer of no less than 50 feet shall be maintained between the proposed subdivision development lots and the agricultural land use located to the east.

7. A 20' wide easement for a future hard-surfaced trail shall be provided on the north and west sides of the proposed subdivision for future trail development as described in the C2C Cornerstone to Capstone Comprehensive Plan (See Map 29: Proposed Trails and Greenway Map).
8. As part of the subdivision plat submittal, the development improvements shall meet the requirements of the Story County Land Development Regulations R-C Residential Conservation Design (Overlay) District Chapter 86.15(4)(A)(1-7) as follows:

   4. Design and Improvement Requirements.

   A. Land Suitability. No land shall be developed which is held to be unsuitable for any proposed use if identified as being environmentally sensitive. Areas identified as being environmentally sensitive include:

   (1) All wetlands and hydric soils by the Natural Resource Conservation Service or Story County Conservation, including a 50-foot buffer around all such identified wetlands.
   (2) Native prairie remnants.
   (3) Significant trees and cover.
   (4) All areas having slopes greater than 14 percent.
   (5) Areas that provide habitat for rare, threatened or endangered species.
   (6) Burial sites and Native American mounds.
   (7) Drainage ways that contain running water during spring runoff, during storm events or when it rains. A 30-foot buffer along each side of the drainage way shall be included.

<u>Proposed Subdivision and Conformance with Conditions on R-1 Zoning</u>

The subdivision request is a preliminary plat for a major subdivision. When a major subdivision is proposed, both a preliminary and final plat are required by the Story County Land Development Regulations. The preliminary plat shows the overall concept and design for the subdivision. The final plat provides the legal description for the lots to record and complete the division of the property. The final plat will be reviewed for conformance with the preliminary plat by staff, the Planning and Zoning Commission, and the Board of Supervisors when it is submitted. The final plat must be submitted within one year of the preliminary plat. Before the submittal of the final plat, all improvements including roads, grading, stormwater management, and utilities are required to be completed or a development agreement and financial security submitted with a timeframe (a maximum of two years) for their completion with the final plat. The design, materials, and workmanship, installation, and construction of improvements must be warranted for a period of two years from and after completion.

To meet the conditions of the 2018 rezoning, the applicant has proposed a 70-lot subdivision at a density of .44 lots per acre (condition one of the rezoning limits the development to 70 lots). The minimum lot size for the R-1 Transitional Residential Zoning District in which the subdivision is located is 25,000 square feet for a single-family dwelling. All lots meet or exceed this minimum lot size requirement. A layout drawing for the subdivision is provided in Figure 3.

The final plat for the proposed Prairie Valley Subdivision will be completed in four phases, demarcated by various colored dashed lines on layout drawing in Figure 3.

Regarding condition two of the rezoning (grouping of septic systems), the Board of Supervisors added this condition as a way to protect the remnant prairie on the site from the moisture of the discharge from the septic laterals. A protective subdrain to divert runoff from the septic laterals away from the prairie remnants is proposed for lots with lateral fields that slope towards the prairie remnants. This proposal has been reviewed by the County Sanitarian and County Conservation. The subdrain is shown by the thin black line on the layout drawing (Figure 3) behind the rear lot lines of the development lots. A design of the protective subdrain is provided with the preliminary plat and available on the agenda center. The subdrains are located on outlots to be owned and managed by a homeowner association. The County Sanitarian and County Conservation Director requested an additional tile on Lot 52. The applicant provided an amended plan to staff showing the drain, although they do not believe it is needed and noted it would add cost to the project. Staff recommends the addition of this tile to the preliminary plat as a condition of approval.

The design of the subdivision meets the conservation design principles prescribed as part of the eighth condition on the rezoning. Story County Conservation performed a desktop survey through the Iowa Department of Natural Resources and determined there are no threatened or endangered species on the site. The applicant also completed an archaeological study that did not locate burial grounds or native American mounds. Dr. Thomas Rosburg, a professor of Ecology and Botany at Drake University, completed a field review to locate remnant prairie and other landscape features, as required by conditions three and eight of the rezoning. The most significant and environmentally sensitive features were the native prairie remnants. Several remnant prairie areas are present on the subject property and they are shown in yellow outlines on the layout drawing for the subdivision in Figure 3. The remnant prairies are mainly located on steeply sloped areas of the south half of the northwest quarter quarter and on the western half of the southeast quarter quarter. These areas were previously the pastureland. Several lots do have areas with slopes over 14% or with potentially hydric soils but were not identified as

environmentally sensitive. Further, the trees on the site were not identified as environmentally sensitive.

The conditional rezoning required the environmentally sensitive areas and floodplain to be rezoned to the Greenbelt-Conservation District and their C2C Future Land Use Map designation amended to Agricultural Conservation and Natural Area (conditions four and five). The layout drawing shows the area to be rezoned to the Greenbelt-Conservation Zoning District and amended to Agricultural Conservation and Natural Areas on the C2C Plan Future Land Use Map in blue. The blue area also contains the FEMA mapped floodplain present on the subject property.

The fifth condition of the rezoning also requires that a management agreement with Story County Conservation be developed to protect the environmentally sensitive areas and floodplain. Since the 2018 rezoning, the developer has instead decided to deed this area and the lots designated with a letter and shown in green on the layout drawing to Story County Conservation. There are five total lots to be deeded to Story County. Four will be dedicated to Story County Conservation, totaling 81.8 acres. The fifth lot to be dedicated to the county is additional right of way along 170th Street. Lot B, which contains 74.07 acres and all of the environmentally sensitive areas and is the area of the rezoning and C2C Plan Amendment, and Lots C and D, will be platted and deeded as part of the first phase of the subdivision. Lot E will be deeded to Story County Conservation as part of the fourth phase of the subdivision.

The measures originally proposed as part of the management agreement with Story County Conservation have been addressed through the preliminary plat, proposed covenants, and an ownership/management agreement. The measures include:

- The applicant worked with the Story County Conservation Board to provide a 35-foot buffer around the remnant prairie. The buffer is shown by a dashed yellow line on the layout drawing. A 45-foot buffer is provided from lots with a protective subdrain.
- Silt fencing is proposed around the prairie remnants to provide protection and a barrier during construction. The location of the silt fence is shown in the erosion control plan as part of the preliminary plat and available on the agenda center.
- The developer will be constructing split rail fencing on the common lot lines of the development lots with the County-owned property to provide demarcation and protection. The homebuilders/lot owners are required to construct split rail fencing on the common property lines with the homeowner association-owned lots. A fence plan is provided as part of the preliminary plat and included as provisions in the ownership/management agreement and covenants.

- The proposed covenants include prohibitions on using fertilizers that contain phosphorous.
- Water quality testing will occur on the Story County-Conservation-owned lots. Per the management/ownership agreement, in the event the testing indicates the use of fertilizers and/or lawn additives that contain phosphates in violation of the Covenants, the Story County Conservation Board may take action at law or equity for relief, either by injunction or damages.
- Per the covenants and ownership/management agreement, all homeowner association outlots and Story County Conservation-owned lots that contain greenspace shall be managed as native prairie lots. No invasive species are allowed on these lots or any development lot and trees and shrubs shall be native species. The Story County Conservation Board will approve all seed mixes for the outlots.
- Per the covenants, no debris, hazardous materials, household hazardous waste, or unapproved plants or soil shall be placed, at any time, in the subdivision.

The Conservation Board discussed these prescriptive measures at the April 13, 2020, meeting. A concern raised by the Board and staff was the expiration or amendment of the covenants. A conservation easement was requested. The County Attorney has reviewed the easement language and determined that it is sufficient to enforce the provisions of the covenants if they were to be amended or expire. The Story County Conservation Board will take action on these provisions and the preliminary plat, covenants, conservation easement, and ownership/management agreement at their May 11, 2020, meeting.

Condition six requires a 50-foot buffer from the parcels in agricultural production to the east. This buffer is shown on the layout drawing in Figure 3. The lots shown in brown on the layout plan in Figure 3, including the 50-foot buffer on the east side of the subdivision, are outlots to be managed by a homeowner association. There are seven outlots and they total 26.20 acres, including the street lots. These outlots include stormwater management retention ponds and the protective subdrain. They also include buffers between the development lots and 170th Street.

The 20-foot wide easement for a future hard-surfaced trail on the north and west sides of the proposed subdivision required by the seventh condition is shown on the plat. Story County Conservation will own the property where the trail easement is located on the west side of the development. The location of this trail may change as an additional trail system will be built by Story County Conservation on the Story County Conservation-owned property as soon as the summer of 2021. A concept trail system is shown in grey in the layout drawing in Figure 3, including a trailhead and parking at the entrance to the subdivision, shown in Lot C. This design may change as Story County Conservation works to develop the system and determine a final design.

Proposed Subdivision and Conformance with the Story County Land Development Regulations

In addition to the conditions placed on the subdivision by the rezoning, the Story County Land Development Regulations contain additional submittal and design standards. Chapter 87 includes items to be shown on the preliminary plat and submitted with the plat. Chapter 88 contains general site planning standards for street and lot design, environmental resource protection, stormwater management, and requires a traffic study.

As required by Chapter 87, the applicant submitted letters from utility and emergency service providers on their ability to serve the subdivision. Xenia Rural Water and Midland Power Cooperative both confirmed that they would be able to serve the subdivision. A six-inch water main is shown on the plat. Alliant Energy will enter into an extension agreement with the developer to extend the gas main from George Washington Carver along 170th. The Gilbert Fire Chief also provided a letter confirming their ability to serve the subdivision:

> *From the time we are toned out for a fire until someone reaches the station can be 2-5 minutes. Confirmed structure fires will be dispatched as a box alarm automatically paging mutual aid from Story City and Roland additional mutual aid can be called in from any number of surrounding departments. With this in mind, I would highly recommend all homeowners subscribe to, and have a monitored security system (such as ADT) installed & tied in with smoke detectors. Early, advanced alerting of a possible fire, especially in new construction, has a marked benefit of getting personnel & equipment moving before a fire can dig itself in without being noticed, or if no one is home. Most homeowners insurance providers offer discounts on the premium for having a monitored security service.*
>
> *Medical emergencies will have similar response times, however some personnel do respond by personal vehicle. Our ambulance service is primarily out of Mary Greely Medical Center in Ames but we have occasionally had Story County Hospital in Nevada or Huxley Ambulance respond when Ames units are tied up.*
>
> *I am aware other developments near this area have installed fire hydrants. If these are planned within this development, please be aware that we cannot pump directly from these into our fire engine to attack a fire - the negative pressure that would be subjected to the water main would be enough to collapse the main. What we can do is attach a hose to allow water to free-flow into a portable tank from which we would be pumping water. The rate of flow from the rural water is questionable. Mutual aid water tenders would also be dumping into this portable tank.*

Staff provided the Fire Chief with the hydrant locations proposed and he raised no further concerns.

As required by Chapter 88, all lots have been reviewed to determine that no flag or double frontage lots are proposed and that all lots meet minimum width and depth-to-width ratio requirements.

Chapter 88 also contains standards for street design and access requirements. The County Engineer reviewed a previous concept drawing of the plat and requested that the west access be moved to the east due to sight distance issues at the location. Permits will be required from the County Engineer for any work in the right-of-way, including the installation and improvement of the accesses. Other street standards have been met.

Chapter 88 also requires that subdivisions are planned so that the street arrangement would allow for access to adjoining properties if they were platted. A stub road is shown from Foxtail Court to the adjoining property to the east. A note is also on the plat that a potential roadway connection could be made on Outlot D between Lot 46 and Lot 56 and between Lots 38 and 42. The developer of Prairie Valley or homeowner association would be responsible for the costs of the road connection with any development to the east.

Standards for environmental resource preservation are also in Chapter 88. A stream easement dedicated to Story County Conservation is required for streams in areas being subdivided. There is a drainage way on the property and a portion of Squaw Creek. These will be deeded to Story County Conservation and are part of the rezoning request to the Greenbelt-Conservation District. If over 15% of natural vegetative cover is removed, mitigation requirements for significant trees would apply. A grove of Cottonwoods and a row of Mulberry, Ash, Cherry, and Locust trees along a fence line will be removed. However, none of the environmentally sensitive areas will be disturbed and no mitigation of trees is required.

Erosion control requirements apply—the applicant is required to have a National Pollutant Discharge Elimination System Permit with the Iowa Department of Natural Resources. A copy of the erosion control plan to be part of this permit was provided with the preliminary plat.

A stormwater management plan was also submitted. To meet the county's requirements, soil quality restoration is proposed on all development lots to provide infiltration to manage a rainfall depth of 1.25-inches. For larger rain events, five dry detention basins are

proposed so that the runoff rates from the site do not exceed the current rate from the 5-year storm event.

A complete traffic impact study was also required as all phases of the development are anticipated to generate 330 trips daily. Manual traffic counts were performed during morning and evening peaks at the intersection of 500th Avenue and 170th Street. Approximately 1.5% of traffic during peak hours was truck traffic. The 2015 average daily traffic counts from the Iowa Department of Transportation are 1,150 vehicles per day on 170th Street and 1,470 on 500th Avenue. Crash data from 2010 to 2020 was evaluated—there were 12 crashes, 11 of which involved animals. The Level of Service (LOS) of roadways in the subdivision, within a quarter mile, and at intersections within a quarter mile was determined to be an "A" level and no decrease to a lower LOS due to the development is anticipated. LOS describes operational conditions within a traffic stream, based upon service measures, such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. LOS A (highest level of service) represents completely free flow of traffic allowing traffic to maneuver unimpeded.

The study determined that a right turn lane will likely be warranted on 170th Street at 500th Avenue with the second phase of the development. Right-turn lanes are likely not warranted on 500th Avenue at 170th but are within one vehicle of being warranted and should be monitored after the full build-out of the subdivision. No turn lanes into the development were recommended. Per the traffic study ordinance, the Board of Supervisors is to review all recommended improvements as part of their review of the preliminary plat. The recommendation as to who should finance improvements comes from the County Engineer. The County may require the improvements to be provided by the applicant, at the recommendation of the County Engineer.

The County Engineer reviewed the traffic study and determined that a right turn lane should be constructed on 170th Street at 500th Avenue before phase two of the development. He recommends that the improvement is paid for/provided by the applicant as road funds are limited and the need for a turn lane prior to phase two would be a direct result of the development. The applicant noted that they believed a right turn lane will be warranted by 2029 without the development based on the existing traffic growth. The evening peak at the intersection is currently 49 cars making right turns onto 500th, based on the traffic study. A turn lane is warranted at a peak of 57 cars per the study. The development will add the eight cars to the peak, warranting the turn lane, by its second phase. The applicant does not believe they should be burdened with the full cost of the turn lane, given its contribution to traffic.

Tax Increment Financing Request for Subdivision

The developer is separately requesting Tax Increment Financing (TIF) from Story County to help pay for infrastructure or other improvements to prepare the lots. If the Board of Supervisors and applicant wish to consider the financing of the right turn lane on 170th at 500th as part TIF request, a condition is recommended requiring action prior to the final plat.

Staff's initial comment on this request was that the adopted Story County Economic Development Processes and Policies do not support the "direct disbursement or rebate to a private entity." The policy does allow the funds to be used for trails and public infrastructure development. At the May 5, 2020, Story County Board of Supervisors meeting, the Board will discuss and consider an amendment to the policy to allow payment to private entities on select residential housing development, which would be the first step in the TIF request process. A second agenda item is to direct staff to create a proposal and timeline for a residential TIF program, the second step in the request. Staff will update the Planning and Zoning Commission on the Board's action at the May 6 meeting. If the availability of TIF impacts the design of the subdivision such as the number of lots or improvements proposed, it will be required to go through the preliminary platting process again, including a hearing before the Planning and Zoning Commission.

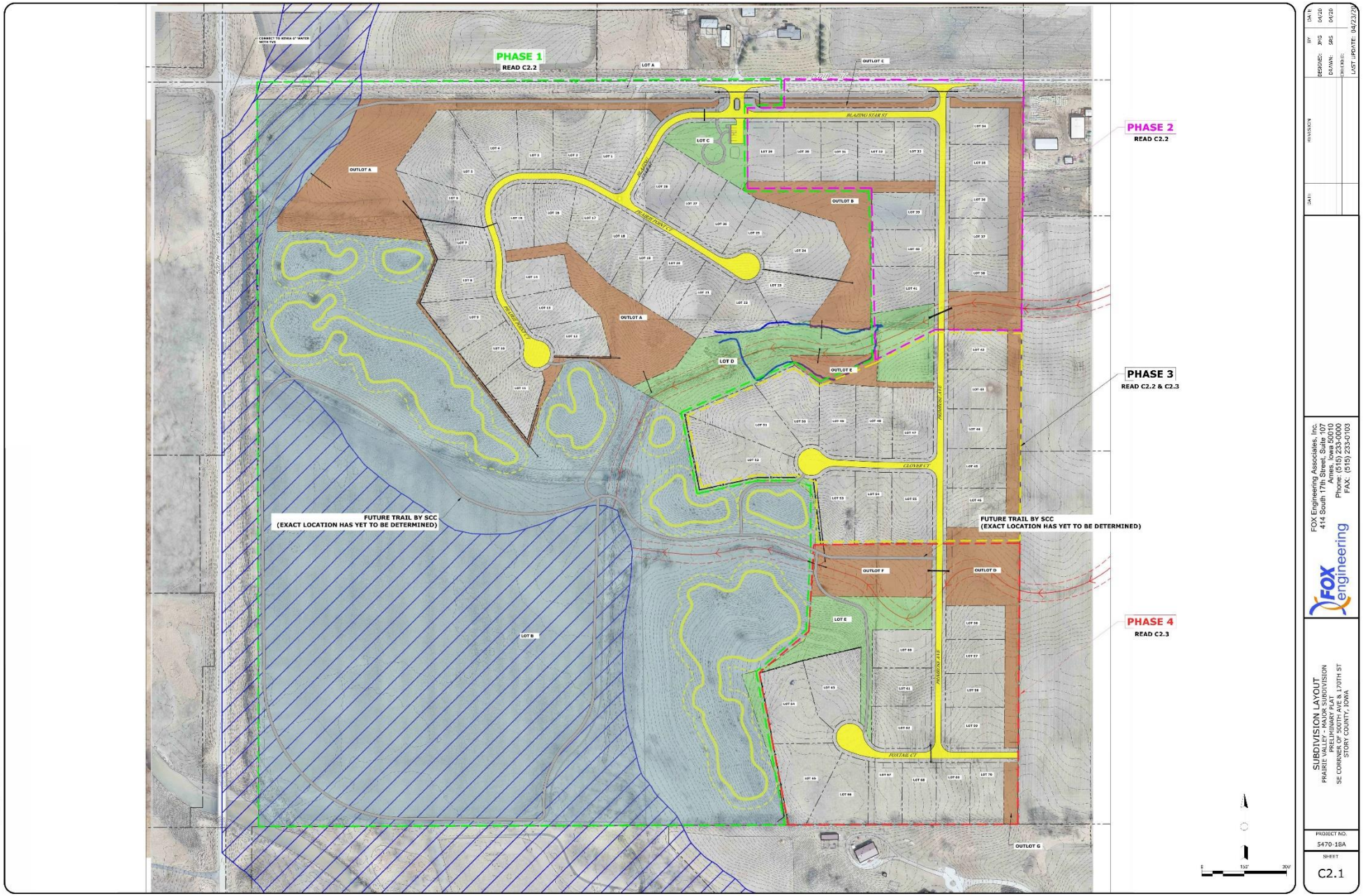


Figure 3: Prairie Valley Subdivision Layout Drawing.

Surrounding Land Use

Adjacent Land Use:
North – a 37.18-net acre parcel in agricultural row crop production; a 33.28-net acre parcel in agricultural row crop production; a 38.79-net acre parcel in agricultural row crop production; and a 6.88-net acre parcel containing a farmstead, a dwelling constructed in 1976, and approximately 3.5 acres in livestock production.
East – a 29.62-net acre parcel in agricultural row crop production; a 40-net acre parcel in agricultural row crop production; and a 9.17-net acre farmstead, a dwelling constructed in 1976, and approximately 4 acres in livestock production.
South – a 53.40-net acre parcel containing a dwelling constructed in 2006, approximately 12 acres in hay production, and pasture area; and a 45.64-net acre parcel containing a dwelling constructed in 2006, approximately 3.5 acres in hay production, and pasture area.
West – (located in Boone County) a 28.91 net-acre parcel that is an outlot in the Buck Hill Subdivision; a 36.47-net acre parcel with dwelling constructed in 2005, horse barn, pasture, and natural area; a 59.10-net acre parcel containing natural area and approximately 10 acres in agricultural row crop production; a 23.46-net acre parcel of natural area; and a 27.38 net-acre parcel in agricultural row crop production.

There is a total of five (5) single-family dwellings, located on parcels between 6.88-net acres and 53.40-net acres, adjacent to the subject property. There is an existing 14-lot subdivision (Eagle Ridge) located approximately one-quarter mile south of the subject property. This subdivision is located on the south side of the floodplain of Squaw Creek. There is another major subdivision, Buck Hill, located approximately one-quarter mile northwest of the subject property on the west side of 500th Avenue in Boone County. This subdivision contains 69 development lots.

C2C Plan Designation

The subject property is currently designated Agricultural Conservation Area (ACA) and Rural Residential Area (RRA) on the C2C Comprehensive Plan Future Land Use Map. Portions of the property are also designated as Natural Resource Areas (NRA). The request to amend the designation for the identified environmentally sensitive areas to the Agricultural Conservation Area if they were previously designated as Rural Residential Area. The areas would then be further designated as Natural Resource Area. Due to the generality of the Natural Resources Area designation, all environmentally sensitive areas are currently not designated as Natural Resources Area and some areas are not natural areas but designated as such. It is an item on the Planning and Development Department's work program to review the entire Natural Resource Area designation for Story County and propose amendments to improve to better reflect existing conditions.

Applicable C2C Plan Goals and Objectives

Based on public input during the creation of the Story County Cornerstone to Capstone (C2C) Comprehensive plan, Story County residents expressed the following weaknesses and threats, among others, which relate to the proposed request:

"Need to continue adding and connecting trails"
"Need to increase public park properties and infrastructure"
"Hard to strike a balance between growth and sustainability and protecting good farmland"

Applicable objectives from the C2C Comprehensive Plan include, but are not limited to:

Objective H1.1: Throughout Story County, plan for a range of housing that meets the needs of residents of various income, age, and health status.
Objective NRR3.1: Preserve and protect the existing native plants and animals, as well as re-establishing them where they historically occurred.
Objective NRR3.7: Restrict development within environmentally sensitive areas including floodplains, steep slopes, wooded areas, and wetlands.
Strategy for NRR Goal 3: Encourage development that limits impact on existing wooded areas and preserves and restores natural prairies and wetlands.

Overall goals for the C2C Plan include:

Agricultural Resources Goals

AR1: Protect agricultural practices in areas with prime soils and viable agricultural interests.
AR2: Minimize conflicts between agricultural and non-agricultural land uses.
AR3: Preserve farmland and the rural landscape as a viable foundation for a strong and growing agricultural economy

Housing Goals

H1: Plan for safe, attractive and affordable housing to meet existing needs and forecasted housing demands of all residents of the county.
H2: Plan for housing types and densities that reinforce the predominately rural character of the unincorporated areas of the county
H3: Housing is planned for, designed, and built in a way that responds to residents' needs and reflects their voices and experiences.

Agricultural Conservation Area principles include:

ACA Principle 1: Conserving agricultural land, as well as agricultural practices, is a fundamental principle in Story County. Areas are identified, conserved, and enhanced within the county for farming practices and agricultural production.
ACA Principle 2: Continue to work towards strategies that promote alternative agricultural methods that work in harmony with conventional operations. A variety of farm types is a good thing.
ACA Principle 3: 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.
ACA Principle 4: Design areas identified for development to limit conflicts between agricultural uses and rural residences and other types of land uses. Through development practices preserve and protect prime agricultural lands and the ability to engage in agricultural activities.
ACA Principle 5: Promote the continued health of agriculture through an ongoing planning process to identify partnerships and develop voluntary, incentive-based programs and strategies.

Principles associated with the Rural Residential Area (RRA) include:

RRA Principle 1: Ensure that new development is sensitive to the predominantly rural nature of the areas.
RRA Principle 2: Encourage clustering of residential sites to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services.
RRA Principle 3: Review design and development standards to ensure that conflicts between proposed development and agricultural and natural resources are minimized. Design new residential development to maintain the open character of rural areas and to protect and maintain agricultural uses and sensitive environmental features.
RRA Principle 4: When development is adjacent to agricultural uses, provide adequate buffers to minimize conflicts.
RRA Principle 5: Locate proposed subdivisions on a case-by-case basis. Establish and use location guidelines in the review process for new rural subdivisions.
RRA Principle 6: Encourage proposed development to take access off existing paved roads unless it can be demonstrated that Minimum Levels of Service requirements may be met or development can mitigate impacts.
RRA Principle 7: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR and Story County standards.

The Future Land Use Map also designates portions of this property as Natural Resource Area (NRA). Principles of this designation include:

> *<u>NRA Principle 1:</u> Generally discourage development within these areas. In unique circumstances where appropriate development types may enhance the area, recognize and encourage such approaches.*
> *<u>NRA Principle 2:</u> Mitigate impacts of proposed development contiguous to areas identified as Natural Resource Area.*
> *<u>NRA Principle 3:</u> Consider areas identified as Natural Resource Area for inclusion in the Greenbelt-Conservation District of the Land Development Regulations and/or take necessary steps to ensure resource conservation through other mechanisms.*
> *<u>NRA Principle 4:</u> Develop site planning and performance standards to apply to properties designated as Natural Resource Area not included in the Greenbelt-Conservation District and in which limited development may occur.*

<u>Official Zoning Map</u>

The subject property is currently zoned A-1 Agricultural District and R-1 Transitional Residential. The Statement of Intent for the A-1 Agricultural District is as follows:

> *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 Cornerstone to Capstone (C2C) Comprehensive 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 Cornerstone to Capstone (C2C) Comprehensive Plan goals and objectives.*

The Statement of Intent for the R-1 Transitional District is as follows:

> *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.*

The applicant is requesting an official zoning map amendment from the A-1 Agricultural District and R-1 Transitional Residential District to the Greenbelt-Conservation District. The Statement of Intent for the Greenbelt-Conservation District reads:

> *The Greenbelt-Conservation District is intended to provide special regulations for resource conservation of lands containing sensitive environmental conditions. These regulations permit reasonable economic use of property and at the same time protect the natural resources and recreational assets of the area. This District is designated to promote water quality and conservation, to protect aquifers, alluvial soils and slopes; and to protect areas which possess outstanding scenic, vegetation, wildlife habitat, and travel corridors, geological, historic or recreational values. Structures inconsistent with the permitted uses shall not be allowed in the Greenbelt-Conservation District.*

Analysis

Rezoning Standards of Approval—*the requested amendment to the Official Zoning Map of Story County is to the GB-C Greenbelt-Conservation District for portions of the subject property determined to be environmentally sensitive and floodplain.*

According to Section 92.06(2) of the *Story County, Iowa Code of Ordinances*, applicable standards for approval include the following. Staff's analysis is included below. The applicant has provided a narrative for the request that is available on the agenda center.

A. The proposed rezoning shall conform to the Story County Cornerstone to Capstone (C2C) Comprehensive Plan.

> **Staff Comment:** *The applicant had a field review completed to identify environmentally sensitive areas on the subject property and has requested a C2C Future Land Use Map Amendment to the Natural Resource Area for the environmentally sensitive areas. The amendment request also includes the floodplain on the property, which was not previously designated as Natural Resource Area. The C2C Amendment to the Natural Resource Areas for these portions of the property was required as a condition of the rezoning of the subject property to R-1 Transitional Residential. The C2C Plan Zoning Compatibility Matrix indicates that Natural Resource Areas are compatible with the Greenbelt-Conservation District and Residential Conservation Design Overlay District. A C2C Plan Future Land Use Map Amendment to the Natural Resource Area for the environmentally sensitive areas and floodplain is also requested. Natural Resource Area Principle 3 is to "consider areas identified as Natural Resource Area for inclusion in the Greenbelt-Conservation District of the Land Development Regulations and/or take necessary steps to ensure*

resource conservation through other mechanisms." The rezoning request specifically follows this principle.

B. The proposed rezoning shall conform to the Statement of Intent for the proposed district and district requirements.

Staff Comment: *The proposed use of the environmentally sensitive areas of the subject property as a county park, owned and managed by Story County Conservation, aligns with the Statement of Intent of the GB-C Greenbelt Conservation District, which reads:*

> *The Greenbelt-Conservation District is intended to provide special regulations for resource conservation of lands containing sensitive environmental conditions. These regulations permit reasonable economic use of property and at the same time protect the natural resources and recreational assets of the area. This District is designated to promote water quality and conservation, to protect aquifers, alluvial soils and slopes; and to protect areas which possess outstanding scenic, vegetation, wildlife habitat, and travel corridors, geological, historic or recreational values. Structures inconsistent with the permitted uses shall not be allowed in the Greenbelt-Conservation District.*

In addition to the ownership and management by Story County Conservation, the Greenbelt-Conservation District zoning will provide the highest level of protection to the environmentally sensitive areas on the subject property. Permitted uses include:

A. Agriculture, but not including clear cutting of naturally occurring tree cover.
B. Truck gardening, nurseries, orchards, apiaries, tree farms, and other similar uses, provided that retail sales are of a seasonal nature only and that parking is adequate to keep all public rights-of-way clear.
C. Livestock grazing, but not including feedlots and poultry farms.
D. Sustained yield forestry.
E. Wildlife preserves.
F. Soil and water conservation.
G. Drainage and water retention, water measurement, and water control facilities.
H. Recreational uses such as canoeing access, boat launching ramps, swimming areas, primitive camping, hiking, horseback riding trails and similar open space uses.
I. Parking in conjunction with permitted uses.
J. Cultural/historic restoration.

C. The proposed rezoning shall be compatible with surrounding land uses and development patterns.

Staff Comment: *The existing character of the area surrounding the subject property is primarily agricultural parcels and large lot residential. A 70-lot residential subdivision is proposed as part of the request.*

A park and protected natural area are unique for the area but does not make the use incompatible. County parks are mainly located in the unincorporated areas of Story County where important resources exist. This is also true of the Greenbelt-Conservation Zoning District. The majority of the properties zoned Greenbelt-Conservation are located around the Skunk River north of Ames, including McFarland Park. By area, it is the second most common zoning district in unincorporated Story County, after A-1 Agricultural.

The subject property is located in the Squaw Creek watershed and is uniquely positioned at the point where Squaw Creek enters Story County. Squaw Creek flows through the southwestern corner of the property, and the Greenbelt-Conservation District would incorporate this area and Squaw Creek's floodplain on the property. The subject property also contains three drainage districts in the Squaw Creek Watershed. The rezoning would be the first to Greenbelt-Conservation along Squaw Creek.

Preserved natural areas provide important ecosystem services to the rural landscape and residential areas—from water quality benefits to providing residents with a recreational opportunity. The proposed Greenbelt Conservation District would include the floodplain on the property providing protection to downstream areas from increased flooding.

The proposed rezoning also ensures that surrounding land uses and development patterns are compatible with the environmentally sensitive areas on the site. The environmentally sensitive area was previously pasture for livestock. The proposed adjacent housing development included a condition that the environmentally sensitive areas were identified, rezoned to Greenbelt-Conservation, and managed to ensure the development did not have adverse impacts on the resources.

D. The proposed rezoning shall protect environmental resources. Rezoning of parcels containing more than fifty (50) percent of the gross acreage as lands identified with areas designated Natural Resource Areas on the Story County Development Plan (C2C) shall not be approved unless such requested action results in a district designation

more restrictive than the current designation, the R-C Residential Conservation Design (Overlay) District is applied to the property, or conditions protecting the identified areas are attached to the rezoning request. (Ordinance No. 184)

Staff Comment: *The proposed rezoning is to a more restrictive district, the Greenbelt-Conservation District, to specifically protect environmental resources.*

E. In areas where the petition to rezone requests a change from A-1 District or A-2 District to another district, lands scoring 267 or above for total LESA score, as determined by a Land Evaluation Site Assessment (LESA) as adopted for Story County, shall not be approved. (Ordinance No. 208)

Staff Comment: *Only the southwest quarter quarter of the subject property is zoned A-1 Agricultural. The LESA score of quarter quarter is 266.*

C2C Future Land Use Map Amendment Standards
According to Section 92.08(1) of the *Story County, Iowa Code of Ordinances*, applicable standards for approval include:

a. The extent to which the change would be consistent with the comprehensive plan goals and policies.

Staff Comment: *The amendment of the Future Land Use Map Designation is consistent with Land Use Goal 2: "Preserve, protect, and plan around the physical characteristics of the land, including floodplains, steep slopes, wetlands, rich soils, and rare geologic or environmental characteristics." The proposed amendment designates the environmentally sensitive areas (including floodplain area) as Natural Resource Area and Agricultural Conservation Area to prevent development of the existing natural areas on the Subject Property. These areas are currently not designated as Natural Resources Area or are designated Rural Residential Areas.*

The amendment would also further the following principles and objectives as currently, the sensitive areas identified by the on-site study and floodplain are not all designated as Natural Resource Areas in the C2C Plan. The Natural Resource Area designation provides protections for the areas under the Story County Land Development Regulations including mitigation if the resources were disturbed.

<u>NRA Principle 1:</u> Generally discourage development within these areas. In unique circumstances where appropriate development types may enhance the area, recognize and encourage such approaches.
<u>NRA Principle 2:</u> Mitigate impacts of proposed development contiguous to areas identified as Natural Resource Area.
<u>Objective H1.1:</u> Throughout Story County, plan for a range of housing that meets the needs of residents of various income, age, and health status.
<u>Objective NRR3.1:</u> Preserve and protect the existing native plants and animals, as well as re-establishing them where they historically occurred.
<u>Objective NRR3.7:</u> Restrict development within environmentally sensitive areas including floodplains, steep slopes, wooded areas, and wetlands.

The amendment also follows the strategy for NRR Goal 3 to "encourage development that limits impact on existing wooded areas and preserves and restores natural prairies and wetlands" and RRA Principle 3 to "review design and development standards to ensure that conflicts between proposed development and agricultural and natural resources are minimized. Design new residential development to maintain the open character of rural areas and to protect and maintain agricultural uses and sensitive environmental features." The study to determine the natural resources on the site informed the development of Prairie Valley to preserve the natural features.

b. Evidence demonstrating the reason(s) why the plan should be changed, including but not limited to whether new information has become available since the comprehensive plan was adopted that supports reexamination of the plan, or that existing or proposed development offer new opportunities or constraints that were not previously considered.

Staff Comment: *Dr. Thomas Rosburg, a professor of Ecology and Botany at Drake University, completed a field review to locate remnant prairie and other landscape features. The most significant and environmentally sensitive features were the native prairie remnants. The remnant prairies are mainly located on steeply sloped areas of the south half of the northwest quarter quarter and on the western half of the southeast quarter quarter. The prairie remnants are not all designated as Natural Resource Area in the C2C Plan or are designated as Rural Residential and Natural Resource Areas.*

c. Whether or not the change is needed to allow reasonable development of the site.

Staff Comment: *The proposed amendment to Agricultural Conservation Area and Natural Resource Area will prevent development of environmentally sensitive areas.*

d. The relationship of the proposed amendment to the supply and demand for the particular land uses within the county and immediate vicinity of the site.

Staff Comment: *The subject property is uniquely situated. Previously grazed, it contains remnant prairie. From the C2C Plan Natural Resource Chapter "In 1873, as much as 332,505 acres of prairie existed, which encompasses over 90% of the Story County's land. Today, the majority of the land that was historically prairie has been converted into cropland." Portions of the prairie are high quality. From Dr. Rosburg's report on the remnants located on the subject property:*

> *The presence of hairy grama is quite significant. It's a prairie species that characterizes the short-grass prairie which is located in the western Great Plains. In order to occupy plant communities in the tallgrass prairie region of Iowa, it requires specialized microenvironments that provide similar growing conditions as in the short-grass prairie – a habitat that is very dry and low in fertility. Hairy grama is known from 35 counties in Iowa (about a third), but it is always limited in its abundance and frequency.*

The property is also located in the Squaw Creek watershed and is uniquely positioned at the point where Squaw Creek enters Story County. Squaw Creek flows through the southwestern corner of the property and would incorporate Squaw Creek's floodplain into the Natural Resource Area Designation. The subject property also contains three drainage districts in the Squaw Creek Watershed.

Preserved natural areas provide important ecosystem services to the surrounding area—from water quality benefits to providing residents with a recreational opportunity. The proposed Natural Resource Area designation would include the floodplain on the property providing protection to downstream areas from increased flooding.

e. A demonstration that the proposed amendment has merit beyond the interests of the applicant.

Staff Comment: *Beyond the ecosystem benefits provided as discussed above, the amendment will designate a future county park as Natural Resource Area. The applicant will deed the lot with the environmentally sensitive areas to Story County Conservation as part of the first phase of the subdivision.*

f. The possible impacts of the amendment on all specific elements of the comprehensive plan as may be applicable, including but not limited to:
   1. Goals. Objectives and strategies as related to the following from C2C Plan; Agricultural Resources, Community Facilities and Services, Communications and Public Safety, Emergency Preparedness, Cultural Resources, Infrastructure and Utilities, and Intergovernmental Coordination. **Staff Comment:** *See analysis for the extent to which the change would be consistent with the comprehensive plan goals and policies in section a.*
   2. Conservation of Natural Resources and Recreation. **Staff Comment:** *The amendment will further the Natural Resource and Recreation Goals through the designation and preservation of the environmentally sensitive areas and floodplain and by providing an opportunity for future expansion of recreational features in Story County. See analysis for the extent to which the change would be consistent with the comprehensive plan goals and policies in section a.*
   3. Land Use. **Staff Comment:** *See analysis for the extent to which the change would be consistent with the comprehensive plan goals and policies in section a.*
   4. Economic Prosperity. **Staff Comment:** *No impact anticipated. EP Goal 3 includes "a balanced approach to environmental sustainability advocates a balance between the utilization of area resources and economic growth. Economic growth should not exceed the ability of the natural or built environment to sustain growth over the long term." Identifying and designating natural resources informed the design of the Prairie Valley subdivision to preserve the resources on the site.*
   5. Transportation. **Staff Comment:** *Part of the area designated as Natural Resource Area will a include a 20' wide easement along the west edge of the subject property for potential future development of a hard-surfaced trail to connect with the City of Gilbert in accordance with the C2C Comprehensive Plan includes Map 29: Proposed Trails and Greenways Map. Walking trail development inside the site is also proposed as part of the county park. A traffic study was completed and determined that a right turn lane will likely be warranted on 170th Street at 500th Avenue after the second phase of the development. The Board of Supervisors is to consider how to pay for the improvement or require the developer to pay per the ordinance. The County Engineer recommends the applicant pay for the turn lane.*

g. Consideration of the fiscal impact of the proposed amendment to Story County.
   Staff Comment: *None anticipated beyond the costs of maintaining a county park. The applicant will deed the lot with the environmentally sensitive areas to Story*

County Conservation as part of the first phase of the subdivision. 1. A traffic study was completed and determined that a right turn lane will likely be warranted on 170th Street at 500th Avenue after the second phase of the development. The Board of Supervisors is to consider how to pay for the improvement or require the developer to pay per the ordinance. The County Engineer recommends the applicant pay for the turn lane.

Major Subdivision Preliminary Plat Requirements

Section 87.09 of the Story County Land Development Regulations contains items to be shown on the plat. The design of the subdivision to meet these standards, as well as those imposed by the conditional rezoning, was discussed in the background and proposed use section of this report. Staff has reviewed the subdivision for conformance with these requirements and standards and found all are met with several conditions.

Comments

The following comments are part of the official record of the proposed **Story County Zoning Map Amendment, Case No. REZ01-20 and SUB06-20**. <u>If necessary, conditions of approval may be formulated based on these comments.</u>

Comments from the Conceptual and Interagency Review Team

A conceptual Review meeting was held for the proposed rezoning and subdivision on October 11, 2018. The submittal was initially made on March 16, 2020; however, it was not complete. Restrictive Covenants and the Management/Ownership agreement were submitted past the deadline extension on March 18. The submittal was routed to the Interagency Review Team on April 6, 2020, for the item to be on the May 6 Planning and Zoning Commission Agenda. The following comments from the review have not already been addressed in this report or require further changes to the submittal. All responses are from the applicant unless noted.

<u>Planning and Development Comments</u>

COMMENT: During a site review on March 11, 2020, it was noted that there was a construction debris pile located on Lot 53. A clean-up plan is required and has been requested. Staff also noted damage to a drainage district intake and notified the County Engineer.

COMMENT: What is the primary path to access the park and trails from the proposed parking lot? Is it the trail along 170th Street? Is wayfinding or directional signage proposed? Would an alternative path along one of the subdivision roads be proposed?

RESPONSE: The Development has provided a trailhead at the entrance to the subdivision. Users will be allowed to park at the trailhead and access the future trail along 170th ST. Any wayfinding and/or directional signage shall be provided by Story County. When Story County designs the trail system, they should consider providing a trail from 170th Street to the trailhead. The trails shown on the plat are for reference only. The location and design of the trails will be by Story County.

COMMENT: A zoning permit will be required for all fences.
RESPONSE: Acknowledged.

COMMENT: Do we have a plan for amending the protection subdrain plan if the lateral location changes?
RESPONSE: I am fine with working with the County if changes to the lateral field locations are made in the future.
Staff would like to request this note be added to the protective subdrain plan as part of the preliminary plat.

<u>Environmental Health</u>
COMMENT: Page C2.2 and C2.3 septic placement: Lot 7 lateral field is unclear. For steep lots, keep in mind that the steeper the ground, the further apart the laterals need to be, so they will take up a bigger footprint (2' of separation distance added for every 5% increase in slope from level). What document will clearly state the septic easements when the laterals are placed on outlots (one document for the subdivision or individual easements)?
RESPONSE:

- Lot 7 lateral field will be placed off lot in a separate easement (70'x120') within Outlot A.
- Steep Slope Lots: Acknowledged that 2-ft of separation distance is added for every 5% increase in slope from level.
- Lateral Field Easements: The final plat will show the Lateral Field Easements within the Outlots.

COMMENT: I do not think the homeowners should be restricted to native vegetation on their lots as required in item c. "All shrubs and trees on Lots and Outlots shall be native species."
RESPONSE FROM PLANNING AND DEVELOPMENT STAFF TO APPLICANT: I spoke with Mike this morning and the language that was struck on invasives was a Conservation Board requirement. I believe Mike has communicated this with Margaret. If you could please add it back in for the Conservation Board's consideration, that would be great.

Assessor
This Subdivision will be assessed under the Iowa Platting Law. Undeveloped lots will be assessed at a minimal agricultural value for five years or until built upon. After five years, all undeveloped lots will be assessed at residential market value.

Comments from the General Public
Notice letters were sent to property owners within ¼ mile of the proposed rezoning on April 28, 2020, regarding the Planning and Zoning Commission Meeting on May 6 and the Board of Supervisors Meeting on May 19. A development proposed sign was placed on the property on April 28. The rezoning request was published in the newspaper on April 30.

Planning staff received one general inquiry phone call at the time of writing this report.

Planning staff has also been in communication with an adjacent landowner who inquired about the calculation of the LESA scores used in the 2018 rezoning.

Comments from Cities within Two Miles
The City of Gilbert will review the request at their May 4, 2020, City Council meeting. The item on the council's agenda is consideration of waiving their right to review.

Points to Consider

The following are points to consider in evaluating the applicant's request to amend the Official Zoning Map, amend the C2C Comprehensive Plan Future Land Use Map Designation, and for a Major Subdivision Preliminary Plat.

1. In 2018, the Board of Supervisors approved the rezoning of the property to R-1 Residential and C2C Plan amendment with conditions. The design of the subdivision meets the conservation design principles prescribed as a condition on the rezoning.
    a. A field review to locate remnant prairie and other landscape features was completed. The most significant and environmentally sensitive features were the native prairie remnants.
    b. The developer will deed the environmentally sensitive and floodplain area to Story County Conservation as part of the first phase of the development. In total, approximately 80 acres will be deed to the county for a county park.
    c. The measures originally proposed as part of a management agreement with Story County Conservation have been addressed through the preliminary plat, proposed covenants, and an ownership/management agreement. The measures include prohibitions on fertilizers containing phosphorous, invasive species; the Story County Conservation Board will review seed mixes; water quality testing

will be performed; and a minimum 35-foot buffer between the remnant prairie and development lots is provided. The Conservation Board will review these provisions at their May 11, 2020 meeting.

d. A 20-foot wide easement for a future hard-surfaced trail on the north and west sides is shown on the plat. Walking trail development inside the site is also proposed as part of the county park.
e. A protective subdrain to divert runoff from the septic laterals away from the prairie remnants is proposed for lots with lateral fields that slope towards the prairie remnants.

2. The applicant submitted letters from utility and emergency service providers confirming their ability to serve the subdivision
3. Chapter 88 General Site Planning Standards and Chapter 87.09 requirements for Major Subdivision Preliminary Plats are met.
4. To meet the county's stormwater management requirements, soil quality restoration is proposed on all development lots to provide infiltration to manage a rainfall depth of 1.25-inches. For larger rain events, five dry detention basins are proposed so that the runoff rates from the site do not exceed the current rate from the 5-year storm event.
5. A traffic study was completed and determined that a right turn lane will likely be warranted on 170th Street at 500th Avenue after the second phase of the development. The Board of Supervisors is to consider how to pay for the improvement or require the developer to pay per the ordinance. The County Engineer recommends the applicant pay for the turn lane. A turn lane on 500th at 170th Street may also be within one car of being needed after the full build-out of the subdivision.
6. The developer is separately requesting Tax Increment Financing (TIF) from Story County to help pay for infrastructure or other improvements to prepare the lots.
7. The conditional rezoning required the environmentally sensitive areas and floodplain to be rezoned to the Greenbelt-Conservation District and their C2C Future Land Use Map amended to Agricultural Conservation and Natural Area. The prairie remnants are not all designated as Natural Resource Area in the C2C Plan or are designated as Rural Residential and Natural Resource Areas.
8. The C2C Plan Natural Resource Area Principle 3 is to "consider areas identified as Natural Resource Area for inclusion in the Greenbelt-Conservation District of the Land Development Regulations and/or take necessary steps to ensure resource conservation through other mechanisms." The rezoning request specifically follows this principle.

Recommendation

Story County Planning and Development Staff support the proposed rezoning from the A-1 Agricultural District and R-1 Transitional Residential District to the GB-C Greenbelt-Conservation District for portions of the subject property determined to be environmentally sensitive, amending the C2C Future Land Use Map Designation from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area for these areas, and the requested major subdivision preliminary plat for the Prairie Valley Subdivision for the Northwest Quarter of Section 7 of Franklin Township with the following conditions on the subdivision plat:

1. The County Conservation Board shall approve the covenants, easement, and management/ownership agreement prior to the Board of Supervisor's approval of the preliminary plat.
2. Construction and demolition debris located in the vicinity of Lot 53 shall be removed by June 6, 2020.
3. A protective subdrain to protect the prairie remnants west of Lot 52 shall be added to the preliminary plat prior to recording.
4. A note that the protective subdrain plan may change per the site evaluation conducted by a certified engineer or soils professional for septic systems and location of the lateral fields shall be added to the preliminary plat prior to recording. The final protective subdrain plan shall be reviewed as part of the final plat.
5. The Board of Supervisors and applicant shall determine a method to pay for the right turn lane on 170th at 500th as part of the preliminary plat consideration unless it is to be considered as part of the separate TIF request. If it is to be considered as part of the TIF request, the financing must be determined prior to submittal of the final plat.
6. The applicant shall consider how to encourage homeowners subscribe to and have a monitored security system (such as ADT) installed & tied in with smoke detectors following the Fire Chief's recommendation.
7. The need for a right turn lane on 500th Avenue at 170th Street shall be monitored after full build-out of the development. The Board of Supervisors may take action as part of the final plat for the last phase of the development to determine who should pay for this turn lane if needed.
8. The developer of Prairie Valley or the homeowner association would be responsible for the costs of a roadway connection on Outlot D between Lot 46 and Lot 56, between Lots 38 and 42, or any additional costs of connecting the Foxtail Court stub road with a development to the east.

Alternatives

The Story County Planning and Zoning Commission may consider the following alternatives for the rezoning and C2C Plan Amendment request:

1. **The Story County Planning and Zoning Commission recommends approval of the proposed Story County Zoning Map Amendment from A-1 Agricultural District and R-1 Transitional Residential District to the GB-C Greenbelt-Conservation District and C2C Future Land Use Map Designation from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area as put forth in case REZ01-20.**
2. The Story County Planning and Zoning Commission recommends approval of the proposed of the proposed Story County Zoning Map Amendment from A-1 Agricultural District and R-1 Transitional Residential District to the GB-C Greenbelt-Conservation District and C2C Future Land Use Map Designation from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area as put forth in case REZ01-20 with conditions.
3. The Story County Planning and Zoning Commission recommends denial of the proposed of the proposed Story County Zoning Map Amendment from A-1 Agricultural District and R-1 Transitional Residential District to the GB-C Greenbelt-Conservation District and C2C Future Land Use Map Designation from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area as put forth in case REZ01-20.
4. The Story County Planning and Zoning Commission remands the Story County Zoning Map Amendment from A-1 Agricultural District and R-1 Transitional Residential District to the GB-C Greenbelt-Conservation District and C2C Future Land Use Map Designation from the Rural Residential Area to the Agricultural Conservation Area and from the Rural Residential Area and the Agricultural Conservation Area to the Natural Resource Area as put forth in case REZ01-20 back to the applicant and/or staff for additional information, and directs staff to place the second consideration on the June 3, 2020, Story County Planning and Zoning Commission Agenda.

The Story County Planning and Zoning Commission may consider the following alternatives for the Prairie Valley Major Subdivision Preliminary Plat request:

1. The Story County Planning and Zoning Commission recommends approval of the proposed Major Subdivision Preliminary Plat as put forth in case SUB 06-20.

2. **The Story County Planning and Zoning Commission recommends approval of the proposed Major Subdivision Preliminary Plat as put forth in case SUB 06-20 with conditions.**
3. The Story County Planning and Zoning Commission recommends denial of the proposed Major Subdivision Preliminary Plat as put forth in case SUB 06-20.
4. The Story County Planning and Zoning Commission the proposed Major Subdivision Preliminary Plat as put forth in case SUB 06-20 back to the applicant and/or staff for additional information and directs staff to place the second consideration on the June 3, 2020, Story County Planning and Zoning Commission Agenda.

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

TEXT, ZONING, AND C2C PLAN AMENDMENTS

1. Property Owner*

(Last Name) Quarry Estates
(First Name)
(Address) 100 S 6th Street
(City) Ames (State) IA (Zip) 50010
(Phone) 515.232.6175 (Email) kfriedrich@friedrich-realty.com

2. Applicant (if different than owner)

(Last Name) Friedrich
(First Name) Kurt
(Address) 100 6th Street
(City) Ames (State) IA (Zip) 50010
(Phone) 515.232.6176 (Email) kfriedrich@friedrich-realty.com

3. Property Address N/A

Parcel ID Number(s) 05-07-100, 05-07-100-200, 05-07-100-305, 05-07-100-400

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 [signature] **Date** 3-6-20 **Applicant Signature** [signature] **Date** 3-6-20

☐ **Code of Ordinances (Text)**

Amended Section(s):

Submittal Requirements:

- ☐ Attend conceptual review meeting**
- ☐ Filing Fee (required prior to processing): $325
- ☐ Proposed text language showing red-lines & strikeouts of the proposed changes
- ☐ Written narrative explaining justification for proposed amendment and conformance to the standards for approval outlined in Section 92.07 of the Story County Code of Ordinances

☑ **Official Zoning Map (Rezoning)*****

Current District: A-1 - Agricultural & R-1 Transition
Proposed District: GBC - Greenbelt Conservation

Submittal Requirements:

- ☑ Attend conceptual review meeting**
- ☑ Filing Fee (required prior to processing): $350
- ☑ Legal description of area to be amended (submit as Word document)
- ☑ Written narrative explaining justification for proposed amendment and response to the standards for approval outlined in Section 92.06(2) of the Story County Code of Ordinances
- ☑ All submittal requirements as outlined in Section 92.06(3) of the Story County Code of Ordinances

☑ **Cornerstone to Capstone Plan*****

Current Designation: Rural Residential Area
Proposed Designation: Natural Resource & Rural Residential

Submittal Requirements:

- ☑ Attend conceptual review meeting**
- ☑ Filing Fee (required prior to processing): $350
- ☑ Legal description of area to be amended (submit as Word document)
- ☑ Written narrative explaining existing and proposed plan designations, as well as justification for amendment

***Prior to submittal of a Text, Zoning, or C2C Plan Amendment application, see conceptual review application and deadline on Planning and Development website.*
****If applying for Zoning and C2C Plan Amendments, only 1 filing fee is required.*

Receipt No.
Receipt Amount

PRAIRIE VALLEY SUBDIVISION REZONE

Date: 4.22.2020

The Prairie Valley rezone petition from A-1 Agricultural & R-1 Transition to GBC Greenbelt Conservation is required to satisfy the following standards for approval per Chapter 92.06(2)(A-E):

A. The proposed rezoning shall conform to the Cornerstone to Capstone (C2C) Comprehensive Plan:

- The petition to rezone the property from A-1 Agricultural & R-1 Transition to GBC Greenbelt Conservation is consistent with the C2C Comprehensive Plan (subject to the approval of the Prairie Valley Land Use revision). Environmental sensitive areas were studied, identified, and mapped on the property. These sensitive areas are included in the GBC rezone legal description.
- The Developer of the Prairie Valley residential subdivision intends to dedicate the GBC District area Story County as part of the subdivision final plat procedures. Story County Conservation intends to utilize the GBC property for soil conservation, water conservation, drainage district improvements and recreational uses such as walking trails. These proposed uses are consistent with the principal permitted uses allowed in the GBC District.

B. The proposed rezoning shall conform to the Statement of Intent for the proposed district and district requirements.

- The following is the GBC District Statement of Intent. *The Greenbelt-Conservation District is intended to provide special regulations for resource conservation of lands containing sensitive environmental conditions. These regulations permit reasonable economic use of property and at the same time protect the natural resources and recreational assets of the area. This District is designated to promote water quality and conservation, to protect aquifers, alluvial soils and slopes; and to protect areas which possess outstanding scenic, vegetation, wildlife habitat, and travel corridors, geological, historic or recreational values. Structures inconsistent with the permitted uses shall not be allowed in the Greenbelt-Conservation District.*
- The proposed GBC rezone district identifies the environmental sensitive areas. Story County Conservation will provide special regulations/conservation measures to protect/enhance these environmental sensitive areas/natural resources of the property and allow users to enjoy the recreational assets of the property. The R-1 Transition area that abuts the GBC District will have to meet several conditions in order to buffer and protect this GBC District such as fencing, placement of septic systems, restrictive plantings (grass/shrubs/trees) and surface drainage measures.

C. The proposed rezoning shall be compatible with surrounding land uses and development patterns.

- The adjacent properties within 1,000-ft are zoned Agricultural Districts in both Story County and Boone County. Agricultural is a permitted principal use in the GBC District therefore agricultural zoning is a compatible land use.
- The R-1 Transition District in the Prairie Valley Subdivision abuts the proposed GBC District. The GBC District is compatible to this land use due to the development conditions required on the R-1 Transition District to development and protect/enhance this GBC District. Development of residential properties adjacent to the GBC District protects the natural resources and allows residentials to enjoy the conservation area.

D. The proposed rezoning shall protect environmental resources. Rezoning of parcels containing more than 50 percent of the gross acreage as lands identified with areas designated natural resource areas on the Cornerstone to Capstone (C2C) Comprehensive Plan shall not be approved unless such requested action results in a district designation more restrictive than the current designation, the R-C Residential Conservation Design (Overlay) District is applied to the property, or conditions protecting the identified areas are attached to the rezoning request.

- The petition of rezoning protects the environmental resources/sensitive areas. 100% of the gross acreage is proposed to be rezoned to GBC which is more restrictive than the current A-1 and R-1 Transition zoning.

E. In areas where the petition to rezone requests a change from A-1 District or A-2 District to another district, lands scoring 267 or above for total LESA score, as determined by a Land Evaluation Site Assessment (LESA) as adopted for Story County, shall not be approved.

- The petition of rezone to GBC consists of approximately 75 acres. The composite LESA score for this 75 acres is 266.

PRAIRIE VALLEY AMENDING CORNERSTONE TO CAPSTONE COMPREHENSIVE PLAN

Date: 4.22.2020

The Prairie Valley Development proposes to amend the Cornerstone to Capstone (C2C) Comprehensive Plan from Rural Residential Designation to the Agricultural Conservation and Natural Areas Designation for the areas designated as environmentally sensitive and floodplain. These areas except those in the southwest quarter quarter are all currently designated Rural Residential. The following is the written application for the amendment per Chapter 92.08(2)(B)(1-7):

(1) The extent to which the change would be consistent with the comprehensive plan goals and policies.

- The amendment would clearly identify the Natural Resources areas based on the existing floodzone and the environmental sensitive areas. The existing land use map is more general and the proposed revision is an accurate representation of the uses.
- The amendment is consistent with the C2C goals by:
  - NRA Principal 1: Generally discourage development within these areas. No development is proposed in the amended NRA areas.
  - NRA Principal 2: Mitigate impacts of proposed development contiguous to NRA areas. No development is proposed within the NRA areas.
  - NRA Principal 3: Consider areas identified in the NRA for includes in the Greenbelt Conservation District (GBC). The applicant is proposing to zone all NRA areas to GBC.
  - NRA Principal 4: Develop site planning and performance standards to apply to properties designated as NRA not included in the GBC District. All proposed NRA will be included in the GBC District so these performance standards are not applicable.
  - Continuing to add and connect trails.
  - Increase public park properties and infrastructure.
  - Strikes a balance between growth and sustainability and protecting good farm ground.
  - Preserve and protect the existing native plants and animals.
  - Restrict development in environmental sensitive areas.
  - Encourage development that limits impacts on existing wooded areas and preserves and restores natural prairies and wetlands.

(2) Evidence demonstrating the reasons why the plan should be changed, including (but not limited to) whether new information has become available since the comprehensive plan was adopted that supports reexamination of the plan, or that existing or proposed development offers new opportunities or constraints that were not previously considered.

- New information and more accurate information is available regarding the Natural Resources and Environmental Sensitive Areas. The amendment better defines and protects these areas.

(3) Whether or not the change is needed to allow reasonable development of the site.

- The amendment is not necessary for the site to be developed into residential lots. The Prairie Valley Development protects all existing natural resources and environmental sensitive areas.

(4) The relationship of the proposed amendment to the supply and demand for the particular land uses within the County and immediate vicinity of the site.

- The amendment will not affect the supply and demand regarding Natural Resources within the County. The amendment does not change the amount of Natural Resources rather it better defines the Natural Resources specifically on this property.

(5) A demonstration that the proposed amendment has merit beyond the interests of the applicant.

- The amendment is merited by more accurately defining/protecting the Natural Resources on the property.

(6) The possible impacts of the amendment on all specific elements of the comprehensive plan as may be applicable, including, but not limited to:

a. Goals. Objectives and strategies as related to the following from C2C Plan; Agricultural Resources, Community Facilities and Services, Communications and Public Safety, Emergency Preparedness, Cultural Resources, Infrastructure and Utilities, and Intergovernmental Coordination.

- No impact

b. Conservation of Natural Resources and Recreation.

- Better defines and expands the Natural Resource and Recreation areas. Allows for the construction/extension of trails and public recreational opportunities.

c. Land Use.

- No impact.

d. Economic Prosperity.

- The approval of this revision will all the development of the abutting R-1 Transition District which will increase property value to Story County.

e. Transportation.

- No impact.

(7) Consideration of the fiscal impact of the proposed amendment to Story County.

- No impact.

PRAIRIE VALLEY PRESCRIPTIVE MEASURES

Date: 4.22.2020

The following is a list of Prescriptive Measures required by Story County Conservation, Environmental Health and Planning & Development regarding the development of a single-family subdivision known as Prairie Valley. The Developer has responded to each measure below. Prescriptive Measures will be addressed with the submittal of the Preliminary Plat, Covenants, and the Development Agreement.

Prescriptive Measures:

A. <u>On-lot or Developed Areas:</u>

1. Stormwater BMPs shall be implemented on residential lots to capture the first flush.
   - This will be addressed in the Preliminary Plat submittal and the Stormwater Management Plan (SWMP). Topsoil preservation will be utilized for a permanent BMP since there is no maintenance component required by the homeowner. In addition, an 8-inch tile with porous backfill will be installed in select locations to protect the environmental sensitive areas from lateral fields and/or surface runoff from the residential lots.
2. Stormwater and erosion BMPs (temporary and permanent) to prevent soil loss, transport outside of the residential lots, construction areas, common spaces, transport to treatment which does not affect prairie areas.
   - This will be addressed in the Preliminary Plat submittal, SWMP, and Erosion Control Plan (ECP). The environmental sensitive areas will be protected by a silt fence prior to the start of any construction. Erosion BMPs are required to be monitored weekly per IDNR requirements to ensure they are functioning per design. During home construction the builder will install additional erosion control measures (silt fence/filter socks) to prevent the migration of soils.
3. Septic systems constructed or discharged regionally and in areas that will not potentially impact native vegetation.
   - This will be addressed in the Preliminary Plat. The locations of the septic laterals will be shown on the Preliminary Plat. The Developer will soil probe the septic lateral locations for soil suitability. Story County would need to approve any proposed revisions to the lateral field locations.
4. Temporary construction fencing and erosion control structures must be used. Such measures shall be placed at least 10' inside the lot boundaries which abut greenspace. Construction activities must not impact greenspace.
   - This will be addressed in the Preliminary Plat and ECP. The environmental sensitive areas will be protected by a silt fence prior to the start of any construction. The silt fence will be placed no closer than 35-ft proposed buffer from the remnant native grasses. In meetings with Staff we have discussed and shown silt fence being placed outside of the proposed lot boundaries. We are planning to utilize a 10-ft strip of greenspace area adjacent/outside of the 35-ft buffer for placement of a subdrain per SCC requirements (proposed 10-ft storm sewer easement). We are also planning to grade detention basins in the greenspace areas and will place erosion control measures in those locations. During home construction the builder will install additional erosion control measures (silt fence/filter socks) to prevent the migration of soils. Please review this measure and revise accordingly (proposed to delete the 10-ft fence inside lot boundaries and delete construction activities must not impact greenspace).

5. Permanent perimeter fence on all property lines abutting green space.
   - This will be addressed in the Preliminary Plat with an Ownership & Fencing Plan. A wood three (3) rail split fence will be constructed by the Developer along the rear property line adjacent to all environmental sensitive areas. The Covenants will require homeowners to place a matching split rail fence along the rear property line adjacent to any proposed Story County dedicated greenbelt areas.
6. Lot owners will recognize that the green spaces adjoining each residential lot will be managed as native prairie. Much of it is a remnant of original native prairies of the area. Management may include but not be limited to prescribed fire, mowing, grazing, hay harvest, brush removal, herbicide application.
   - The Covenants will address this measure. Signage will be included along the green spaces areas and informational sign with the mailbox kiosk(s) to explain the development's conservation principles.
7. Prohibition on planting invasive species. This applies to all vegetation in the development.
   - The Covenants and Agreement will address this measure (refer to the State of Iowa invasive species list).
8. Shrubs or trees must be native species. SCC must review and approve all plantings.
   - The Covenants and Agreement will address this measure (refer to the State of Iowa native species list).
9. Prohibition on use of lawn fertilizers containing phosphorus and herbicides.
   - The Covenants and Agreement will address this measure. Lawn fertilizers containing phosphorus will be prohibited. Herbicides will be allowed.
10. Prior approval of all seed mixes by Story County. This includes temporary mixes and permanent mixes. This would be for any native seeding homeowners may want to do in their yard, as well as seeding during construction.
    - The Covenants and Agreement will address this measure. Story County Conservation (SCC) will encourage native grass seeding and will offer review seed mixes and origins. The Developer will utilize SUDAS seed mixtures for temporary seeding disturbed areas along with permanent seed mixes in Homeowner Association (HOA) common areas.
11. Homeowners will contribute a monthly conservation fee of which 100% will be used to manage the greenspace with the goal of increasing and maintaining its native biodiversity and conservation value.
    - The Covenants and Agreement will address this measure. The annual per lot fee will be $250. An inflationary adjustment every 5-years to represent CPI for central Iowa. The HOA will be responsible for the payment to Story County Conservation.
12. Design standards (these areas shall be declared environmentally sensitive areas and will not be developed):
    - Hydric soils/wetland buffer of 50'
      - The hydric soils map was submitted as part of the R-1 District rezoning and this map will be included with the SWMP. The wetland buffer of 50-ft will be shown on the Preliminary Plat.
    - Native prairie remnants
      - The native prairie remnants and the 35-ft buffer will be shown on the Preliminary Plat.
    - Significant trees and cover
      - This will be addressed in the Preliminary Plat.
    - Slopes greater than 14%
      - This will be addressed in the Preliminary Plat.

- Rare or T & E species habitat
  - Story County will perform a desktop research to verify if further field studies are necessary.
- Native American burial sites/mounds
  - Iowa State Archeology will perform a desktop research and/or contact Native American Tribes to verify if further field studies are necessary.
- Drainage ways buffer of 30'
  - This will be addressed in the Preliminary Plat.

<u>Green Spaces:</u>

13. Minimum 40' buffer between lot line and the border of extant prairie.
    - This will be addressed in the Preliminary Plat. Residential lots that abut the remnant prairie shall have a minimum of a 35-ft buffer area from any property line.
14. Water quality testing will be performed by Story County in the regional stormwater treatment train. Should water quality be outside acceptable standards, the HOA will take appropriate action to correct the abnormality.
    - The Covenants and Agreement will address this measure. Story County may place monitoring wells to monitor/test stormwater runoff from the Prairie Valley development. These monitoring wells would exclude any contributing off-site stormwater runoff. The HOA will be responsible to take appropriate action to correct water quality issues outside acceptable standards.
15. Prohibition on depositing any plant, soil, construction, industrial, or household debris, or any hazardous material on the greenspaces.
    - The Covenants and Agreement will address this measure.
16. Story County will own all greenspace and have sole management and decision-making ability.
    - The Covenants and Agreement will address this issue. This will be addressed in the Preliminary Plat with an Ownership & Fencing Plan and per the Phasing Plan. As each phase of the subdivision is developed, portions of the environmental sensitive and greenspace areas will be dedicated at Final Plat to Story County.
17. Light foot traffic only is allowed in greenspace, no sledding, bikes, etc. No hunting/trapping etc., due to proximity to residential. SCCB will set rules for use of the property under its control.
    - The Covenants and Agreement will address this issue.
18. Dedicated access gate for burn equipment, etc., also for public access—and likely a public parking area.
    - The Covenants and Agreement will address this issue. The Preliminary Plat will show the location of the proposed public parking area along with proposed access locations to the greenspace.
19. SCC will develop a foot-trail system that will be maintained only by county personnel or their designees/contractors.
    - The Covenants and Agreement will address this issue. The Preliminary Plat will show the general location of a proposed trail system which is subject to revisions per SCC.
20. SCC will have legally effective mechanism to enforce prescriptive measures.
    - The Agreement will address this issue.

Planning & Development Staff Comments:

A. The property has already been rezoned from A-1 District to R-1 District with conditions (NW NW, NE NW & SE NW). A new rezoning application is required to request a change in zoning of the A-1 District to the GBC District for the SW NW and from the R-1 District to the GBC District of the natural areas.
   - The Developer is planning to submit a rezoning application per this request.

B. Provide further clarification of septic system plan. A condition of the rezoning requires group septic system discharges where possible.
   - This will be addressed in the Preliminary Plat with a Septic System Plan. Each lot will have their own septic system with later fields. Some lots will be allowed to place their later fields in an easement in the green areas as identified on the Preliminary Plat. At this time grouping of septic systems is not proposed.
   - Grouping of septic systems is not proposed because many of the lots in this development have adequate area for either a conventional onsite septic system or a more advanced system with less required footprint. The onsite treatment systems adjacent to the sensitive environmental areas will not discharge into these areas to ensure that the in-situ soils remain unchanged. A proposed drainage tile with full granular bedding to the surface will be placed adjacent to these later fields to intersect any effluent discharge. It is likely that the later field effluent discharge will be conveyed in the groundwater in the general direction as the surface contours. In general the later fields surface contours are directed away from the environmental sensitive areas. Thus, no impact is anticipated to these areas.

C. How many phases are planned with this project? Subdivision site improvements based on the preliminary plat are required to be completed within one year or the final plat may be submitted along with a financial security and development agreement.
   - The Preliminary Plat will show a proposed phasing phase. The plan currently has a total of four (4) phases.

D. Planning and Development staff review restrictive covenants submitted with subdivision plats.
   - The restrictive covenants will be submitted with the Preliminary Plat for staff comments.

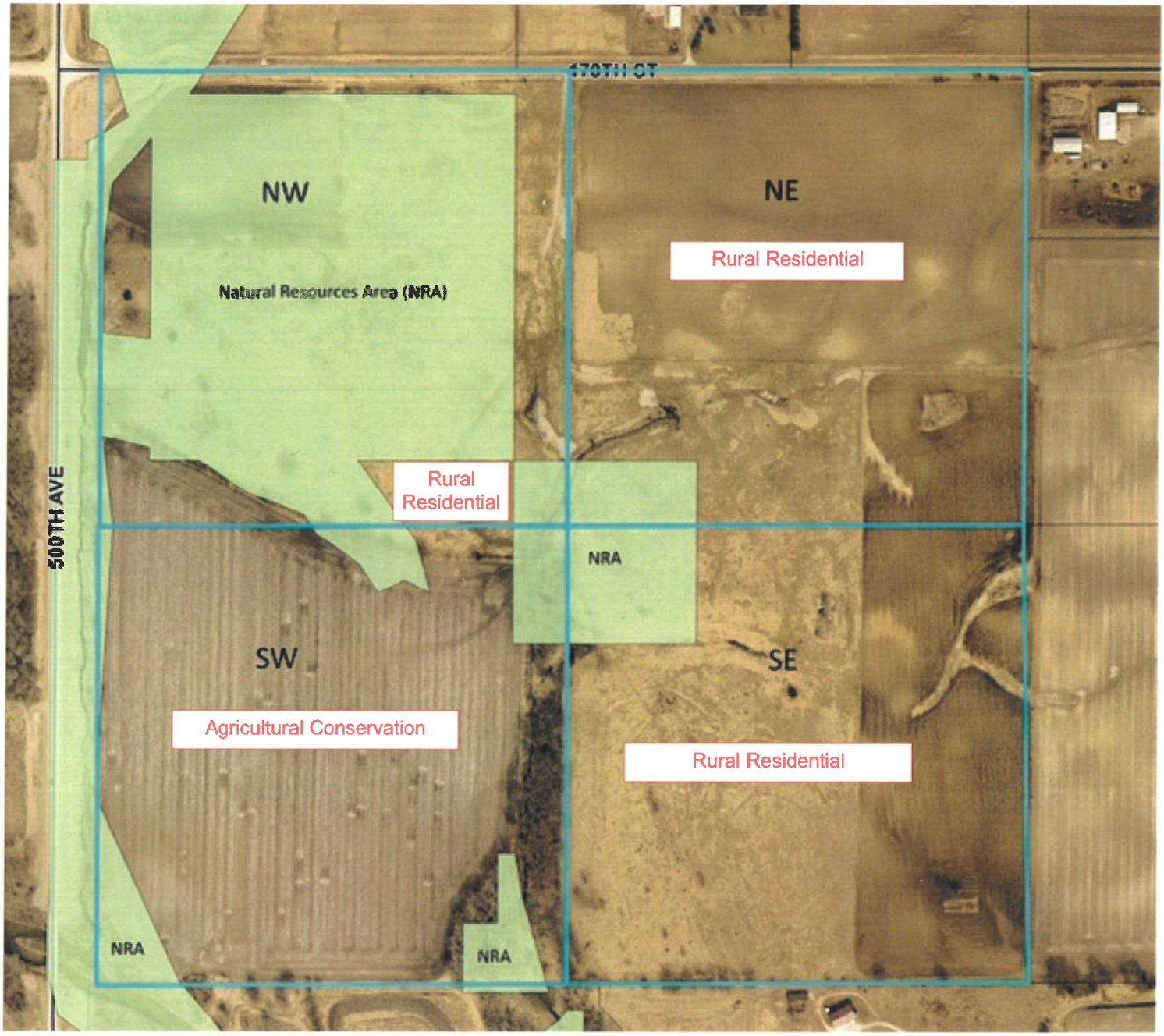
E. A management agreement with Story County Conservation is required and was made a part of the conditions for the rezoning of the property.
   - The Story County Attorney and Developer's Attorney will write the management agreement.

F. Planning and Development staff support Story County Conservation Staff's compromise on the temporary construction fencing to allow construction of the fencing five feet from the rear property line.
   - We are planning on placing construction fencing (silt fence) throughout the greenbelt area (GBC District Area and HOA Greenspace area) to protect the environmental sensitive areas and migration of soils during construction. The ERC plan will be submitted with the Preliminary Plat for Staff comment and review.

G. Planning and Development staff support Story County Conservation Staff's compromise on the minimum buffer between the lot line and border of prairie of 35 feet.
   - The Preliminary Plat will show the 35-ft buffer area. We do not plan to complete any construction activities within this 35-ft buffer area.

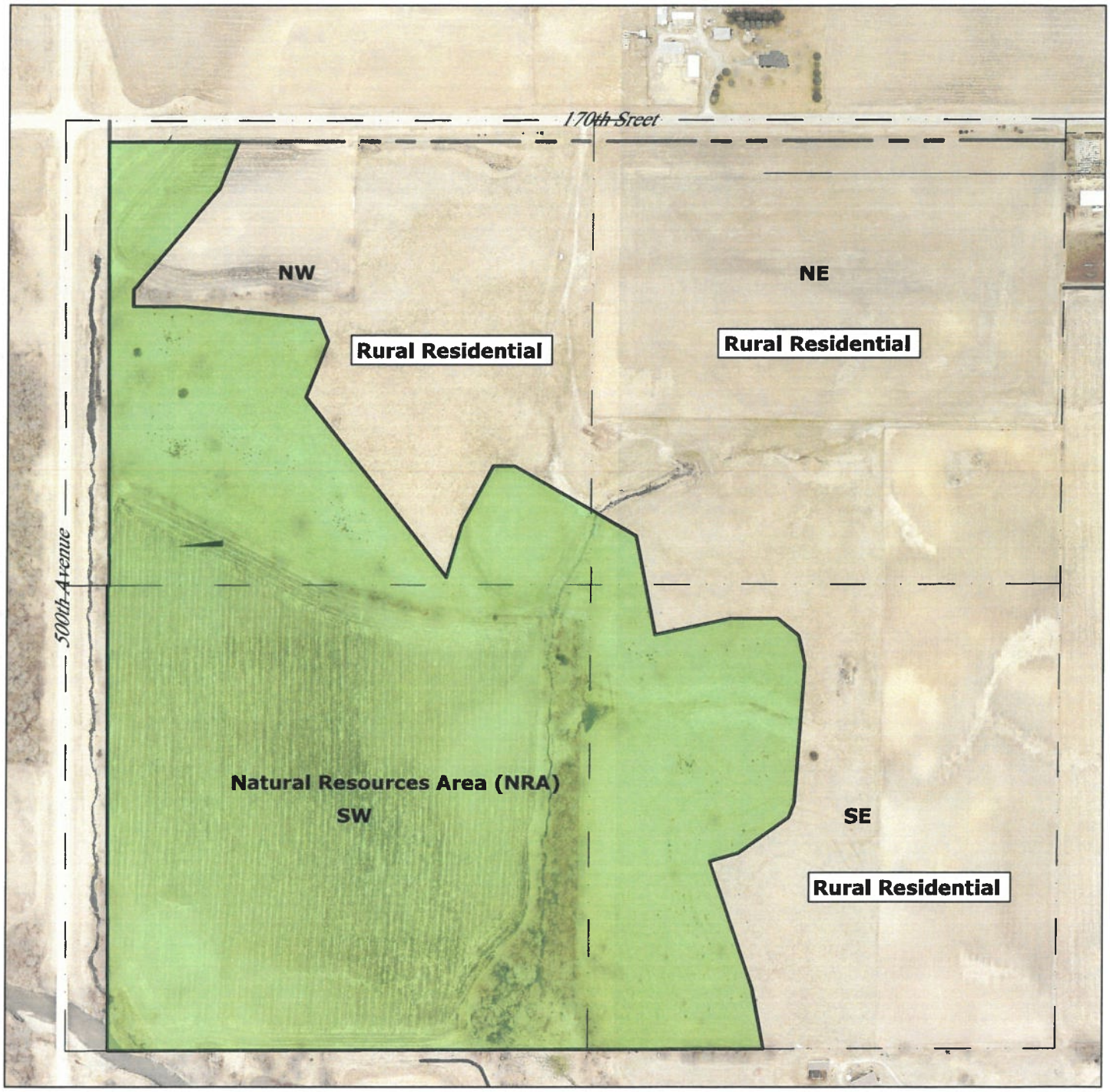
H. Planning and Development staff support Story County Conservation Staff's position that only the stormwater quality from on-site stormwater will be monitored, excluding stormwater generated off site.
   - This will be addressed in the Covenants and Agreement.
I. Planning and Development staff support Story County Conservation considering alternative locations for future property owners to recreate outside of the trail system, particularly for sledding.
J. Through oversight by Story County Conservation, the Story County Attorney's Office if necessary would be involved in any enforcement action involving the courts.

Story County Existing C2C Land Use Plan
160-acre Prairie Valley Property



Story County Proposed C2C Land Use Plan

160 acre Prairie Valley Subdivision



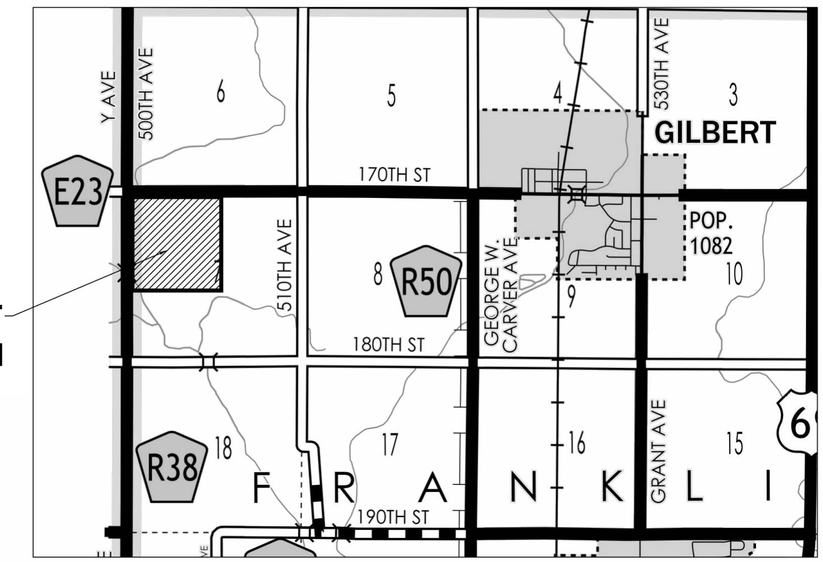
PRELIMINARY PLAT
PRAIRIE VALLEY - MAJOR SUBDIVISION

SE CORNER OF 500TH AVE & 170TH ST.
STORY COUNTY, IA

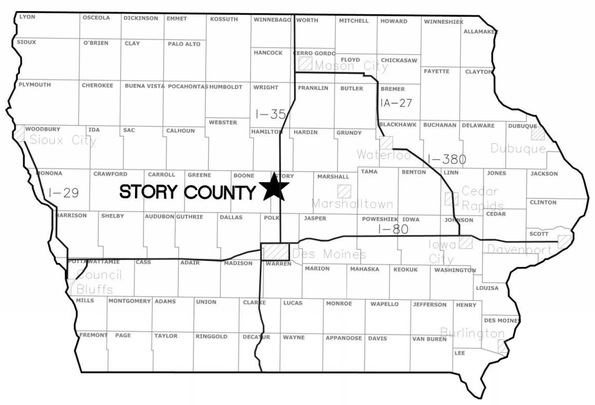
PRAIRIE VALLEY - MAJOR SUBDIVISION

INDEX OF SHEETS

NO.	DESCRIPTION
G1.1	COVER SHEET
G1.2	LEGEND & PROTECTION SUBDRAIN DETAIL
G1.3	TYPICAL ROADWAY CROSS SECTION
C1.1	EXISTING CONDITIONS AND BOUNDARY
C2.1 - C2.3	PROPOSED SUBDIVISION LAYOUT
C3.1 - C3.3	PROPOSED LOT DIMENSIONS
C4.1	OWNERSHIP AND FENCING PLAN
C4.2	STEEP SLOPES MAP
EC.1 - EC.4	EROSION CONTROL PLAN
PP1.1 - PP1.7	ROADWAY PLAN & PROFILE



LOCATION MAP



PRELIMINARY PLAT DATA:

Applicant
Friedrich Realty
Att: Kurt Friedrich
106 6th Street
Ames, IA 50010

Owner
Quarry Estates, LLC
619 E. Lincoln Way
Ames, IA 50010

Plan Preparation
FOX Engineering Associates Inc.
414 South 17th Street, Suite 107
Ames, IA 50010
Contact: John Gade, P.E.
ph (515) 233-0000
email jmg@foxeng.com

Survey Datum
All elevations are to NAV 88 unless otherwise noted

Flood Information
The SW portion of the site is Flood Zone A as per FIRM Map Panel No. 19169C0130E, dated 2/20/2008

Current Land Use

Pasture	= 66 AC
Farmed (hay ground)	= 25 AC
Farmed (row crop)	= 19 AC
Farmed (long term prairie)	= 41 AC
Stream channels/road right of way	= 9 AC
TOTAL	= 160 AC

Proposed Lots
70 total lots

Lots per Acre (Density)
0.44 lots per acre

Existing Easements
No existing easements are on this property

Drainage District
The property has three (3) Story County Drainage Districts
Drainage District #8, Drainage District #67, & Drainage District #95

Legal Description
The Northwest Quarter of Section 7, Township 84 North, Range 24 West of the 5th P.M., Story County, Iowa, except the West 125 feet of the Northwest Quarter of said Northwest Quarter and except the West 120 feet of the Southwest Quarter of said Northwest Quarter

Site Location
SE Corner of 500th Ave & 170th Street, Story County, Iowa

Site Area
163.38 acres which includes 2.49 acres of public right of way

Zoning
A-1 Agriculture
Conditional Zoning of R-1 "Transitional Residential District"
Floodplain & Environmental Sensitive Area: Proposed Zoning to GBC "Greenbelt Conservation"

Parcel Identification No.
05-07-100-105, 05-07-100-200, 05-07-100-305, & 05-07-100-400

R-1 Bulk Requirements

Lot Area	= 25,000 SF
Front Setback	= 40 FT
Side Setback	= 10 FT
Side Setback Corner Lot	= 25 FT
Flag Yard Setback	= 20 FT
Rear Setback	= 35 FT
Lot Width	= 90 FT
Structure Width	= 20 FT
Max Structure Height	= 40 FT

Districts

School	- Gilbert
Water	- Xenia
Gas	- Alliant Energy
Electric	- Midland Power
Emergency	- Gilbert Fire & Rescue
Water Shed	- Squaw Creek

911 Addresses
All new lots shall require a 911 address for inhabited structures, including residences and businesses, telecommunications towers and facilities, and for any public assembly area including open-air, outdoor activities. 911 addresses shall be assigned by Story County at the request of the property owner

THIS PROJECT IS COVERED BY THE IOWA DEPARTMENT OF NATURAL RESOURCES NPDES GENERAL PERMIT NO. 2. THE CONTRACTOR SHALL CARRY OUT THE TERMS AND CONDITIONING OF GENERAL PERMIT NO. 2 AND STORM WATER POLLUTION PREVENTION PLAN WHICH IS PART OF THESE CONTRACT DOCUMENTS. REFER TO SECTION 2602 OF THE DOT STANDARD SPECIFICATION FOR ADDITIONAL INFORMATION.

SURVEY NOTE: CONTOURS SHOWN ARE CREATED FROM A COMBINATION OF FOX ENGINEERING SURVEYS COMPLETED SUMMER/FALL 2019 AND AEROVIEW AERIAL SURVEY.

THE STATEWIDE URBAN DESIGN & SPECIFICATIONS (SUDAS) AND STORY COUNTY SUPPLEMENT TO SUDAS ALONG WITH SPECIFIC PROJECT SUPPLEMENTAL SPECIFICATIONS & SPECIAL PROVISIONS SHALL APPLY TO THIS PROJECT.

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.

FOX engineering

Certification: I hereby certify that the perimeter boundary of this preliminary plat was surveyed by me or under my direct personal supervision and that I am a duly licensed Land Surveyor under the laws of the State of Iowa.

R. Bradley Stumbo Date: 4/23/2020
R. Bradley Stumbo License #17161
My license expires December 31, 2021

R. BRADLEY STUMBO LICENSED 17161 IOWA LAND SURVEYOR

LICENSED PROFESSIONAL ENGINEER JOHN M. GADE 16015 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.

JOHN M. GADE P.E. 4.23.2020
License number 16015 DATE

My license renewal date is December 31, 2021.

Pages or sheets covered by this seal:
ALL

DATE	REVISION	BY

DESIGNED: JMG
DRAWN: SRS
CHECKED:
LAST UPDATE: 04/21/20

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103
FOX engineering

COVER SHEET
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST.
STORY COUNTY, IA

PROJECT NO. 5470-18A
SHEET G1.1

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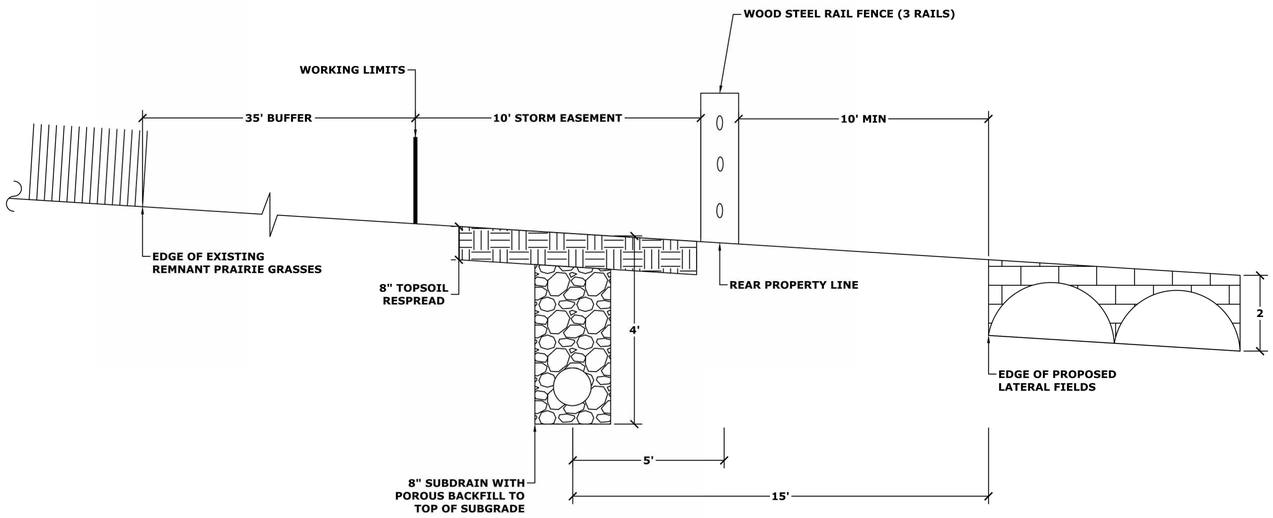

1
G1.2

PROTECTION SUBDRAIN DETAIL

NO SCALE

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
OHP	OHE	ELECTRIC –OVERHEAD
UCP	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			
T		CABLE TV PEDESTAL			STORM SEWER INTAKE, SW–503/ 504
		CONTROL/ TRAVERSE POINT			
S	S	CURB STOP			STORM SEWER INTAKE, SW–505
E		ELECTRICAL PEDESTAL			
		ELECTRICAL MANHOLE			STORM SEWER INTAKE, SW–506
		ELECTRICAL TRANSFORMER			
FO		FIBER OPTIC PEDESTAL			STORM SEWER INTAKE, SW–507/ 508
		GAS METER			
GV		GAS VALVE			STORM SEWER INTAKE, SW–509/ 510
		FIRE HYDRANT			STORM SEWER INTAKE, SW–511
JB		JUNCTION BOX			STORM SEWER INTAKE, SW–512/ BEEHIVE
		LIGHT POLE			
		MAIL BOX			STORM SEWER INTAKE, SW–513
MH		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
S	S	SANITARY MANHOLE	T		TELEPHONE PEDESTAL
		SECTION CORNER –FOUND			TRAFFIC POLE
		SIGN	W		WATER MANHOLE
		STUMP	WM		WATER METER
		TREE –DECIDUOUS	WV	WV	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		

REVISION	DATE	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/21/20		

FOX Engineering Associates, Inc.
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Ames, Iowa 50010
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FOX engineering

LEGEND & PROTECTION SUBDRAIN DETAIL
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST.
STORY COUNTY, IA

PROJECT NO.
5470-18A

SHEET
G1.2

DRAWING FILENAME
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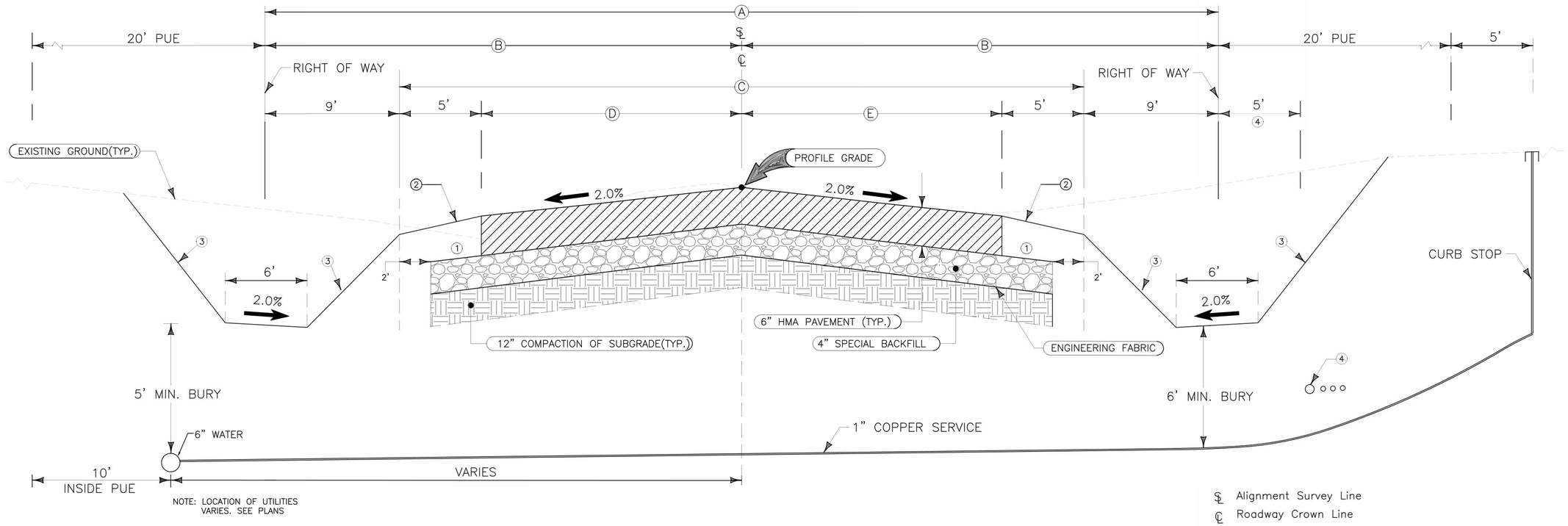

℄ Alignment Survey Line

℄ Roadway Crown Line

1. Subgrade Preperation 3' Outside Edge of Pavement
2. 5' shoulder @ 5.0%, 6" Minimum Black Topsoil
3. Slope MAX 3:1 (H:V), 2' min. depth, 12" min. Topsoil Placement
4. Locate Public Utilities 5' Inside Easement
   Gas, Electric, cable, phone

A FEET	B FEET	C FEET	D FEET	E FEET
50'	25'	32'	11'	11'

1 / G1.3 TYPICAL ROADWAY CROSS SECTION
HMA PAVING
NO SCALE

DATE	REVISION	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/21/20		

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TYPICAL ROADWAY CROSS SECTION
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST.
STORY COUNTY, IA

PROJECT NO.
5470-18A

SHEET
G1.3

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LAYER MNGR NAME
LAYOUT NAME
G1.3

DATE	REVISION	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/23/20		

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EXISTING CONDITIONS AND BOUNDARY

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO. 5470-18A

SHEET C1.1

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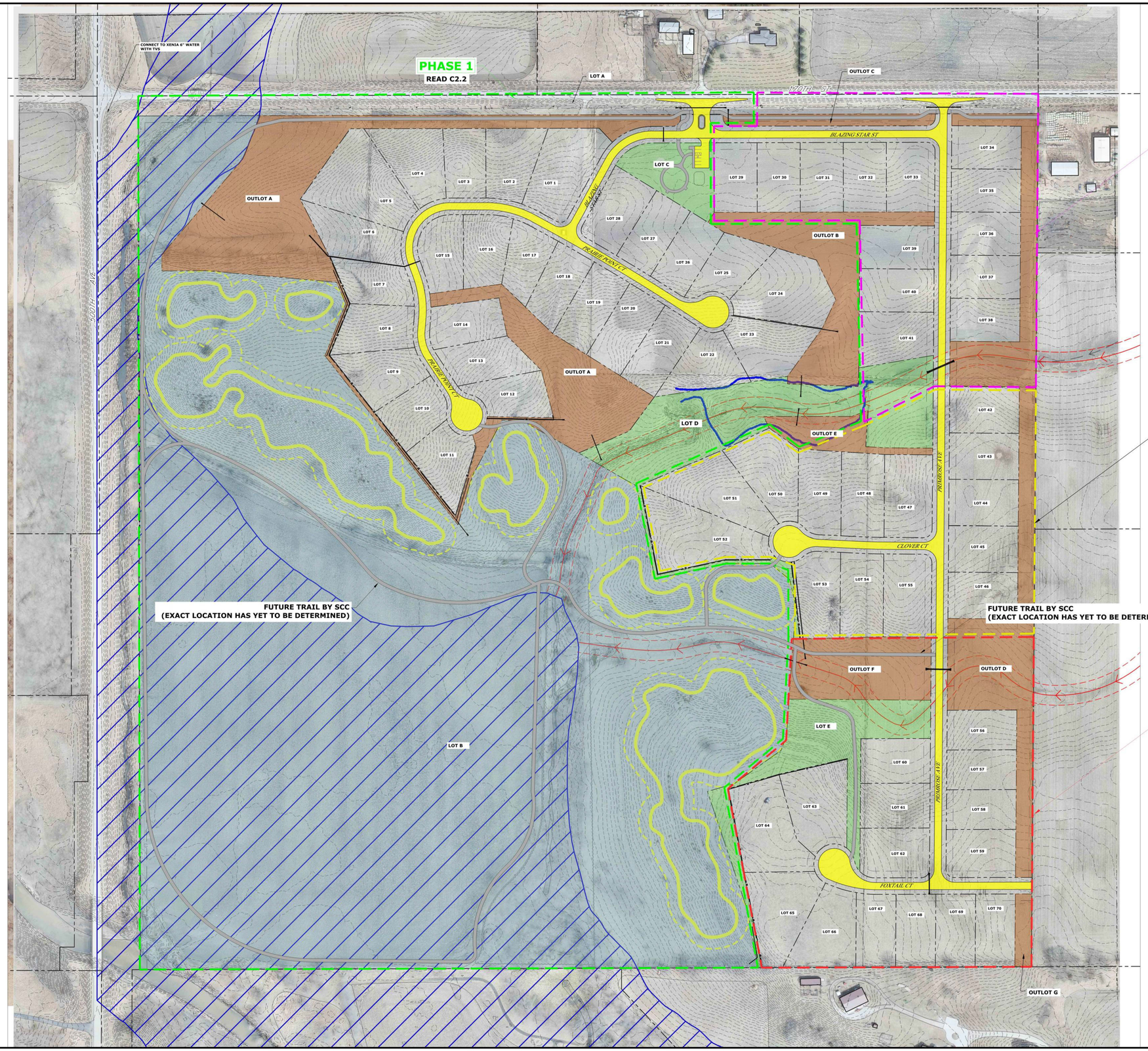

DATE	REVISION	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/23/20		

FOX Engineering Associates, Inc.
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FAX: (515) 233-0103

FOX engineering

SUBDIVISION LAYOUT

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
C2.1

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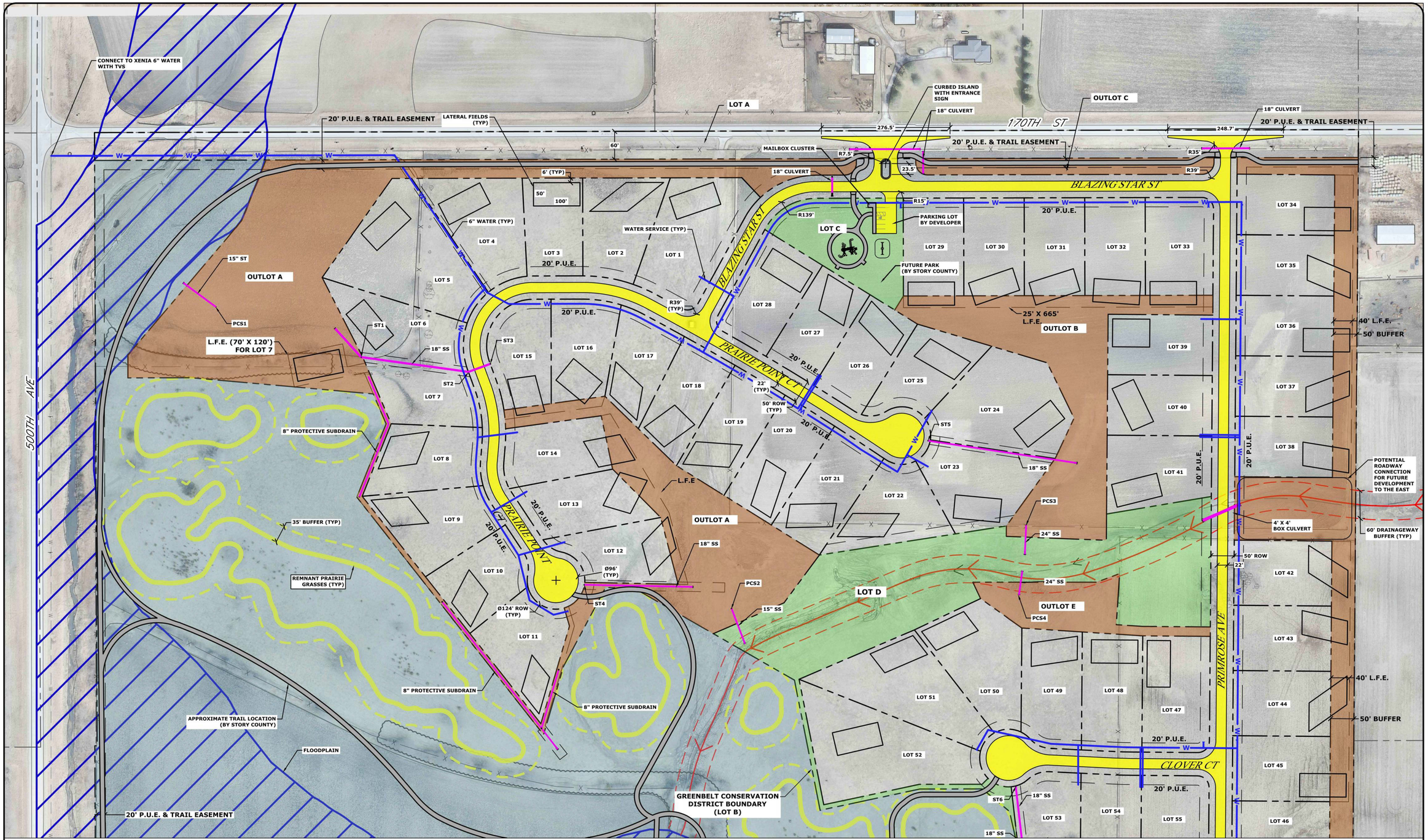
FoxGrayScale AERIAL.ctb

LAYER MNGR NAME

LAYOUT NAME
C2.1



LATERAL FIELD LOCATION

50' X 100' OR 60' X 80'
ALL LATERAL FIELDS WILL BE PROTECTED PRIOR TO CONSTRUCTION WITH FENCING (NO GRADING/HEAVY EQUIPMENT ALLOWED)

LATERAL FIELD EASEMENT (L.F.E.)

PCS = POND CONTROL STRUCTURE

SS = STORM SEWER

ST = STORM STRUCTURE

DATE	REVISION	BY
	DESIGNED:	JMG
	DRAWN:	SRS
	CHECKED:	
	LAST UPDATE: 04/23/20	

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

SUBDIVISION LAYOUT - NORTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO. 5470-18A

SHEET C2.2

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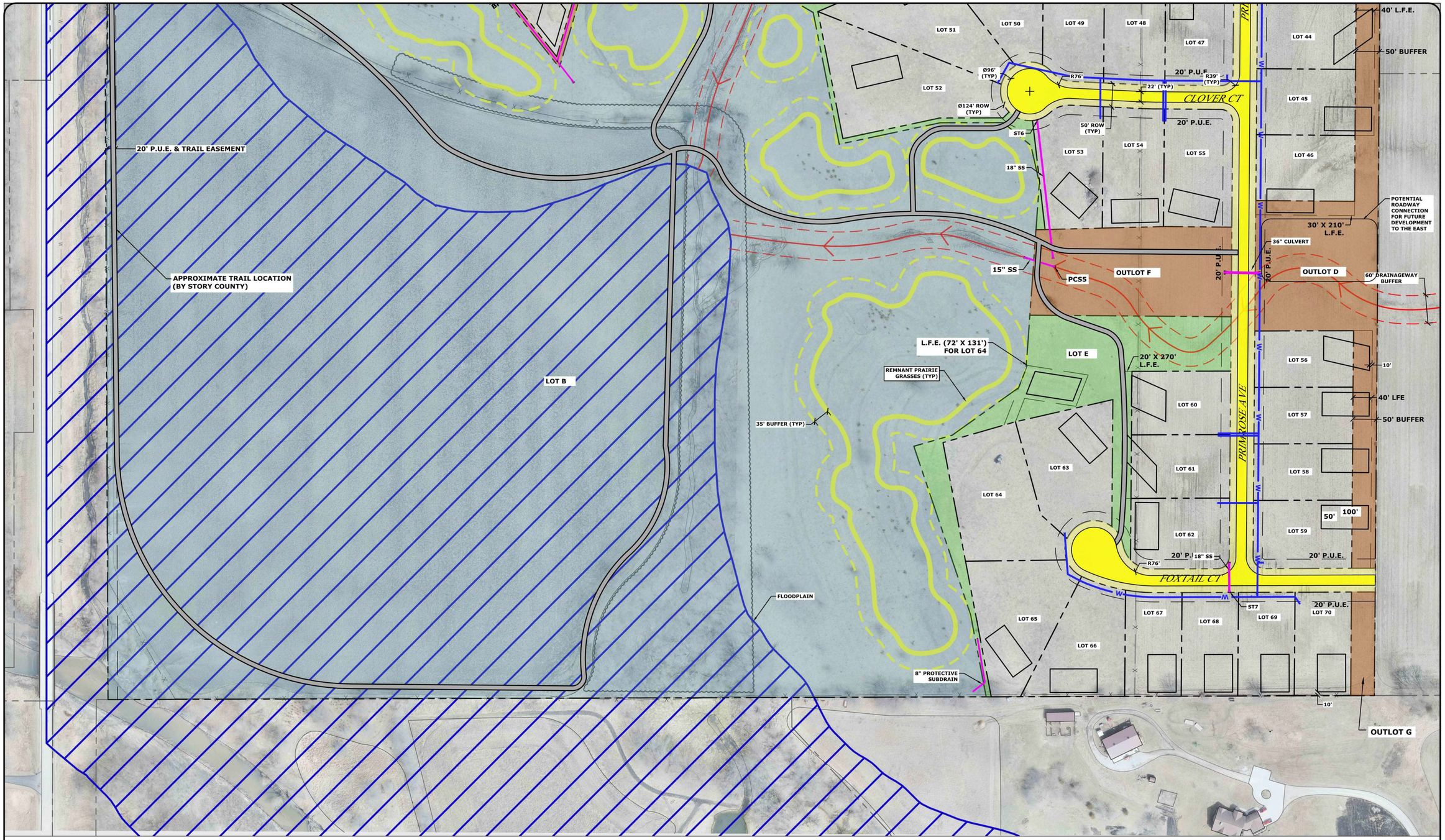

LATERAL FIELD LOCATION

50' X 100' OR 60' X 80'
ALL LATERAL FIELDS WILL BE PROTECTED PRIOR TO CONSTRUCTION WITH FENCING (NO GRADING/HEAVY EQUIPMENT ALLOWED)

LATERAL FIELD EASEMENT (L.F.E.)

PCS = POND CONTROL STRUCTURE

SS = STORM SEWER

ST = STORM STRUCTURE

0 100' 200'

DATE	BY	REVISION	DATE
04/20	JMG		
04/20	SRS		

DESIGNED:
DRAWN:
CHECKED:
LAST UPDATE: 04/23/20

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

SUBDIVISION LAYOUT - SOUTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
C2.3

DRAWING FILENAME
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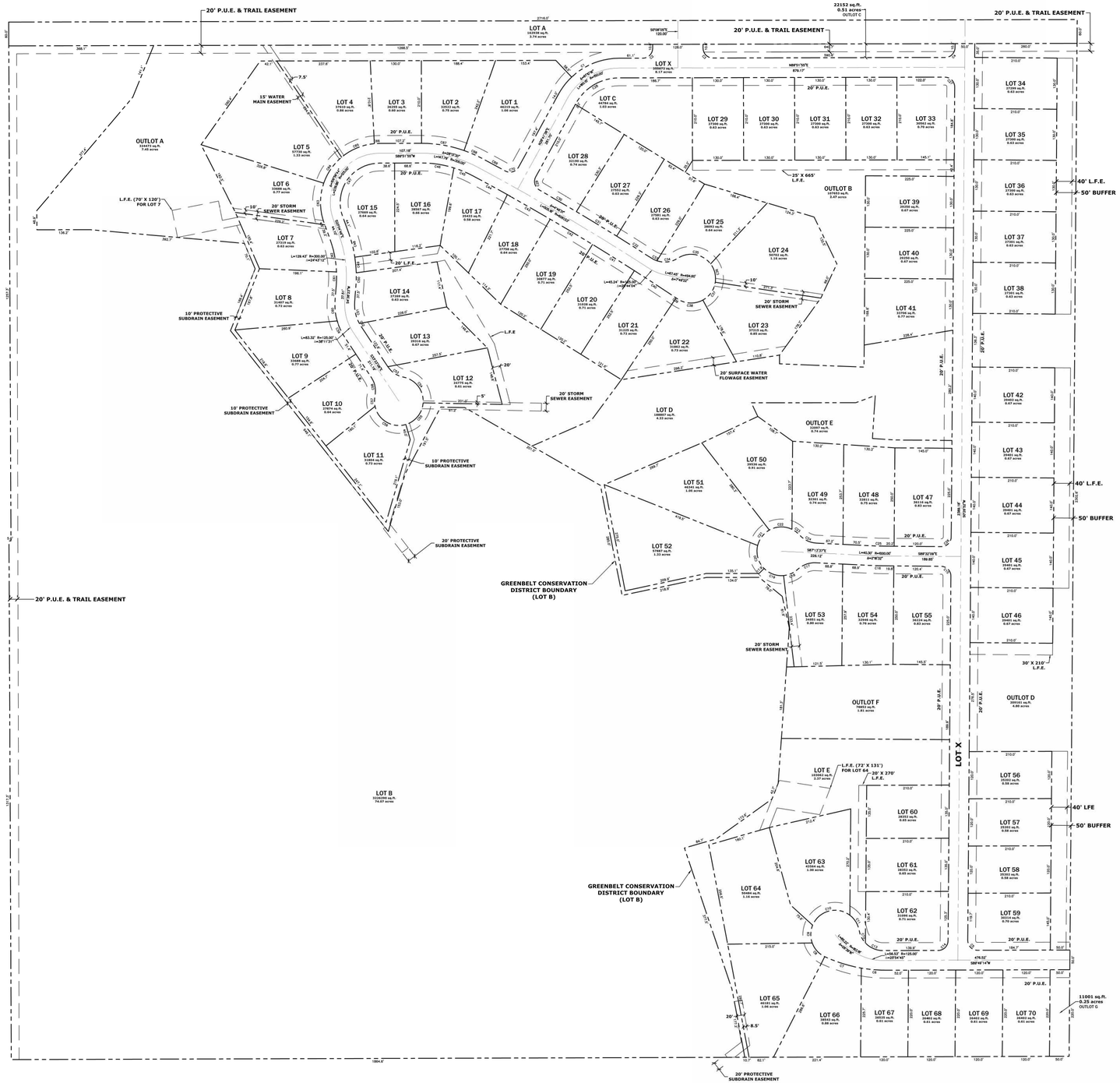
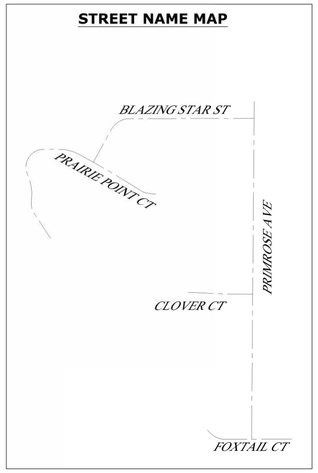


Parcel Curve Data			
Curve Number	Length	Radius	Delta
C1	132.19'	175.00'	43°16'42"
C2	39.27'	25.00'	90°00'00"
C3	39.27'	25.00'	90°00'00"
C4	39.01'	25.00'	89°24'04"
C5	39.54'	25.00'	90°37'37"
C6	68.26'	375.00'	10°25'48"
C7	97.69'	375.00'	14°55'35"
C8	48.46'	62.00'	44°47'12"
C9	46.16'	62.00'	42°39'42"
C10	113.27'	62.00'	104°40'44"
C11	46.21'	62.00'	42°42'11"
C12	36.19'	62.00'	33°26'25"
C13	50.65'	62.00'	46°48'13"
C14	39.00'	25.00'	89°22'22"
C15	39.26'	25.00'	89°59'01"
C16	41.30'	1025.00'	2°18'32"
C17	49.17'	62.00'	45°26'36"
C18	40.61'	62.00'	37°31'51"
C19	54.42'	62.00'	50°17'43"
C20	63.41'	62.00'	58°36'00"
C21	50.50'	62.00'	46°40'13"
C22	59.82'	62.00'	55°16'45"
C23	24.36'	62.00'	22°30'41"
C24	49.17'	62.00'	45°26'36"
C25	39.29'	975.00'	2°18'32"
C26	39.28'	25.00'	90°00'59"
C27	39.52'	25.00'	90°34'53"
C28	133.45'	125.00'	61°10'16"
C29	38.91'	25.00'	89°10'17"
C30	108.13'	5559.47'	1°06'52"
C31	120.01'	5559.47'	1°14'13"
C32	104.69'	5559.47'	1°04'44"
C33	15.44'	62.00'	14°16'14"
C34	55.64'	62.00'	51°25'11"
C35	92.73'	62.00'	85°41'53"
C36	49.46'	62.00'	45°43'32"
C37	57.18'	62.00'	52°50'28"
C38	67.62'	62.00'	62°29'12"
C39	4.49'	6036.53'	0°02'33"
C40	126.81'	6036.53'	1°12'13"
C41	125.40'	6036.53'	1°11'25"
C42	125.40'	6036.53'	1°11'25"
C43	125.23'	6036.53'	1°11'19"
C44	100.05'	6036.53'	0°56'39"
C45	51.98'	275.00'	10°49'46"
C46	83.49'	275.00'	17°23'44"
C47	191.89'	100.00'	109°56'44"
C48	64.78'	325.00'	11°25'12"
C49	40.07'	325.00'	7°03'49"
C50	35.37'	325.00'	6°14'10"
C51	58.14'	100.00'	33°18'52"
C52	8.51'	100.00'	4°52'39"
C53	49.17'	62.00'	45°26'36"
C54	89.97'	62.00'	83°08'46"
C55	74.97'	62.00'	69°16'41"
C56	101.96'	62.00'	94°13'24"
C57	26.23'	62.00'	24°14'22"
C58	49.17'	62.00'	45°26'36"
C59	45.87'	150.00'	17°31'18"
C60	54.11'	150.00'	20°40'13"
C61	33.73'	275.00'	7°01'37"
C62	84.92'	275.00'	17°41'35"
C63	102.40'	150.00'	39°06'53"
C64	81.08'	150.00'	30°58'16"
C65	91.52'	150.00'	34°57'22"
C66	12.84'	150.00'	4°54'13"
C67	110.06'	325.00'	19°24'12"
C68	50.04'	325.00'	8°49'17"
C69	67.13'	6289.26'	0°36'42"
C70	39.27'	25.00'	90°00'03"

ZONE R-1 SETBACKS

FRONT SETBACK (MIN)	-	40 FT
SIDE SETBACK (MIN)	-	10 FT
SIDE SETBACK CORNER LOT (MIN)	-	25 FT
REAR SETBACK (MIN)	-	35 FT

STREET NAME MAP



0 150' 300'

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REVISION	DATE	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/21/20		

FOX Engineering Associates, Inc.
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FAX: (515) 233-0103

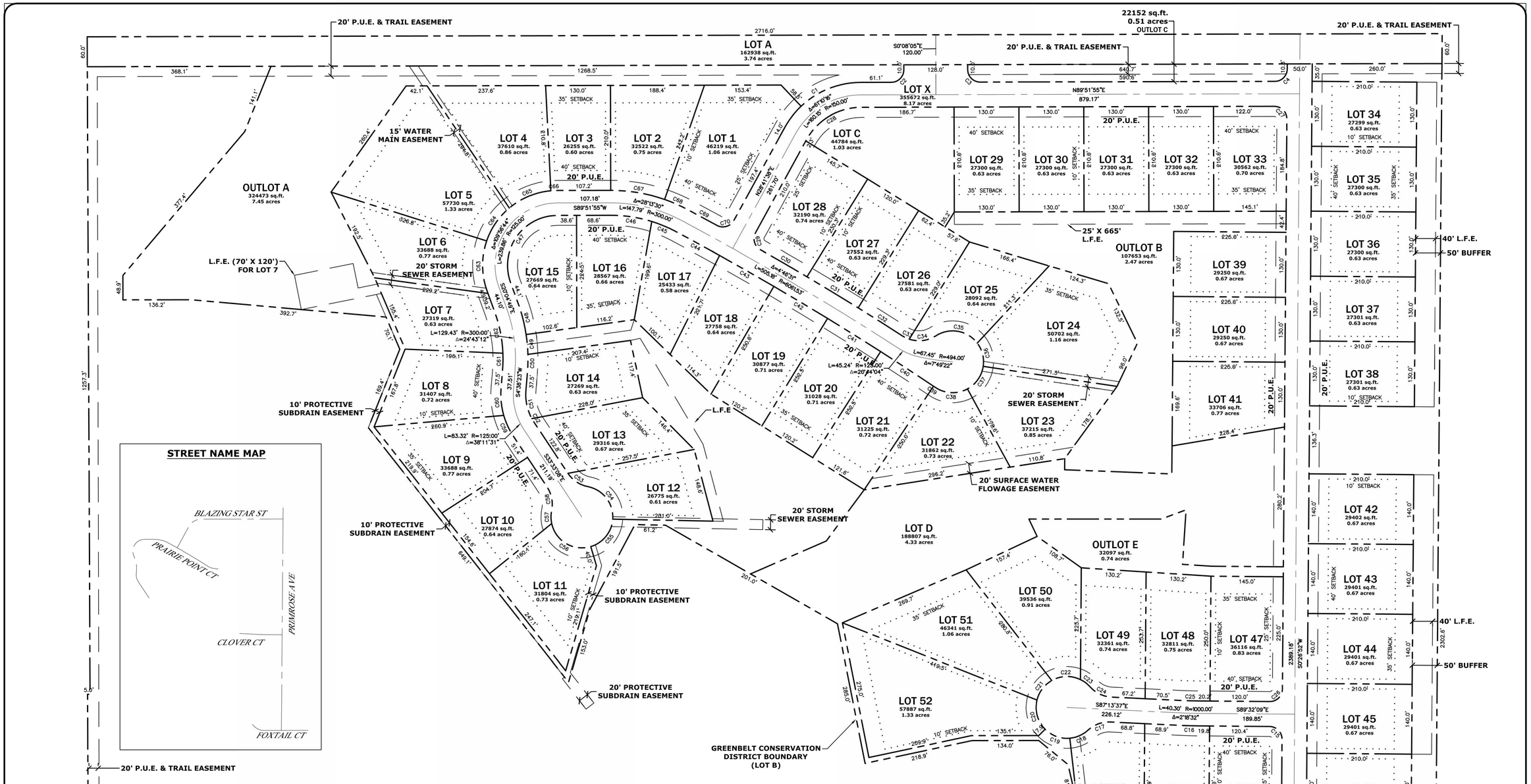
FOX engineering

LOT DIMENSIONS

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH S
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
C3.1



Parcel Curve Data			
Curve Number	Length	Radius	Delta
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C4	39.01'	25.00'	89°24'04"
C5	39.54'	25.00'	90°37'37"
C6	68.26'	375.00'	10°25'48"
C7	97.69'	375.00'	14°55'35"
C8	48.46'	62.00'	44°47'12"
C9	46.16'	62.00'	42°39'42"
C10	113.27'	62.00'	104°40'44"
C11	46.21'	62.00'	42°42'11"
C12	36.19'	62.00'	33°26'25"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C13	50.65'	62.00'	46°48'13"
C14	39.00'	25.00'	89°22'22"
C15	39.26'	25.00'	89°59'01"
C16	41.30'	1025.00'	2°18'32"
C17	49.17'	62.00'	45°26'36"
C18	40.61'	62.00'	37°31'51"
C19	54.42'	62.00'	50°17'43"
C20	63.41'	62.00'	58°36'00"
C21	50.50'	62.00'	46°40'13"
C22	59.82'	62.00'	55°16'45"
C23	24.36'	62.00'	22°30'41"
C24	49.17'	62.00'	45°26'36"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C25	39.29'	975.00'	2°18'32"
C26	39.28'	25.00'	90°00'59"
C27	39.52'	25.00'	90°34'57"
C28	133.45'	125.00'	61°10'16"
C29	38.91'	25.00'	89°10'17"
C30	108.13'	5559.47'	1°06'52"
C31	120.01'	5559.47'	1°14'13"
C32	104.69'	5559.47'	1°04'44"
C33	15.44'	62.00'	14°16'14"
C34	55.64'	62.00'	51°25'11"
C35	92.73'	62.00'	85°41'53"
C36	49.48'	62.00'	45°43'32"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C37	57.18'	62.00'	52°50'28"
C38	67.62'	62.00'	62°29'12"
C39	4.49'	6036.53'	0°02'33"
C40	126.81'	6036.53'	1°12'13"
C41	125.40'	6036.53'	1°11'25"
C42	125.40'	6036.53'	1°11'25"
C43	125.23'	6036.53'	1°11'19"
C44	100.05'	6036.53'	0°56'59"
C45	51.98'	275.00'	10°49'46"
C46	83.49'	275.00'	17°23'44"
C47	191.89'	100.00'	109°56'44"
C48	64.78'	325.00'	11°25'12"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C49	40.07'	325.00'	7°03'49"
C50	35.37'	325.00'	6°14'10"
C51	58.14'	100.00'	33°18'52"
C52	8.51'	100.00'	4°52'39"
C53	49.17'	62.00'	45°26'36"
C54	89.97'	62.00'	83°08'46"
C55	74.97'	62.00'	69°16'41"
C56	101.96'	62.00'	94°13'24"
C57	26.23'	62.00'	24°14'22"
C58	49.17'	62.00'	45°26'36"
C59	45.87'	150.00'	17°31'18"
C60	54.11'	150.00'	20°40'13"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C61	33.73'	275.00'	7°01'37"
C62	84.92'	275.00'	17°41'35"
C63	102.40'	150.00'	39°06'53"
C64	81.08'	150.00'	30°58'16"
C65	91.52'	150.00'	34°57'22"
C66	12.84'	150.00'	4°54'13"
C67	110.06'	325.00'	19°24'12"
C68	50.04'	325.00'	8°49'17"
C69	67.13'	6289.26'	0°36'42"
C70	39.27'	25.00'	90°00'03"

ZONE R-1 SETBACKS

FRONT SETBACK (MIN)	-	40 FT
SIDE SETBACK (MIN)	-	10 FT
SIDE SETBACK CORNER LOT (MIN)	-	25 FT
REAR SETBACK (MIN)	-	35 FT

0 100' 200'

DATE	BY	
	DESIGNED:	JMG
	DRAWN:	SRS
	CHECKED:	
	LAST UPDATE:	04/21/20

REVISION

DATE

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
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FOX engineering

LOT DIMENSIONS - NORTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH S
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
C3.2

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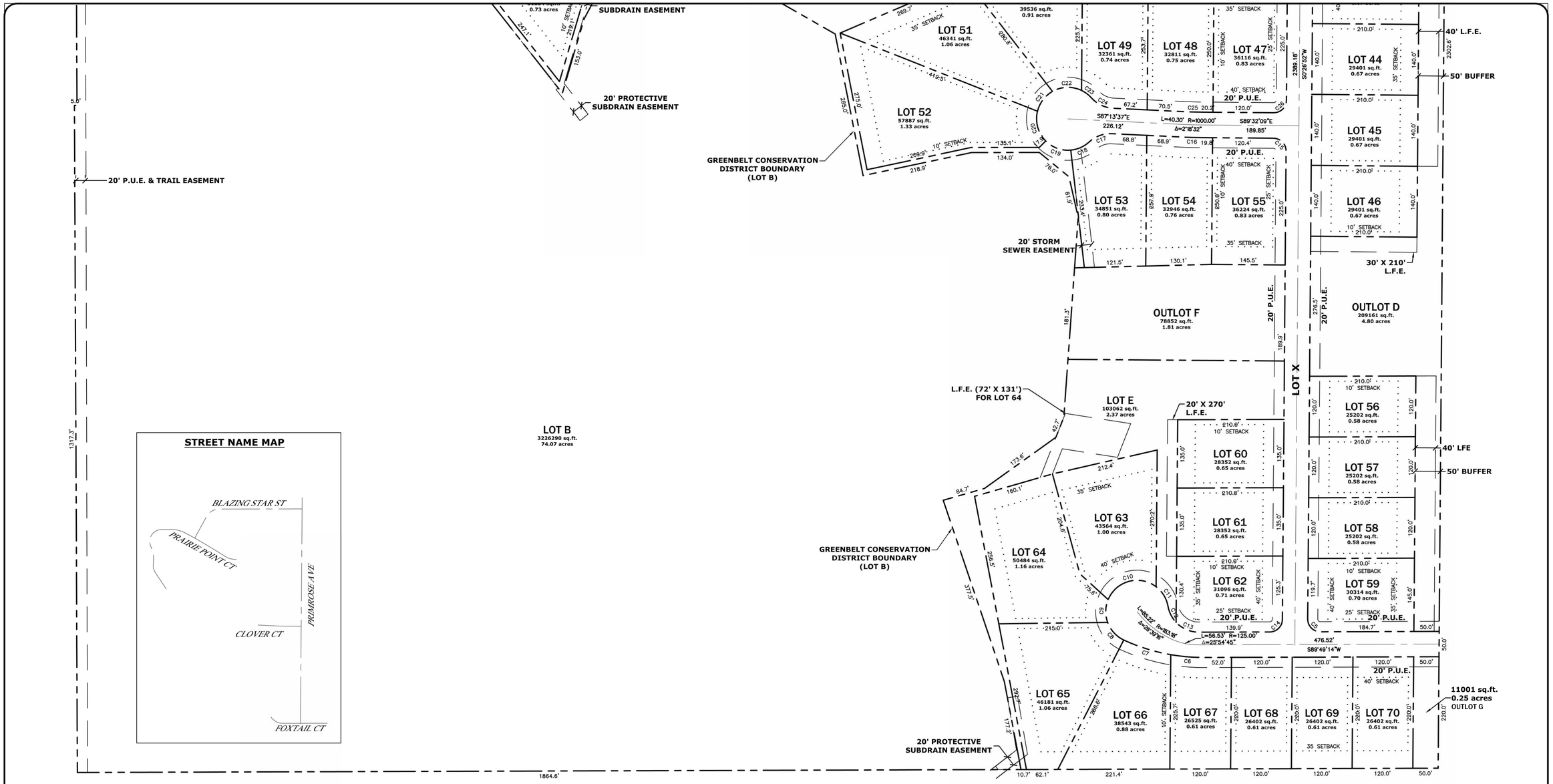
LAYER MNGR NAME
PLOT STYLE TABLE FoxGrayScale.ctb



Parcel Curve Data			
Curve Number	Length	Radius	Delta
C1	132.19'	175.00'	43°16'42"
C2	39.27'	25.00'	90°00'00"
C3	39.27'	25.00'	90°00'00"
C4	39.01'	25.00'	89°24'04"
C5	39.54'	25.00'	90°37'37"
C6	68.26'	375.00'	10°25'48"
C7	97.69'	375.00'	14°55'35"
C8	48.46'	62.00'	44°47'12"
C9	46.16'	62.00'	42°39'42"
C10	113.27'	62.00'	104°40'44"
C11	46.21'	62.00'	42°42'11"
C12	36.19'	62.00'	33°26'25"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C13	50.65'	62.00'	46°48'13"
C14	39.00'	25.00'	89°22'22"
C15	39.26'	25.00'	89°59'01"
C16	41.30'	1025.00'	2°18'32"
C17	49.17'	62.00'	45°26'36"
C18	40.61'	62.00'	37°31'51"
C19	54.42'	62.00'	50°17'43"
C20	63.41'	62.00'	58°36'00"
C21	50.50'	62.00'	46°40'13"
C22	59.82'	62.00'	55°16'45"
C23	24.36'	62.00'	22°30'41"
C24	49.17'	62.00'	45°26'36"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C25	39.29'	975.00'	2°18'32"
C26	39.28'	25.00'	90°00'59"
C27	39.52'	25.00'	90°34'57"
C28	133.45'	125.00'	61°10'16"
C29	38.91'	25.00'	89°10'17"
C30	108.13'	5559.47'	1°06'52"
C31	120.01'	5559.47'	1°14'13"
C32	104.69'	5559.47'	1°04'44"
C33	15.44'	62.00'	14°16'14"
C34	55.64'	62.00'	51°25'11"
C35	92.73'	62.00'	85°41'53"
C36	49.48'	62.00'	45°43'32"

Parcel Curve Data			
Curve Number	Length	Radius	Delta
C37	57.18'	62.00'	52°50'28"
C38	67.62'	62.00'	62°29'12"
C39	4.49'	6036.53'	0°02'33"
C40	126.81'	6036.53'	1°12'13"
C41	125.40'	6036.53'	1°11'25"
C42	125.40'	6036.53'	1°11'25"
C43	125.23'	6036.53'	1°11'19"
C44	100.05'	6036.53'	0°56'59"
C45	51.98'	275.00'	10°49'46"
C46	83.49'	275.00'	17°23'44"
C47	191.89'	100.00'	109°56'44"
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Parcel Curve Data			
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C54	89.97'	62.00'	83°08'46"
C55	74.97'	62.00'	69°16'41"
C56	101.96'	62.00'	94°13'24"
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C59	45.87'	150.00'	17°31'18"
C60	54.11'	150.00'	20°40'13"

Parcel Curve Data			
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C68	50.04'	325.00'	8°49'17"
C69	67.13'	6289.26'	0°36'42"
C70	39.27'	25.00'	90°00'03"

ZONE R-1 SETBACKS

FRONT SETBACK (MIN)	-	40 FT
SIDE SETBACK (MIN)	-	10 FT
SIDE SETBACK CORNER LOT (MIN)	-	25 FT
REAR SETBACK (MIN)	-	35 FT

0 100' 200'

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LAYER MNGR NAME
PLOT STYLE TABLE: FoxGrayScale.ctb

DATE	BY	REVISION	DATE
DESIGNED:	JMG		
DRAWN:	SRS		
CHECKED:			
LAST UPDATE: 04/21/20			

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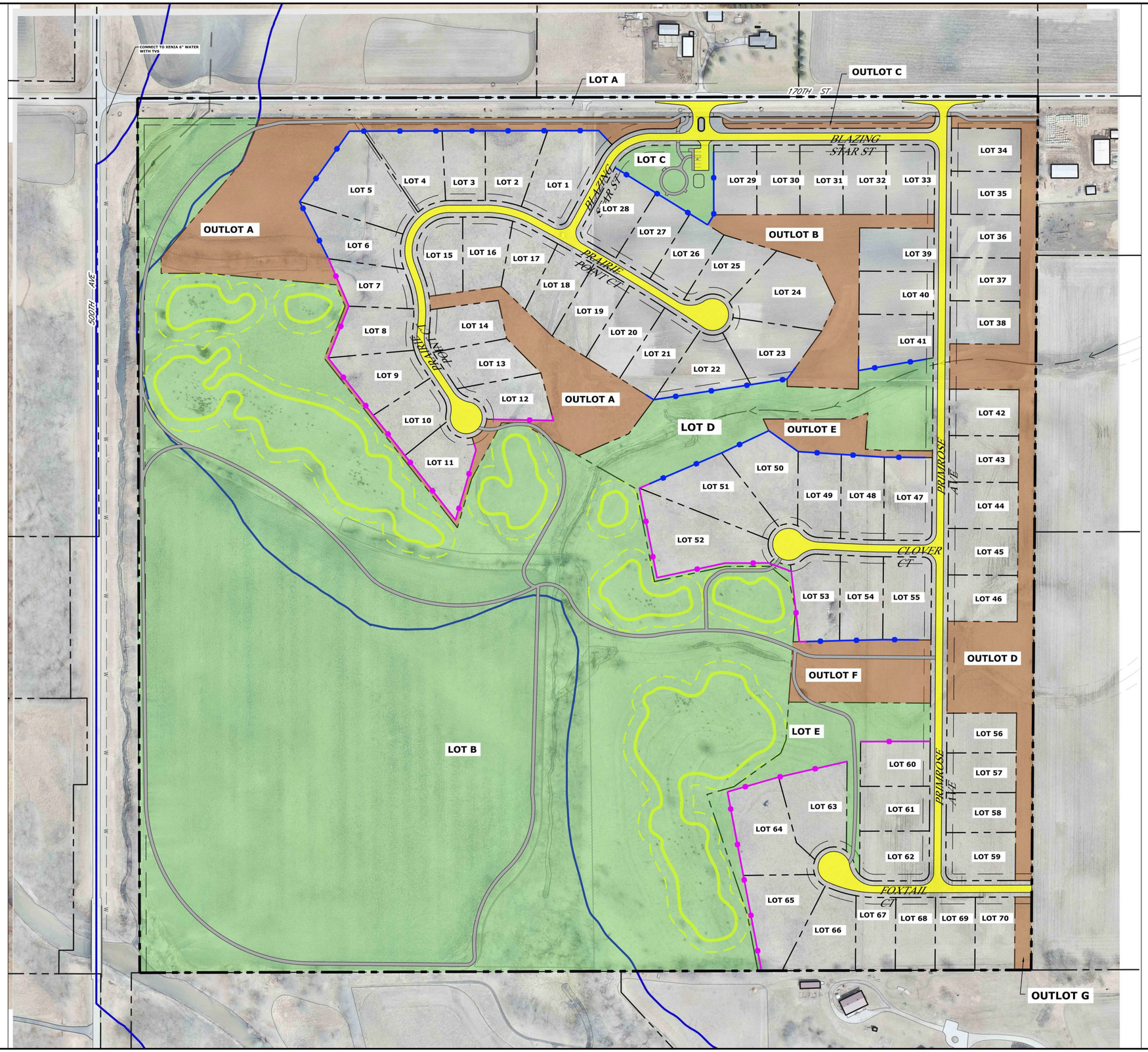
FOX engineering

LOT DIMENSIONS - SOUTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH S
STORY COUNTY, IOWA

PROJECT NO. 5470-18A

SHEET C3.3



PRAIRIE VALLEY WILL DEDICATE THE FOLLOWING LOTS TO STORY COUNTY:

LOT A - 170TH STREET RIGHT OF WAY	3.74 AC
LOT B - GBC ZONING DISTRICT	74.07 AC
LOT C - PARK/TRAIL HEAD	1.03 AC
LOT D - DRAINAGE DISTRICT DIKE	4.33 AC
LOT E - ACCESS TO LOT B	2.37 AC
TOTAL	85.27 AC

PRAIRIE VALLEY WILL DEDICATE THE FOLLOWING LOTS TO PRAIRIE VALLEY HOME OWNERS ASSOCIATION (HOA):

OUTLOT A	7.45 AC
OUTLOT B	2.47 AC
OUTLOT C	0.51 AC
OUTLOT D	4.80 AC
OUTLOT E	0.74 AC
OUTLOT F	1.81 AC
OUTLOT G	0.25 AC
LOT X (PRIVATE STREETS)	8.17 AC
TOTAL	26.20 AC

GENERAL NOTES:

1. FENCE CONSTRUCTION TO BEGIN/END 40' FROM LOT RIGHT OF WAY LINE.

2. ALL STORMWATER BMP'S BENEFITING THE R-1 DEVELOPMENT WILL BE OWNED & MAINTAINED BY HOA.

3. STORY COUNTY WILL HAVE ACCESS RIGHTS ON OUTLOTS A, B, C, D, E, F & G.

4. OUTLOTS A,B,C,D,E,F & G ARE ENCUMBERED WITH THE "CONSERVATION EASEMENTS"

LEGEND

- PRAIRIE VALLEY HOA (OWNS & MAINTAINS)
  - STORMWATER FACILITIES
  - BUFFER AREAS
- STORY COUNTY (DEVELOPER WILL DEDICATE LAND FOR STORY COUNTY TO OWN & MAINTAIN)
- WOOD 3-SPLIT RAIL FENCE ON PROPERTY LINE TO PROTECT ENVIRONMENTAL SENSITIVE AREAS (INSTALLED PER PHASE BY DEVELOPER)
- WOOD 3-SPLIT RAIL FENCE ON PROPERTY LINE TO PROTECT STORY COUNTY GREENSPACE AREAS (INSTALLED BY HOME BUILDER AS A CONDITION OF BUILDING PERMIT)

0 150' 300'

DATE	REVISION	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE: 04/23/20		

FOX Engineering Associates, Inc.
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Ames, Iowa 50010
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FOX engineering

OWNERSHIP & FENCING PLAN

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO. 5470-18A

SHEET C4.1

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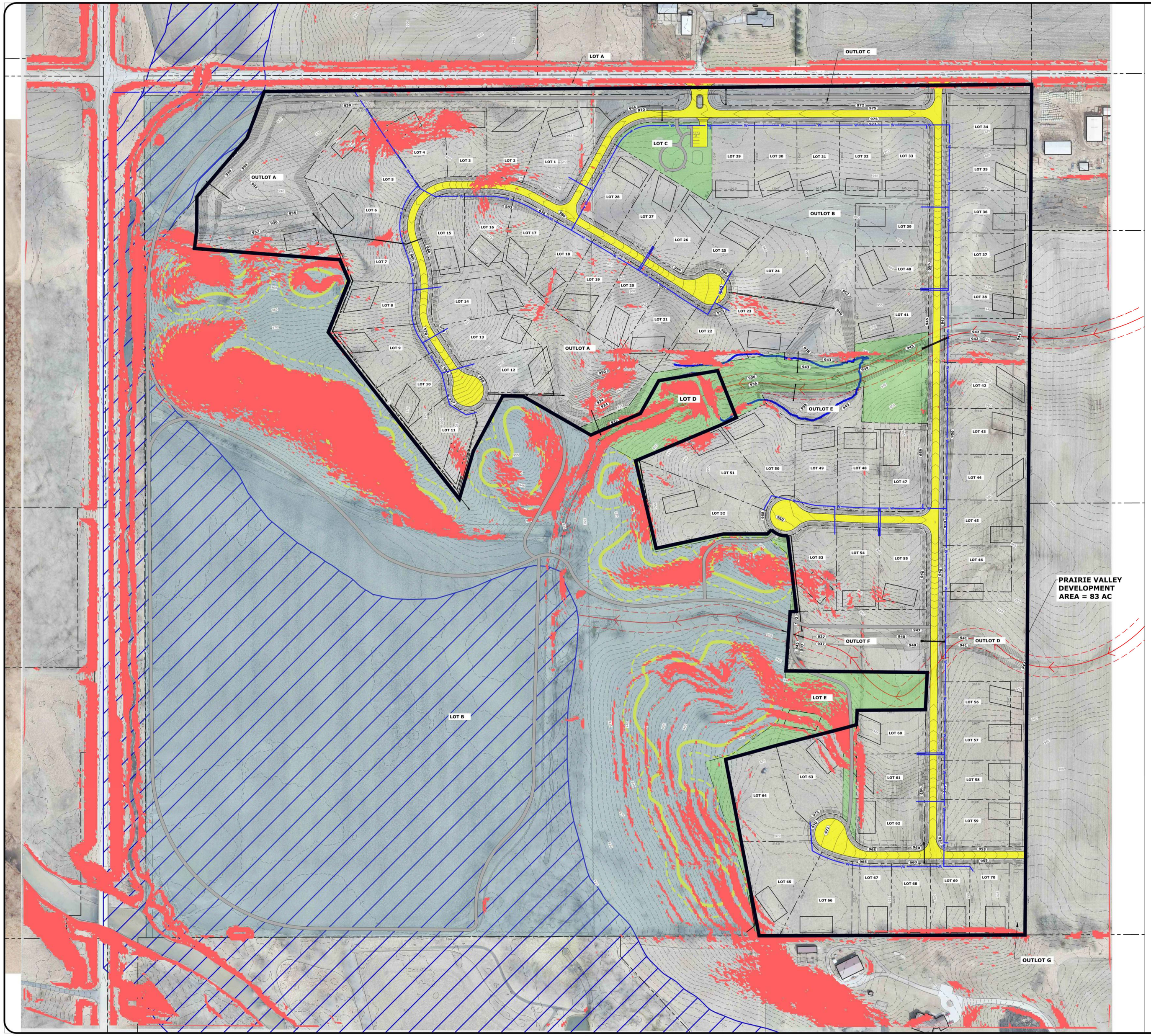

LEGEND

DOTOSON FAMRMS PROPOSED DEVELOPMENT AREA = 85 AC

= **SLOPES GREATER THAN 14%**

3.8% = **SLOPES GREATER THAN 14% WITHIN PRAIRIE VALLEY 83 AC. DEVELOPMENT AREA**

- **STORY COUNTY ALLOWS 15% OF SUBDIVISION TO DEVELOP ON SLOPES GREATER THAN 14%**

0 150' 300'

DRAWING FILENAME
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PLOT STYLE TABLE FoxGrayScale.AERIAL.ctb
LAYER MNGR NAME
LAYOUT NAME C4.2

DATE	REVISION	BY	DATE
	DESIGNED:	JMG	04/20
	DRAWN:	SRS	04/20
	CHECKED:		
	LAST UPDATE:		04/23/20

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FOX engineering

STEEP SLOPES MAP
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
C4.2

All contractors/subcontractors shall conduct their operations in a manner that minimizes erosion and prevents sediments from leaving the roadway right-of-way and prevents chemical contamination of soil and water. The Prime Contractor shall be responsible for compliance and implementation of the Pollution Prevention Plan (PPP) for their entire contract. This responsibility shall be further shared with subcontractors whose work is a source of potential pollution as defined in this PPP. All work necessary to be in compliance with the PPP shall be considered incidental to the project. Therefore, it is in the best interest of the Contractor to disturb as little land as possible.

1. **SITE DESCRIPTION**

This Pollution Prevention Plan (PPP) is for the PRAIRIE VALLEY-Residential Subdivision, SE corner of 500th Avenue and 170th St., Story County, Iowa. This PPP covers approximately 163 acres with 62 of the acres being disturbed.

The PPP is located in an area of fourteen (14) soil types: Storden Loam (L62D2, L62E2), Nicollet Loam (L55), Webster Clay Loam (L107), and Clarion Loam (L138B, L138C, & L138C2), Belview Loam (L62F), Spillville-Coland complex (1585), Dickinson Fine Sandy Loam (175 & 175B), Coland Clay Loam (135), Estherville Sandy Loam (34C) and Terril Loam (27B). The estimated average NRCS runoff curve number for this PPP after completion will be 66.

Refer to the drawings, "PRAIRIE VALLEY-residential subdivision" for locations of typical slopes, ditch grades, and major structural and non-structural controls. A copy of this plan will be on file at the Project Engineer's office. All drainage will flow into tributaries of the South Skunk River.

Potential Sources of Pollution

Site sources of pollution generated as a result of this work relate to silts and sediment that may be transported as a result of a storm event. However, this PPP provides conveyance for other (non-project related) operations. These other operations have storm water runoff, the regulation of which is beyond the control of this PPP. Potentially this runoff can contain various pollutants related to site-specific land uses. Examples are:

a. Rural Agricultural Activities:

Runoff from agricultural land use can potentially contain chemicals including herbicides, pesticides, fungicides and fertilizers.

b. Commercial and Industrial Activities:

Runoff from commercial and industrial land use may contain constituents associated with the specific operation. Such operations are subject to potential leaks and spills that could be commingled with run-off from the facility. Pollutants associated with commercial and industrial activities are not readily available since they are typically proprietary.

2. **CONTROLS**

At locations where runoff can move offsite, silt fence shall be placed along the perimeter of the areas to be disturbed prior to beginning grading, excavation or clearing and grubbing operations. Vegetation in areas not needed for construction shall be preserved. As areas reach their final grade, additional silt fences, silt basins, intercepting ditches, sod flumes, letdowns, rip-rap, bridge end drains, and earth dikes shall be installed as specified in the plans and/or as required by the Project Engineer. This will include using silt fence as ditch checks and to protect intakes. Temporary stabilizing seeding shall be completed as the disturbed areas are constructed. If construction activity is not planned to occur in a disturbed area for at least 14 days, on any portion of the site, the area shall be stabilized by temporary seeding or mulching on the last day, day zero, of land disturbing activities. Other stabilizing methods shall be used outside the seeding time period.

As the work progresses, additional erosion control items may be required as determined by the Contractor after field investigation. These may include items such as silt fence, erosion control mats, check dams and other appropriate measures installed by the Contractor as directed by the Engineer. The Contractor will complete the construction with the establishment of permanent perennial vegetation of all disturbed areas.

3. **OTHER CONTROLS**

Contractor disposal of unused construction materials and construction material wastes shall comply with applicable state and local waste disposal, sanitary sewer, or septic system regulations. In the event of a conflict with other governmental laws, rules and regulations, the more restrictive laws, rules or regulations shall apply.

Tracked-out material carried from this work site onto adjacent roads shall be cleaned up at the end of the workday or immediately when directed to do so by the Engineer.

Approved State or Local Plans:

During the course of this construction, it is possible that situations will arise where unknown materials will be encountered. When such situations are encountered, they will be handled according to all federal, state, and local regulations in effect at the time.

4. **MAINTENANCE**

The Contractor is required to maintain all temporary erosion control measures in proper working order, including cleaning, repairing, or replacing them throughout the contract period. Cleaning of silt control devices shall begin when the features have lost 50% of their capacity.

5. **INSPECTIONS**

Inspections shall be made by the Owner every seven calendar days. The Contractor shall immediately begin corrective action on all deficiencies found. The findings of this inspection shall be recorded in the project diary. Based on the results of the inspection, pollution prevention measures identified in the plan shall be revised at the construction site as appropriate as soon as practicable after the inspection and to the plan as soon as practicable after the inspection but in no case more than 7 calendar days following the inspection. If the permittee determines that making these changes at the construction site or to the plan less than 72 hours after the inspection is impracticable, the permittee shall document in the plan why it is impracticable and indicate an estimated date by which the changes will be made. The Contractor shall implement all revisions.

6. **NON-STORM DISCHARGES**

This includes subsurface drains (i.e. longitudinal and standard subdrains) and slope drains. The velocity of the discharge from these features may be controlled by the use of patio blocks, Class A stone or erosion stone.

7. **PROHIBITED DISCHARGES**

- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance; and
- Soaps or solvents used in vehicle and equipment washing.

Storm Water Pollution Prevention Plan - Supplemental items

Phase 1 - Site Evaluation and Design Development

Existing soil information: See the Story County Soil Survey, NW quarter of Section 7 of T84N, R24W.

Existing runoff quality: Existing data on runoff water quality is not available.

Location of surface water on site: Runoff surface drains from the site.

Name of receiving stream: Surface drains to unnamed tributary to Squaw Creek to South Skunk River.

Construction activity description: General soil disturbing activities associated with grading and utility installation include: stockpiling, trenching, backfilling, grading, paving and seeding.

Site map: The plans show slopes after grading, disturbed areas, drainage patterns, and discharge points.

Phase 2 - Control Selection/Plan Design

(A) Select Erosion and Sediment Controls

The Contractor shall submit specifications for temporary and permanent measures to be used for controlling erosion and sediment. Clearing and grading should not be started until a firm construction schedule is known and can be effectively coordinated with the grading and clearing activity.

The following Stabilization measures will be utilized:

Temporary seeding - Exposed areas subject to erosion should be covered as quickly as possible. Under Iowa's General Permit No. 2., disturbed areas of the construction site that will not be re-disturbed for 14 days or more, on any portion of the site, the area shall be stabilized by day zero, the last day of land disturbing activities.

Permanent seeding and planting - Permanent seeding shall be done in accordance with the Seeding Plan. The seeding schedule shall follow the Iowa Department of Transportation specifications. Temporary seeding shall be utilized for erosion control until permanent seeding can be established.

Mulching - Temporary vegetation will be used as mulch when permanent seeding is completed.

Preservation of Natural Vegetation - Natural Vegetation shall be preserved where possible within the construction limits. Natural vegetation shall not be disturbed outside of the construction limits. Vegetation may be mowed or harvested for hay crop.

Vegetative Strips - Vegetative strips may be utilized to slow runoff velocities and deposit sediments from disturbed areas.

Soil Retaining Measures - Soil to be reused will be stockpiled onsite as indicated on the plans. Silt fence will be utilized to maintain soils onsite.

Minimization of land exposure - Exposure of disturbed land shall be minimized in terms of area and time.

Roadways - Roadways will be surfaced or otherwise stabilized as soon as feasible.

Topsoil - shall be preserved, onsite, unless infeasible and de-compacted prior to final stabilization. Re-spread minimum depth of eight-inches (8") of topsoil with at least 3% organic matter, per SUDAS.

The following structural practices will be utilized:

Earthen Berm or Dike - Earthen dikes may be used to divert water around disturbed areas and around intakes as directed by the Engineer.

Silt fence - Silt fence shall be placed on the perimeter of the disturbed area as shown on the drawings. Additional silt fence shall be provided at the discretion of the Engineer.

Gravel Construction Entrance - A gravel or rock construction entrance will be used to reduce or eliminate offsite tracking of soil or debris.

(B) Select other controls

Disposal of construction site waste materials - The Contractor will be responsible for making sure that all construction wastes are properly disposed of at facilities permitted to accept these types of wastes.

Treatment or disposal of sanitary wastes generated onsite - The Contractor will be responsible for providing sanitary facilities for workers in accordance with local and state requirements.

Prevent offsite tracking of sediments and generation of dust - The Contractor shall prevent the tracking of sediments offsite. A construction entrance shall be installed as shown on the plans. The Contractor will be responsible for immediate cleanup of any tracked mud or debris.

The Contractor will also be responsible for preventing dust generation from construction activities. The Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. Dust prone materials in piles or in transit shall be covered when practical to prevent blowing. Buildings and operating facilities which are affected adversely by dust shall be adequately protected from dust. Existing and new equipment which may be adversely affected by dust shall be adequately protected.

The Contractor will be responsible for preventing chemical contamination of soil and water.

PCC waste - The Contractor shall provide and maintain a containment facility for waste paving product (i.e. PCC wash out station). Perform maintenance when washout station is at 75% capacity.

Stored materials - The Contractor shall be responsible for storing materials so that rain water doesn't carry chemical contamination into soil or water.

Equipment servicing - Contractor shall prevent spilling of petroleum products. Spill shall be cleaned up immediately. Used petroleum containers are to be disposed of correctly and not buried on-site.

Building construction product - Contractor shall prevent cleaning of equipment in a manner that contaminates soil or water and waste products from becoming airborne and leaving the site.

(C) Inspection and maintenance plan

The contractor will be responsible for installation and all associated costs of erosion and stormwater management controls during the contract period. Details of control measures are shown on the plans.

The Owner's representative will be responsible for filling out an inspection report for the site. The inspection reports can be used to record scheduled maintenance. Any changes that may be required to correct deficiencies in the Storm Water Pollution Prevention Plan noted during an inspection should be made as soon as practical after an inspection but in no case later than 7 days after the inspection.

(D) Control Description

Description of controls can be found in section (A). The Contractor will be responsible for submitting specifications of the selected controls. The location of determined controls can be found on the plans. Additional controls may be required at the discretion of the Engineer.

(E) Schedule of major activities

Prior to initiating construction, the Contractor shall submit a schedule of major activities including:

1. Land clearing and grading in relation to the corresponding schedule for all excavation work. If at all possible, the clearing should immediately precede the construction activity.
2. Installation and anticipated completion date of each control measure.

Phase 3 - Plan Implementation

Contractor Certification

All Contractors and subcontractors, including short-term contractors and subcontractors coming on-site, must sign the Contractor certification statement before conducting any professional service at the site identified in the plan. The certification must be signed by an authorized representative (i.e., principal executive officer, president, secretary, treasurer or vice president, general partner, proprietor, ranking elected official). Upon signing the certification, the Contractor or subcontractor becomes a co-permittee with the Owner and other co-permittee Contractors. In signing the plan, the authorized representative certifies that the information is true and assumes liability for the plan. Note that Section 309 of the Clean Water Act provides for significant penalties where information is false or the permittee violates, either knowingly or negligently, permit requirements.

The General Contractor will be responsible for collecting and maintaining signatures. The Contractor shall provide copies of signed certifications to the Owner and Engineer upon request and at the termination of the contract.

(A) Notice of Intent (NoI)

The Owner or an agent of the Owner will fulfill the public notice requirement and submit the Notice of Intent for coverage under General Permit No. 2. The project required the obtaining of a NPDES General Permit for storm water discharge associated with construction activities. The Owner and the Contractor have a copy of this permit. The Contractor and all subcontractors shall be responsible for compliance and fulfilling all requirements of the NPDES General permit including the Storm Water Pollution Prevention Plan.

Phase 4 - Plan Implementation

The Contractor shall follow the schedule as submitted under Phase 2 (E). The Contractor shall keep the Engineer informed of any deviation of the schedule or plan.

(A) Inspection and Maintenance Reports

A copy of the inspection log shall be maintained at the site.

(B) Records of Construction Activities

In addition to the installation and maintenance of erosion control implementation, the Contractor should keep records of the construction activity on the site. In particular, the Contractor should keep a record of the following information:

-The dates when major grading activities occur in a particular area.

-The dates when construction activities cease in an area, temporarily or permanently.

-The dates when an area is stabilized, temporarily or permanently.

-These records can be used to make sure that areas where there is no construction activity will be stabilized within the required time frame. Records shall be retained for a period of at least three years from the date that the site is finally stabilized.

(C) Plan Updates

The pollution prevention plan shall be updated:

-When it does not accurately reflect the site features and operations.

-When the Contractor, Owner, or Engineer observes that it is not effective in minimizing pollutant discharge from the site.

-To include Contractors identified after the submittal of the Notice of Intent. These Contractors shall certify the plan and be identified as co-permittees and

-To identify any change in ownership or transference of the permit and permit responsibilities.

If, at any time during the effective period of the permit, the IDNR finds that the plan does not meet one or more of the minimum standards established in the general permit, the IDNR will notify the permittee of required changes necessary to bring the plan up to standard. Permittees shall have 3 days after notification to make the necessary changes and shall submit to the Department a written certification that the changes have been made.

(E) Report of Hazardous Conditions

Because construction activities may include handling of certain hazardous substances over the course of the project, spills of these substances may create a hazardous condition and are required to be reported. Iowa law requires that as soon as possible but not more than six hours after the onset of a hazardous condition the IDNR (515) 725 - 8694 and local Sheriff's Office (515) 382 - 7458 or the office of the Sheriff of the affected county be notified. The Owner and Engineer should also be informed of the hazardous condition in a timely manner. Contractor is responsible for spill clean-up, remediation and reporting.

The Contractor shall submit a report to the Engineer within 14 calendar days of a hazardous condition. The report shall describe the release and the circumstances leading to the release. Steps to prevent the reoccurrence of such releases are to be identified in the plan and implemented.

(F) Plan location and access

Plan location - A copy of the Pollution Prevention Plan must be kept at the construction site from the time construction begins until the site has reached final stabilization.

Retention of records - Retention of records requires that copies of the Storm Water Pollution Prevention Plan and all other reports required by the permit, as well as all of the data used to complete the Notice of Intent, be retained for 3 years after the completion of final site stabilization.

Access - Although plans and associated records are not necessarily required to be submitted to the IDNR, these documents must be made available upon request to the Department of Natural Resources. If storm water runoff is discharged to a municipal separate storm sewer system, the plans must be made available upon request to the municipal operator of the system.

Phase 6 - Final Stabilization and NoD

(A) Final Stabilization

Final stabilization is defined in the general permit as meaning that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70%, sufficient to preclude erosion, for the entire disturbed area of the permitted project has been established or equivalent stabilization measures have been employed or which has been returned to agricultural production.

The Contractor shall notify the permit holder and Engineer of final stabilization in accordance with the contract documents. The Owner and Engineer will review the site before finalizing the contract and taking control of the site. The Contractor will be required to provide a copy of all inspection and maintenance logs, schedule of construction activities, and Contractor Certifications to the Owner at this time.

(B) Notice of Discontinuation (NoD)

The permit holder (Owner) will be required to submit the Notice of Discontinuation once control of the site has been obtained from the Contractor.

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PLOT STYLE TABLE	LAYER MNGR NAME	LAYOUT NAME
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REVISION		DATE	BY	DATE
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		DRAWN:	SRS	04/20
		CHECKED:		
		LAST UPDATE: 04/23/20		

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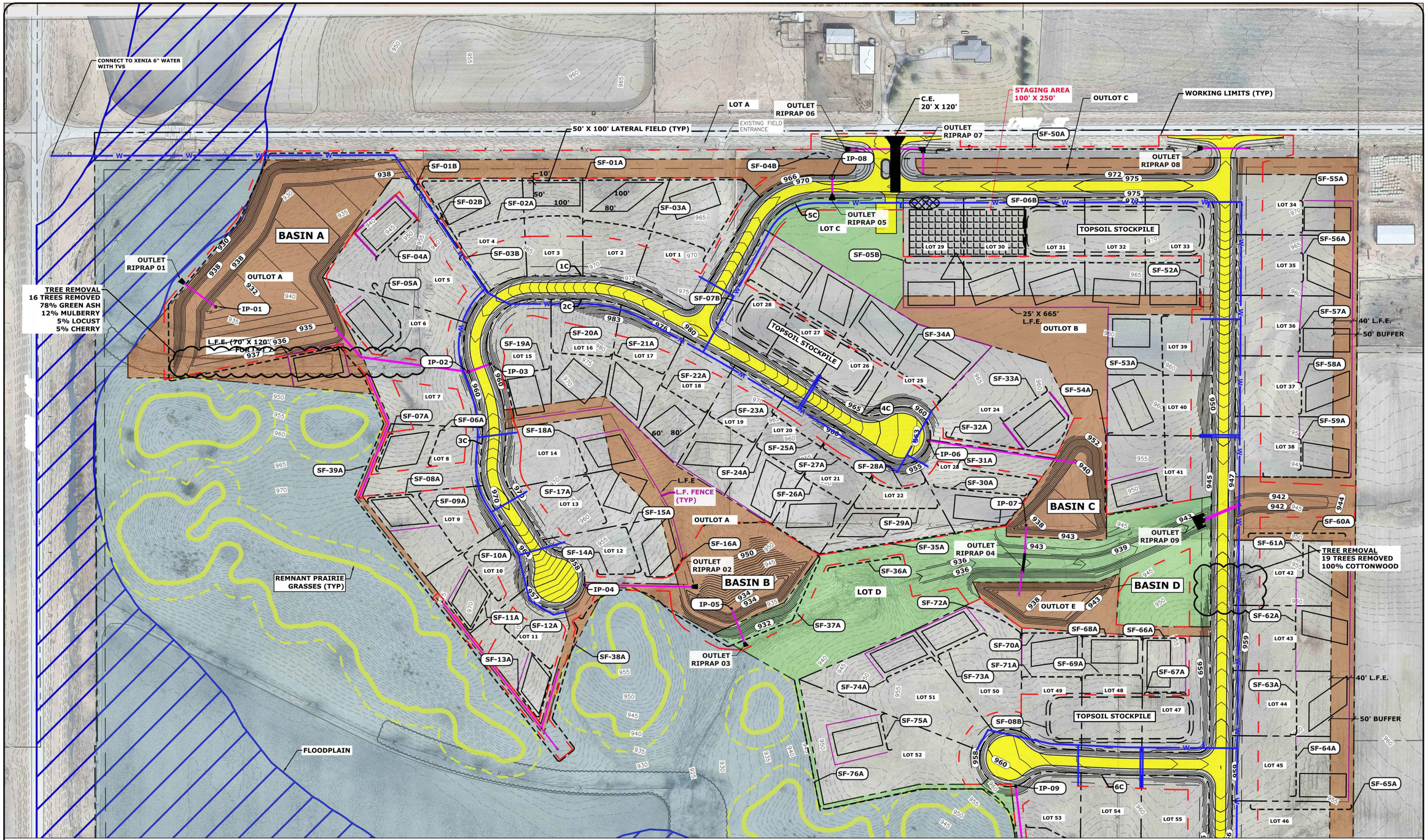
Phone: (515) 233-0000
FAX: (515) 233-0103

STORM WATER POLLUTION PREVENTION PLAN
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
EC.1



LEGEND

- CE — CONSTRUCTION ENT.
- SF — SILT FENCE
- IP — INLET PROTECTION
- OP — OUTLET PROTECTION
- PS — PERMANENT SEEDING
- TS — TEMPORARY SEEDING
- BM — BLANKET & MATTING
- CD — ROCK CHECK DAM
- CONCRETE, PAINT, AND GROUT WASHOUT AREA
- DESIGNATED STAGING AREA FOR PORTABLE RESTROOMS, TEMPORARY FUEL TANKS, WASTE CONTAINERS, AND OTHER CHEMICALS.
- SPILL KIT
- A — CONTROL TO BE INSTALLED PRIOR TO CONSTRUCTION
- B — CONTROL TO BE INSTALLED AFTER GRADING OR PIPE INSTALLATION
- C — INSTALL DITCH CHECK, TYPICAL. SPACED FOR 3-FOOT VERTICAL DROP

0 100' 200'

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	DRAWN:	SRS	04/20
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	LAST UPDATE: 04/23/20		

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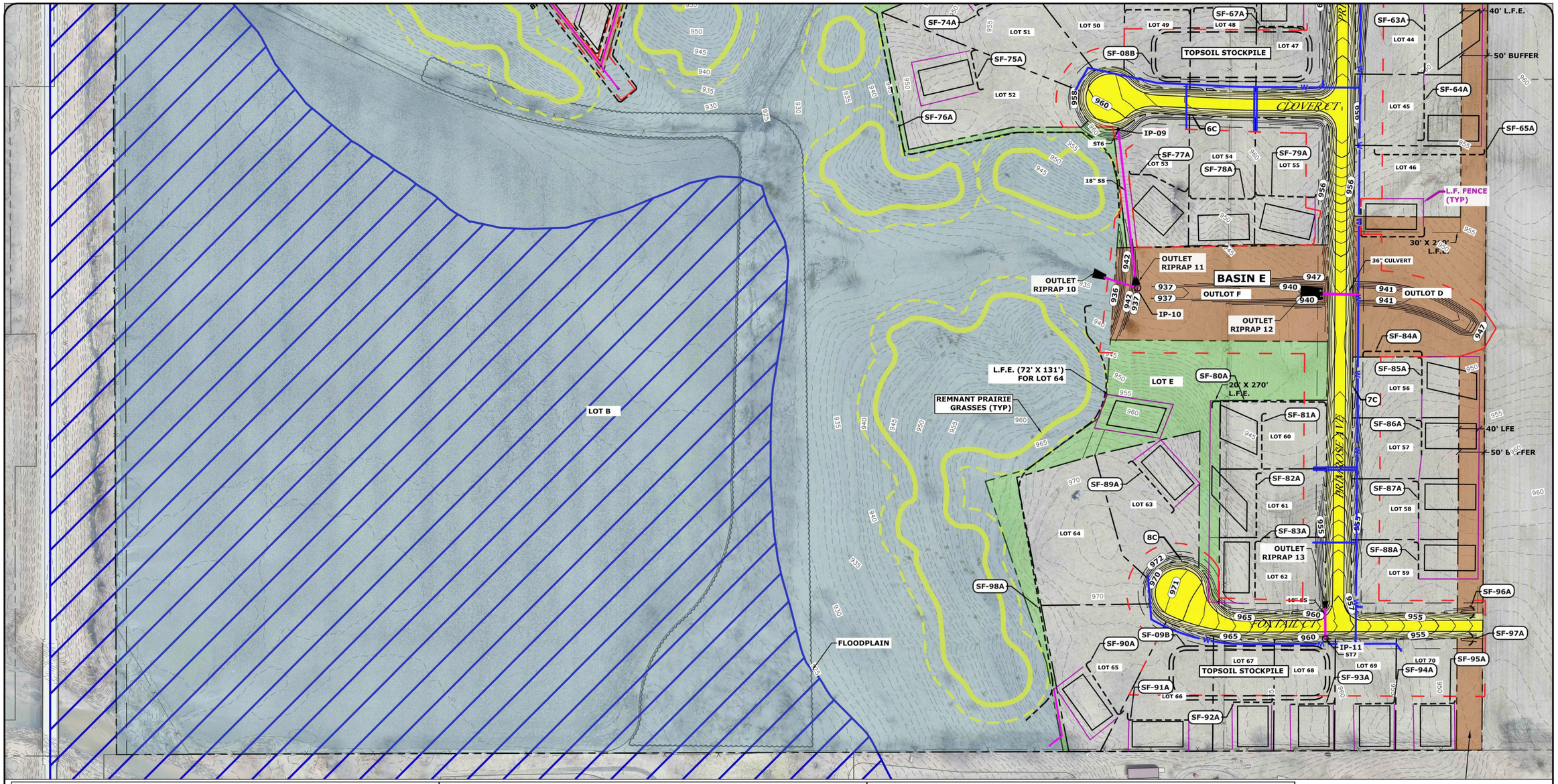
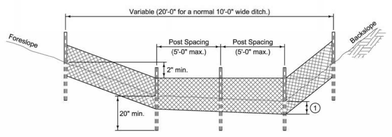
EROSION CONTROL - NORTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

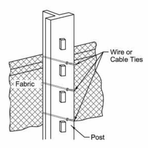
PROJECT NO. 5470-18A

SHEET EC.2





TYPICAL SILT FENCE DITCH CHECK



ATTACHMENT TO POST

1 Insert 12 inches of fabric a minimum of 6 inches deep (fabric may be folded below the ground line).

SUDAS Standard Specifications

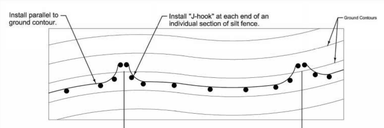
SILT FENCE

REVISED 2 1-22-14

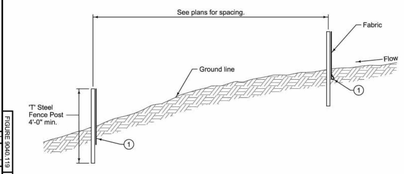
SUDAS 9040.119

SHEET 1 of 2

FIGURE 9040.119 SHEET 1 OF 2



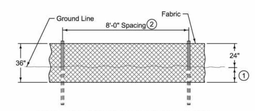
TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Plan View)



TYPICAL SILT FENCE INSTALLATION ON LONGITUDINAL SLOPES
(Profile View)

1 Insert 12 inches of fabric a minimum of 6 inches deep (fabric may be folded below the ground line).

2 Reduce post spacing to 5'-0" at water concentration areas, or as required to adequately support fence.



DETAILS OF SILT FENCE ON LONGITUDINAL SLOPES

SUDAS Standard Specifications

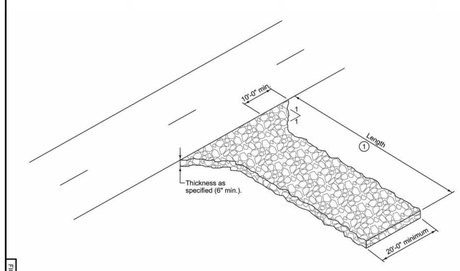
SILT FENCE

REVISED 2 1-22-14

SUDAS 9040.119

SHEET 2 of 2

FIGURE 9040.120 SHEET 1 OF 1



1 Entrance length: 50 foot minimum (30 foot for single family residential), or as specified in the contract documents. Length of entrance may be increased if sediment track-out occurs.

SUDAS Standard Specifications

STABILIZED CONSTRUCTION ENTRANCE

REVISED 2 1-22-14

SUDAS 9040.120

SHEET 1 of 1

0 100' 200'

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LAYER MNGR NAME

LAYOUT NAME
EC.3

PLOT STYLE TABLE
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04/20	JMG	DESIGNED:
04/20	SRS	DRAWN:
		CHECKED:
LAST UPDATE: 04/23/20		

REVISION

DATE

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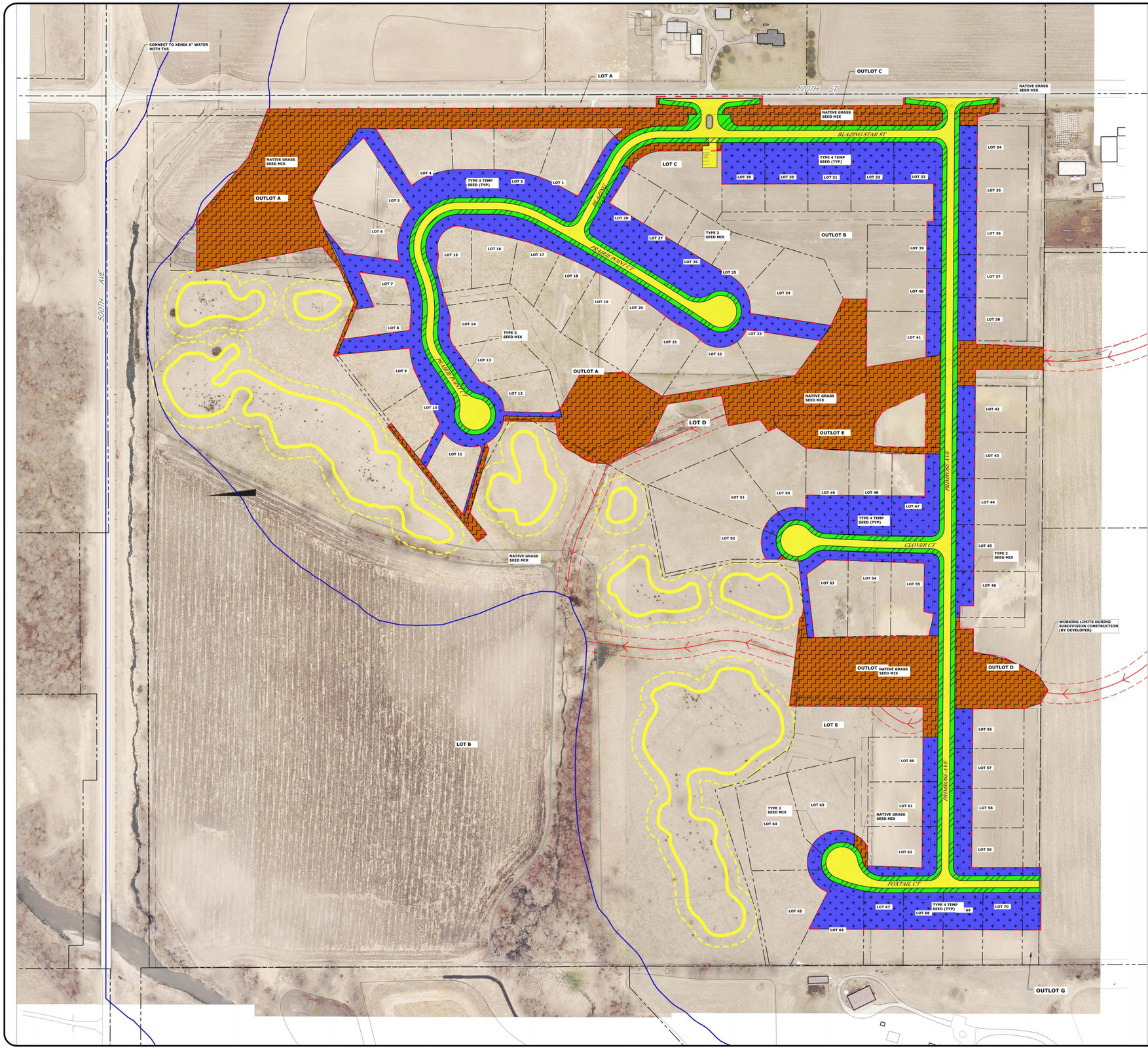
EROSION CONTROL - SOUTH HALF

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
EC.3



LEGEND

- TYPE-2 SEED MIXTURE - AC
- TYPE-4 TEMPORARY SEEDING - AC
- NATIVE GRASS SEED MIXTURE - AC

*ALL SEEDING IS PER SUDAS STANDARD SPECIFICATIONS

DATE	REVISION	DATE	BY
		DESIGNED:	JMG 04/20
		DRAWN:	SRS 04/20
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		LAST UPDATE: 04/23/20	

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SUBDIVISION LAYOUT
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
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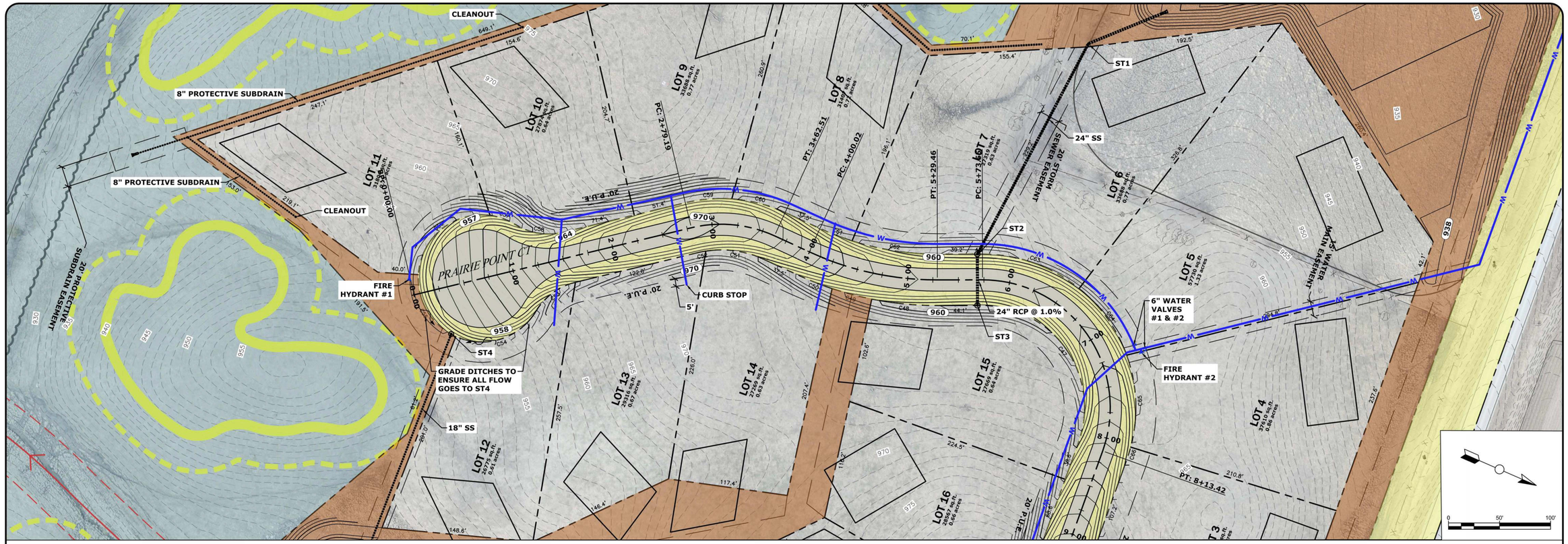

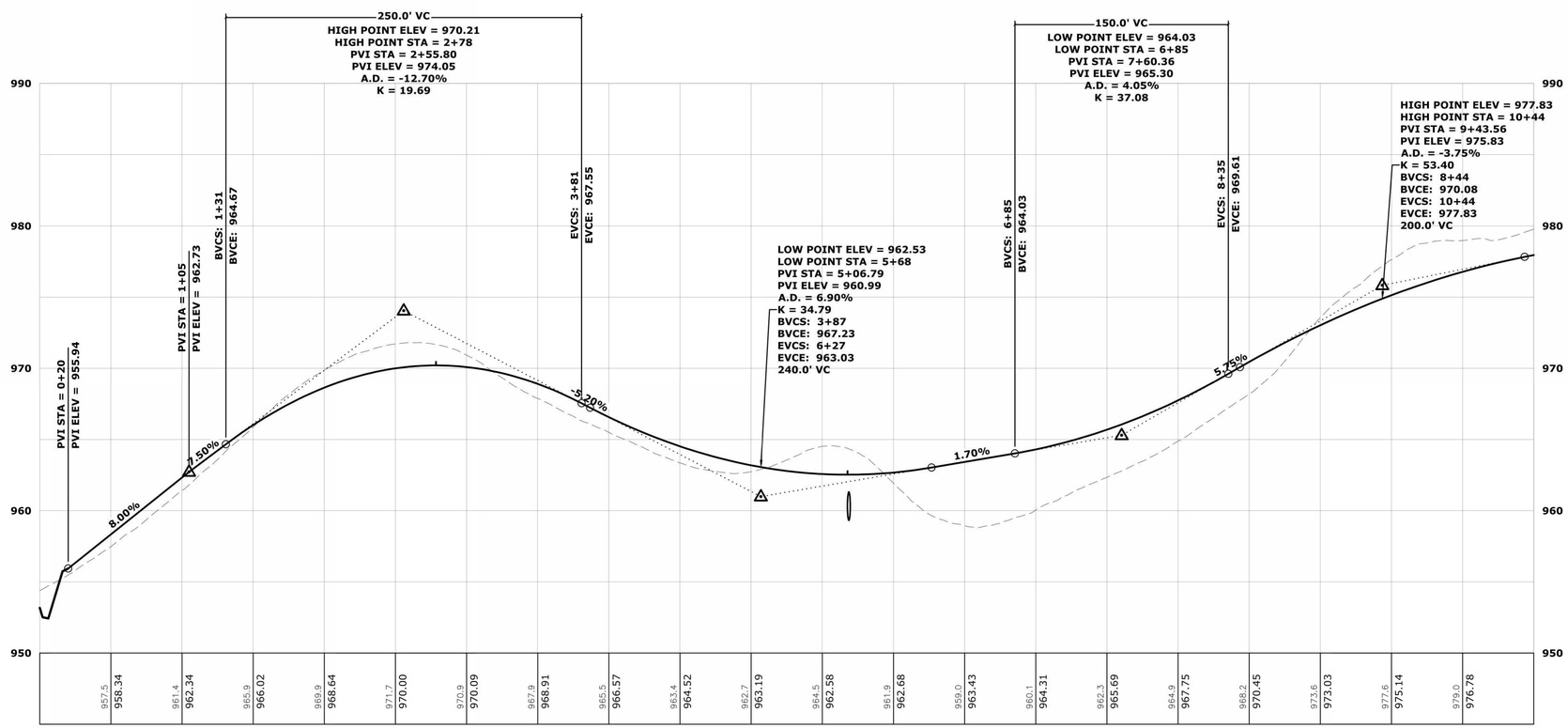

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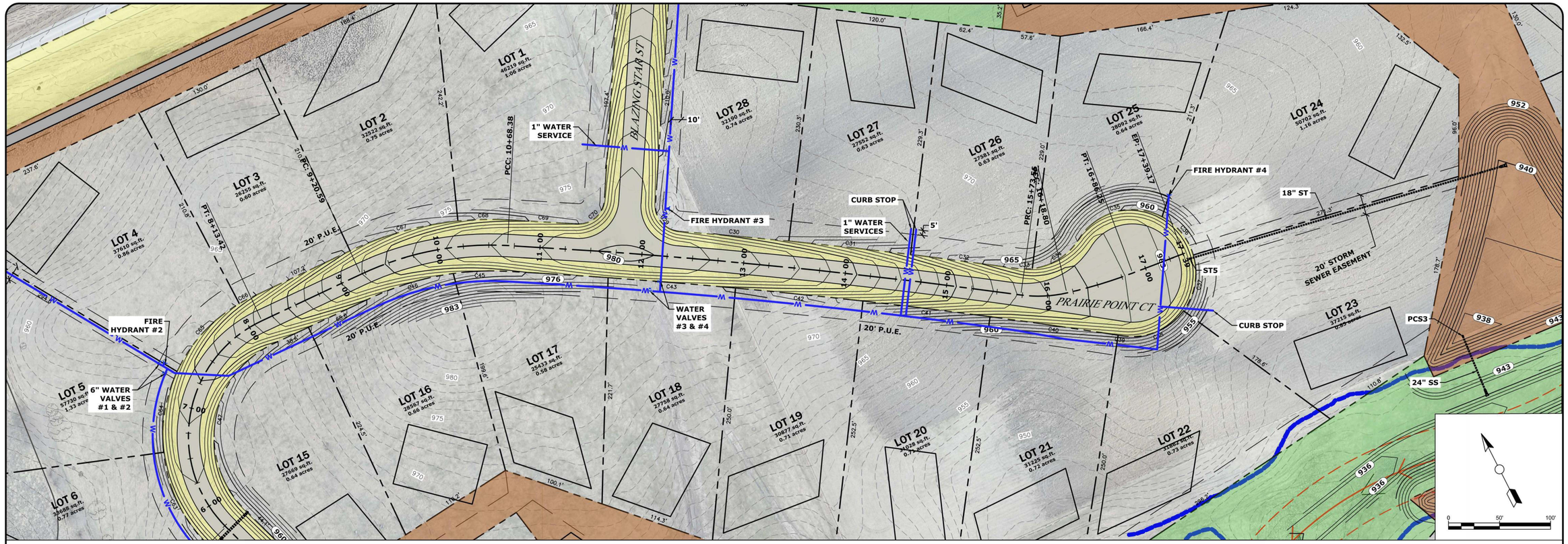
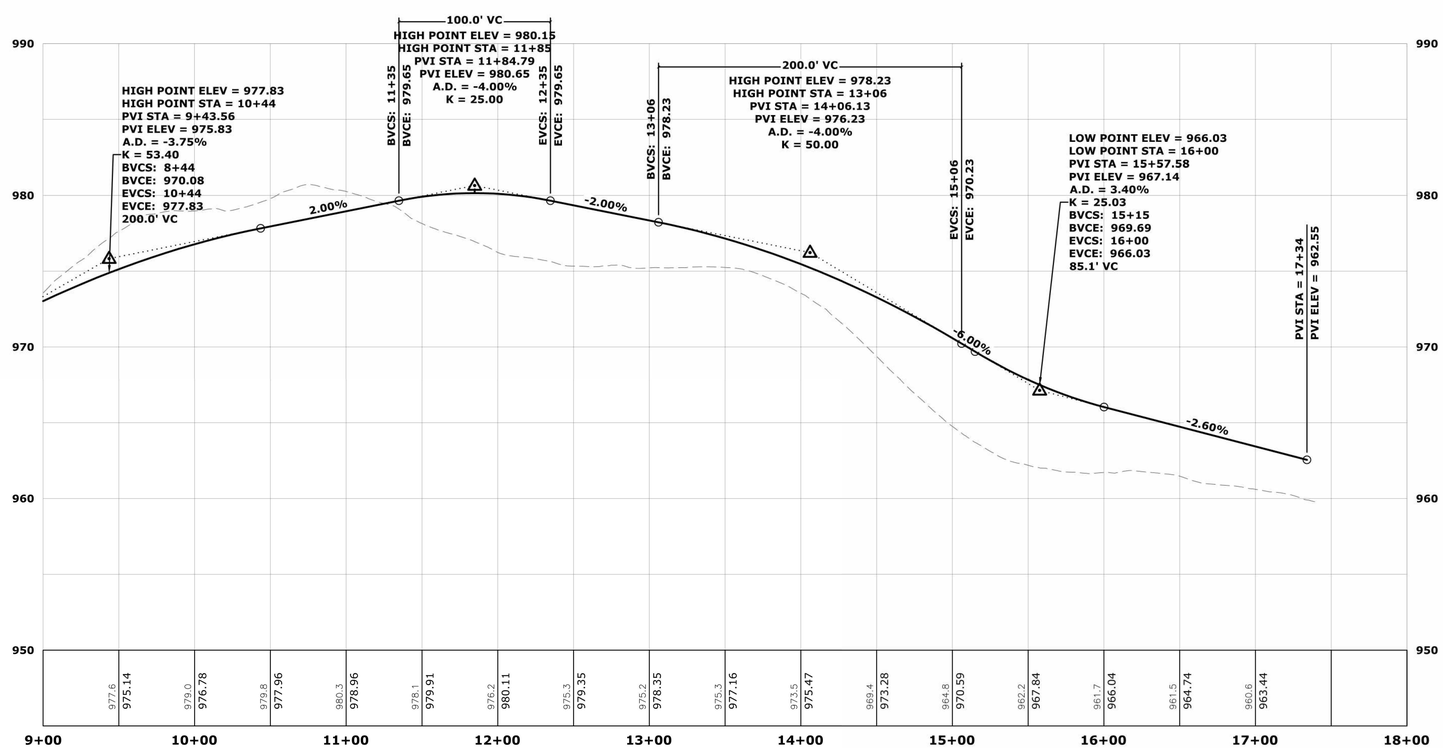
PRAIRIE POINT CT PLAN & PROFILE

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
PP1.1





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PRAIRIE POINT CT PLAN & PROFILE

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO. 5470-18A

SHEET PP1.2

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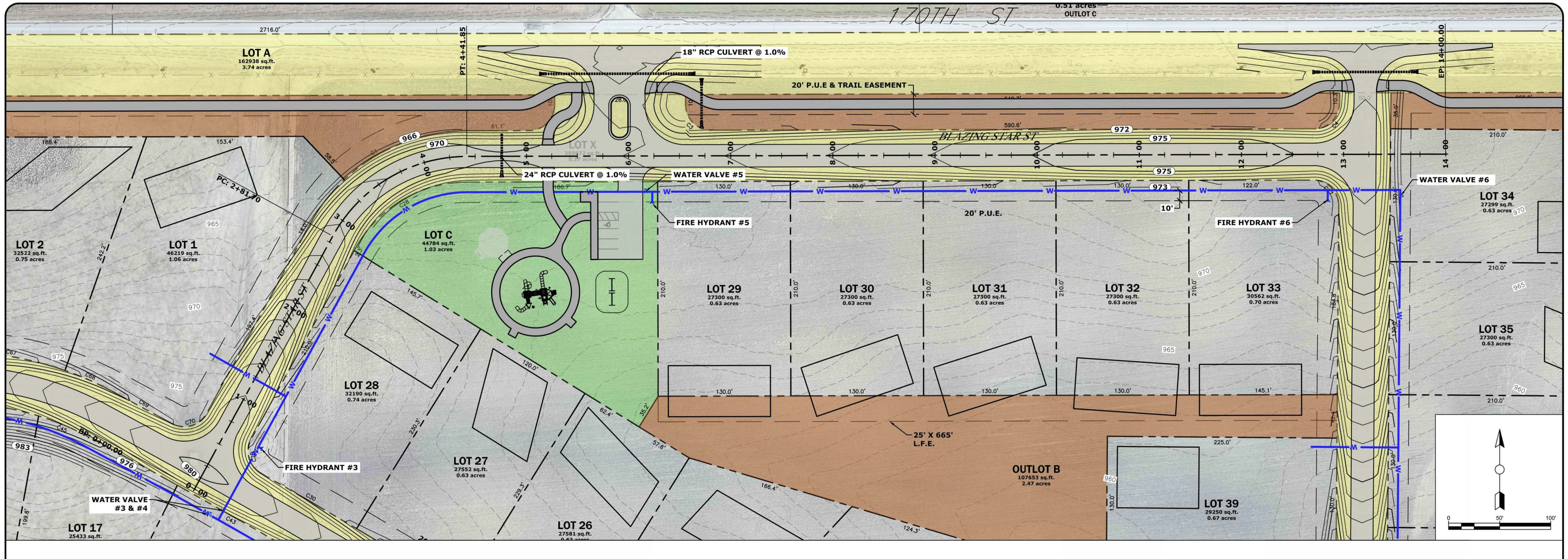

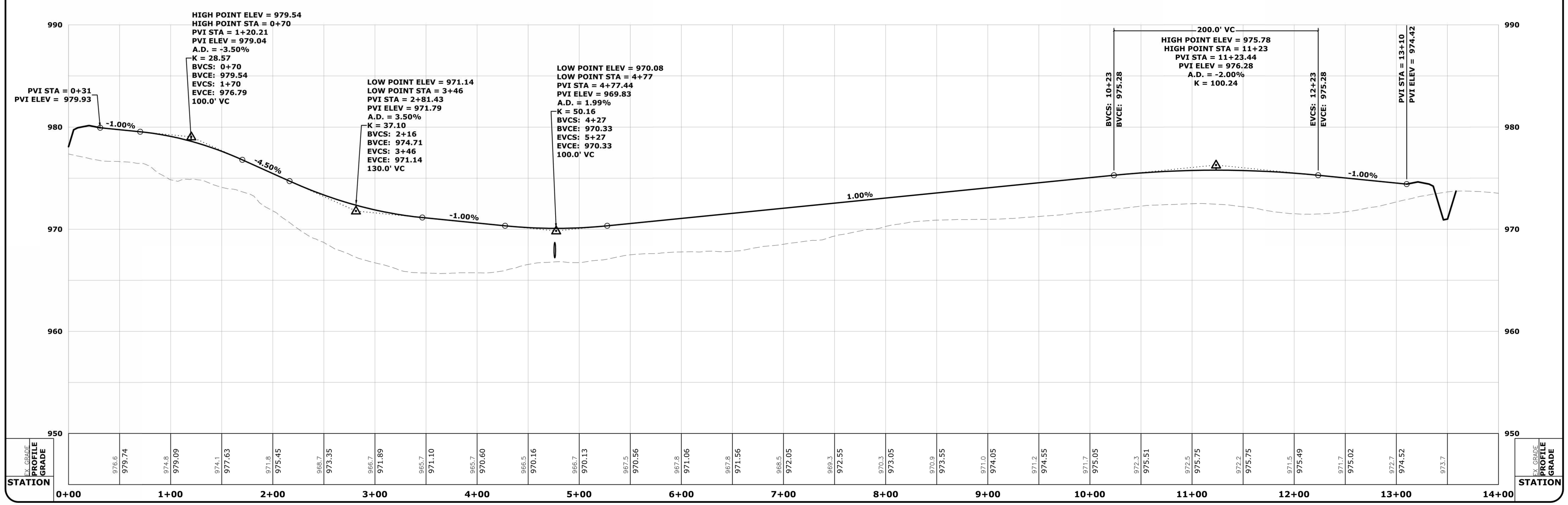

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04/20	JMG
04/20	SRS

DESIGNED:
DRAWN:
CHECKED:
LAST UPDATE: 04/23/20

REVISION

DATE

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BLAZING STAR ST PLAN & PROFILE

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
PP1.3

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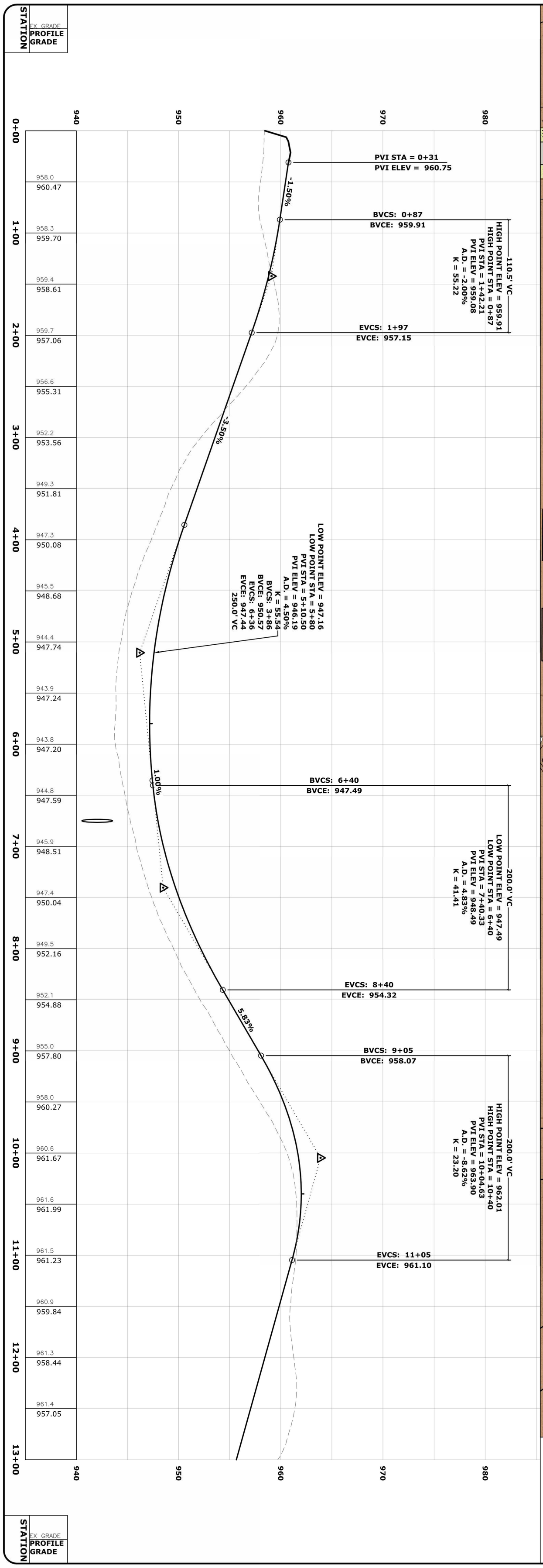

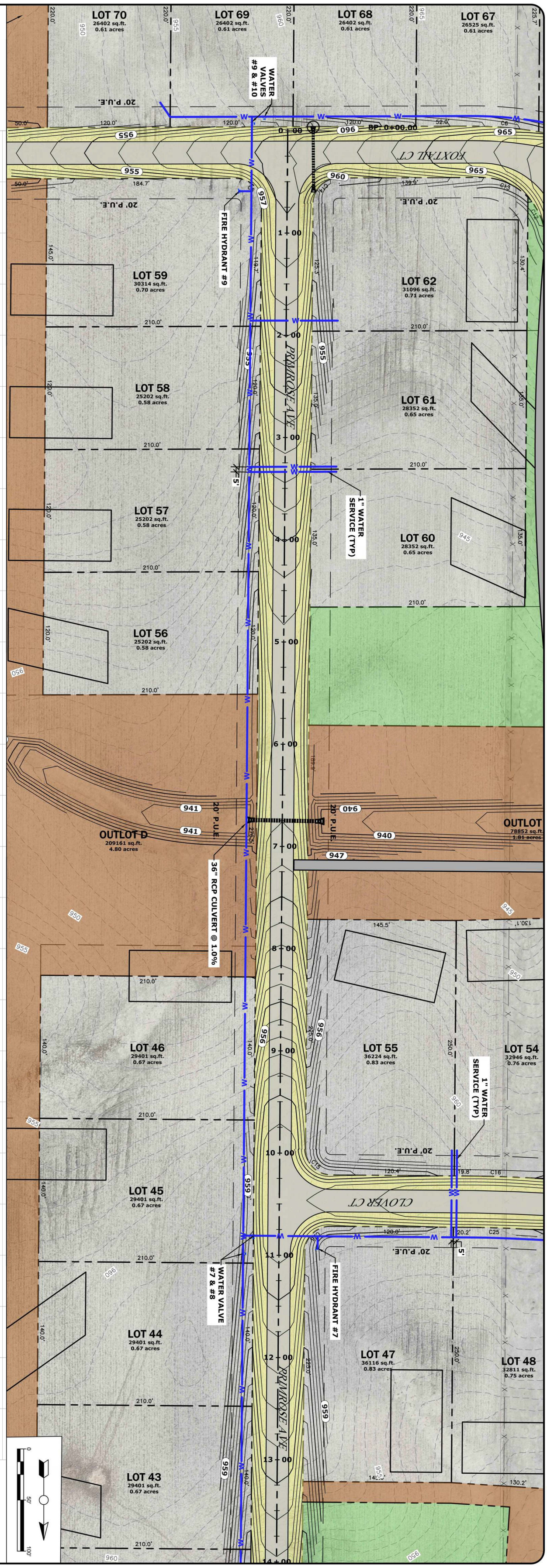

PROJECT NO.	SHEET
5470-18A	PP1.4

PRIMROSE AVE PLAN & PROFILE
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

FOX engineering
FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

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		DRAWN:	SRS	04/20
		CHECKED:		
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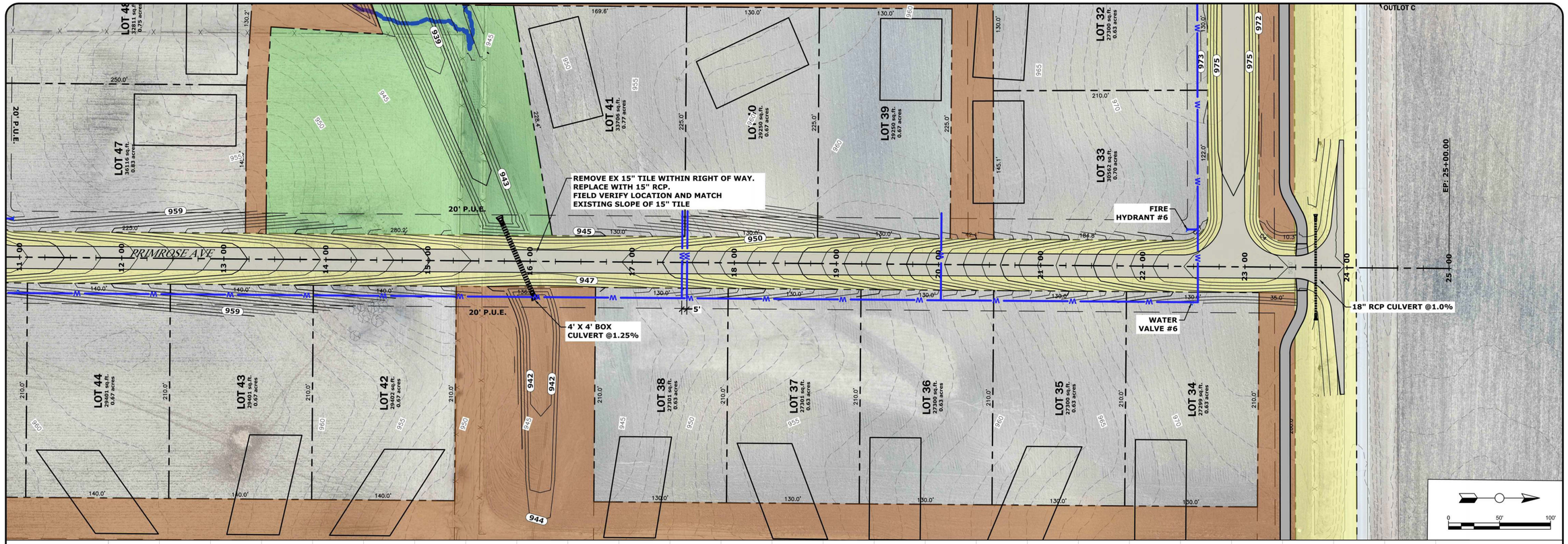

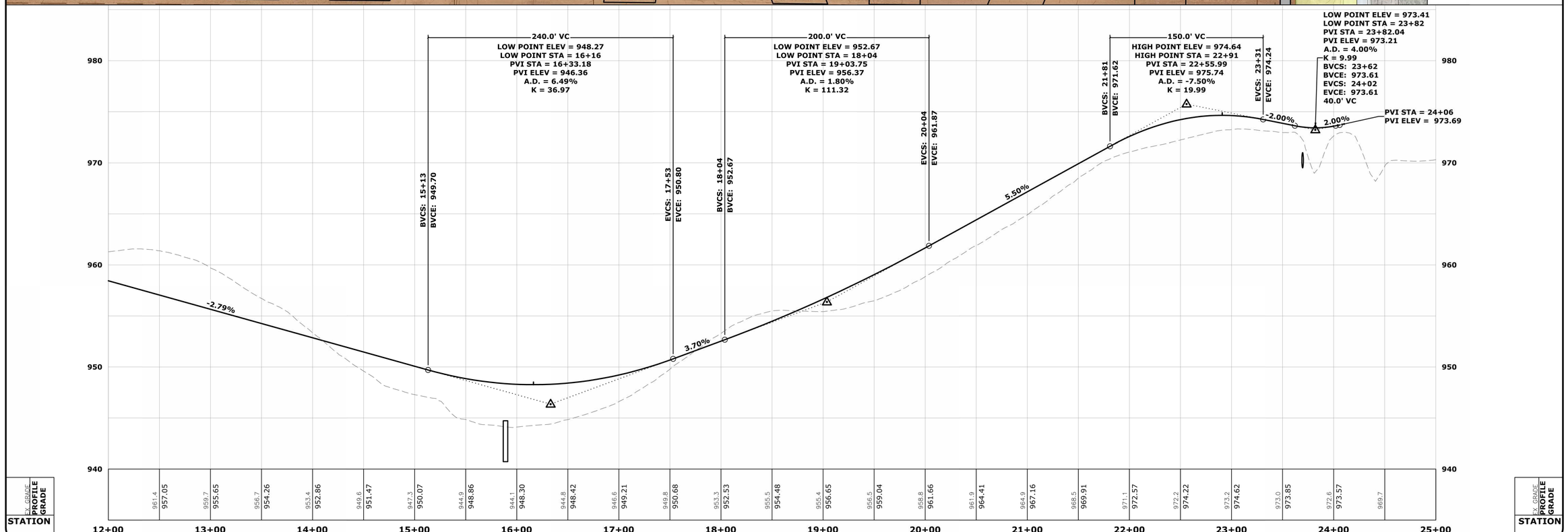

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PRIMROSE AVE PLAN & PROFILE

PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

PROJECT NO.
5470-18A

SHEET
PP1.5

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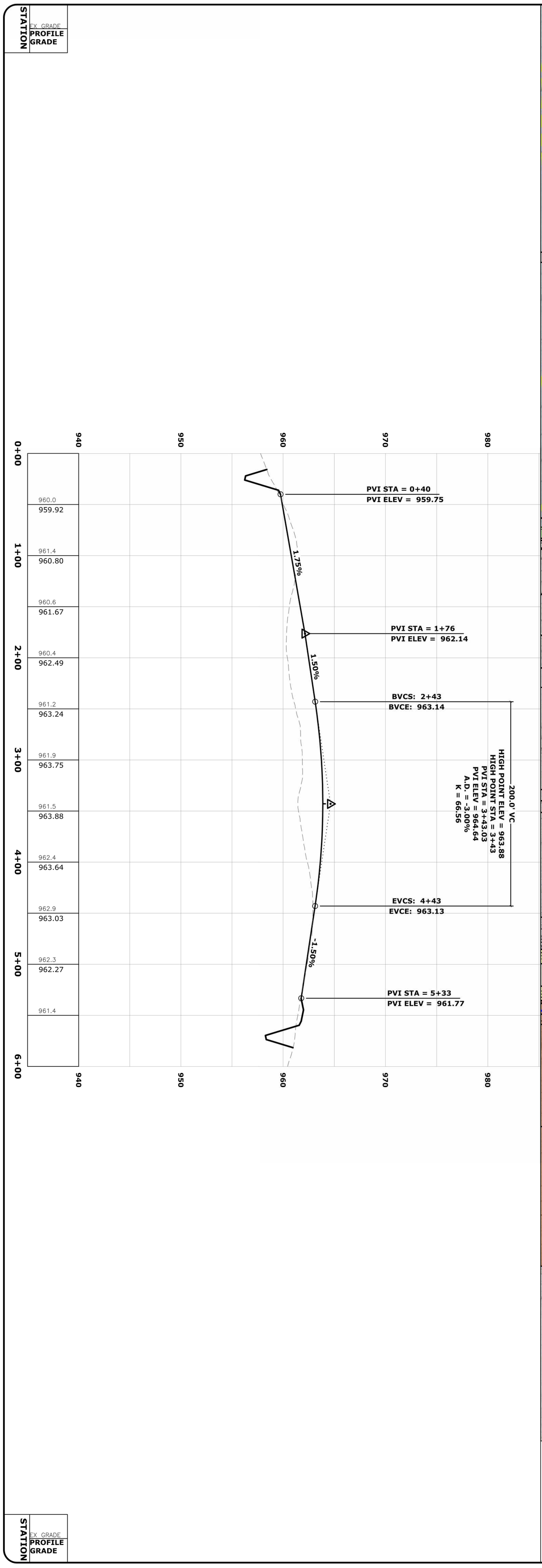

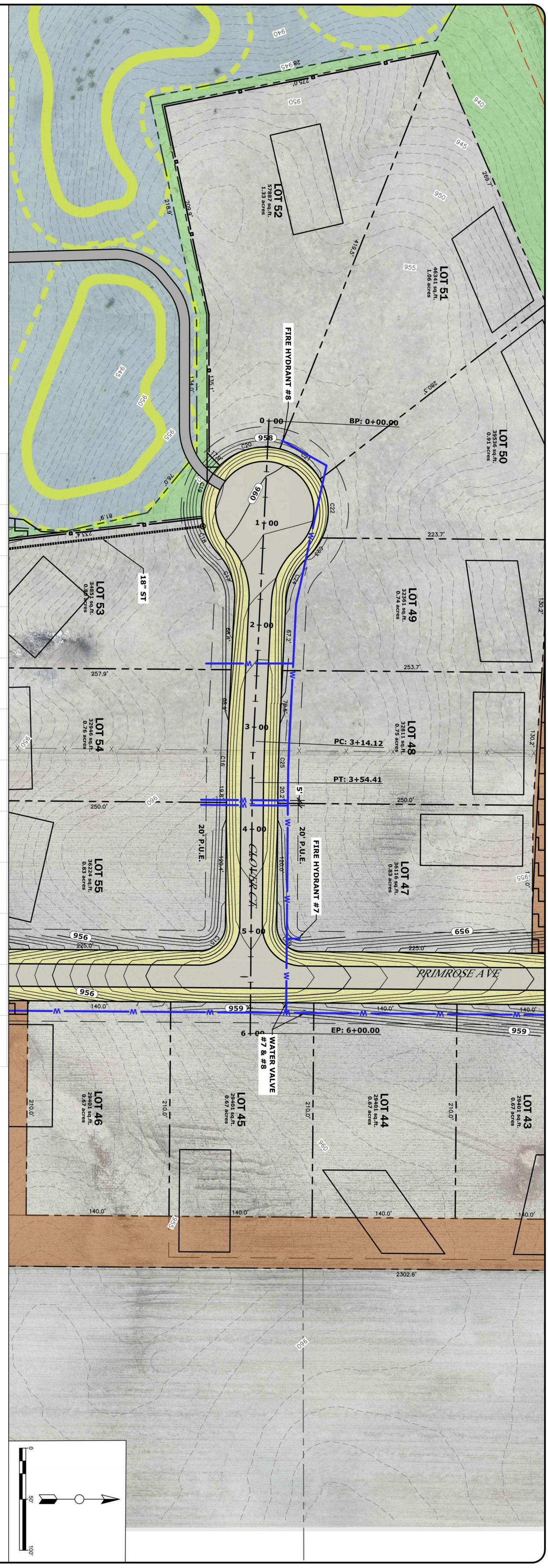

STATION	EX GRADE	PROFILE GRADE

PROJECT NO.	SHEET
5470-18A	PP1.6

CLOVER CT PLAN & PROFILE
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

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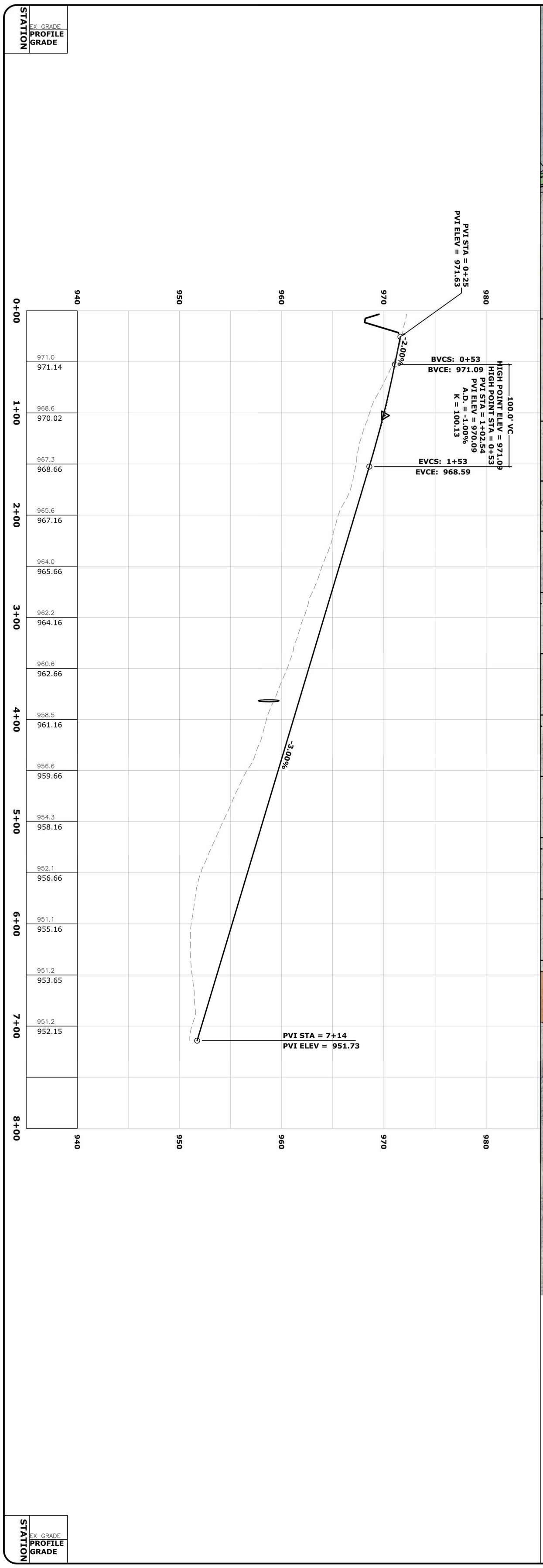

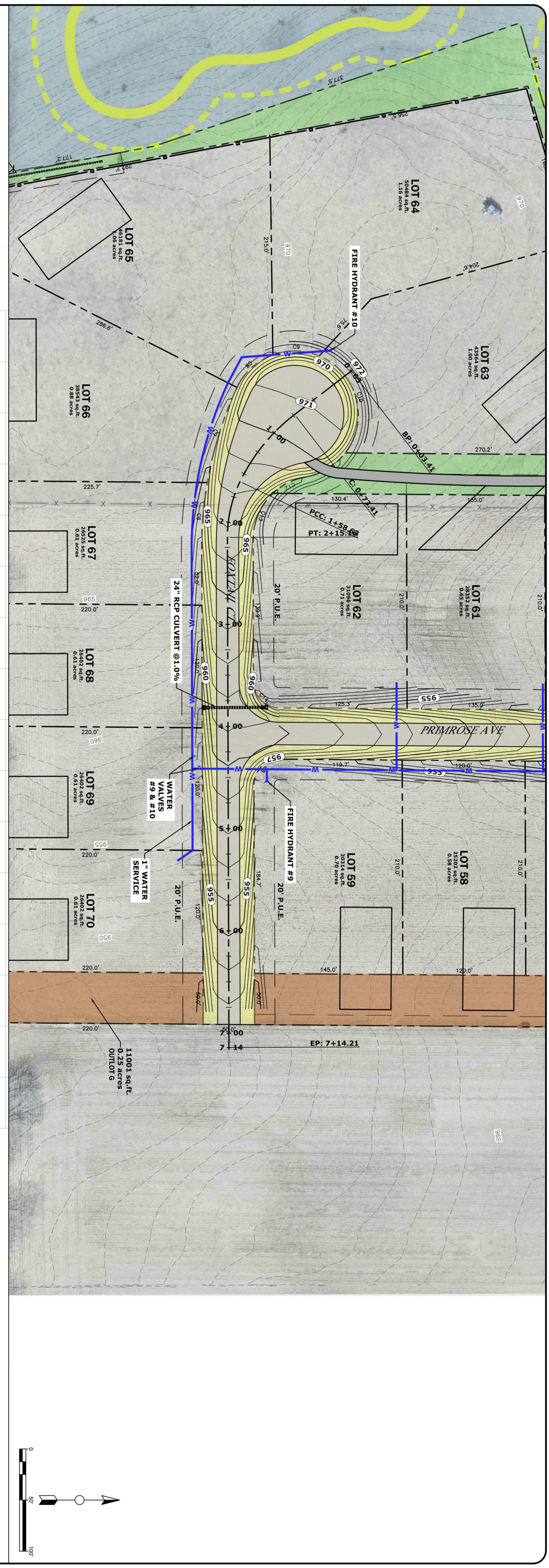

FOXTAIL CT PLAN & PROFILE
PRAIRIE VALLEY - MAJOR SUBDIVISION
PRELIMINARY PLAT
SE CORRNER OF 500TH AVE & 170TH ST
STORY COUNTY, IOWA

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
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FAX: (515) 233-0103

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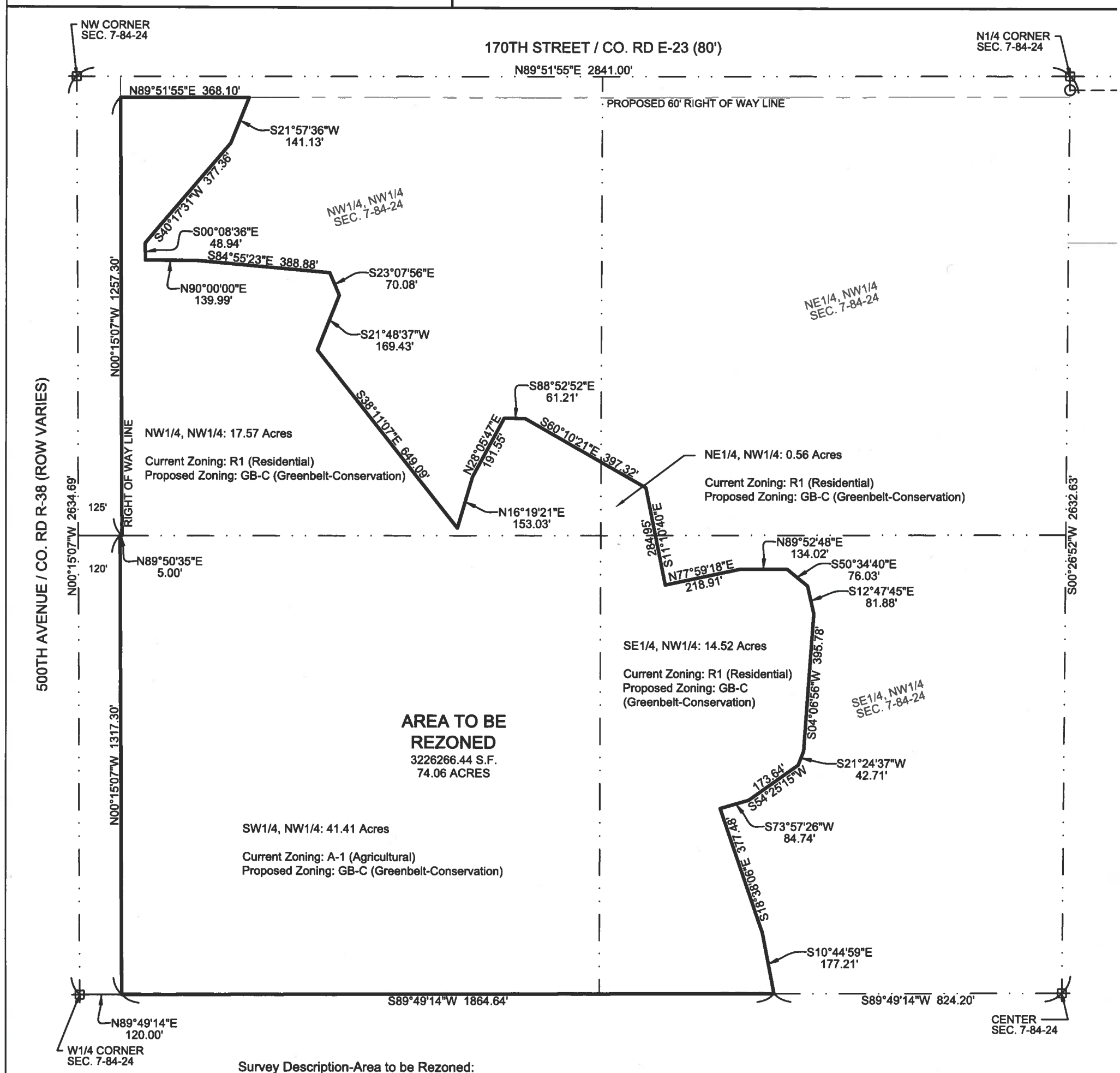
		DESIGNED:	JMG	04/20
		DRAWN:	SRS	04/20
		CHECKED:		
		LAST UPDATE: 04/23/20		

PROJECT NO. 5470-18A
SHEET PP1.7

REZONING PLAT

LOCATION:	IN THE NW1/4 OF SECTION 7-84-24, STORY COUNTY, IOWA
PROPRIETOR:	QUARRY ESTATES, LLC
REQUESTED BY:	JOHN GADE, FOX ENGINEERING
SURVEYOR:	R. BRADLEY STUMBO, PLS #17161 FOX ENGINEERING ASSOCIATES, INC. AMES, IA 50010 515-233-0000



Survey Description-Area to be Rezoned:
A part of the Northwest Quarter of Section 7, Township 84 North, Range 24 West of the 5th P.M., Story County, Iowa, being more particularly described as follows: Beginning at the intersection of the south line of said Northwest Quarter with the east right of way line of 500th Avenue; thence following said right of way line N00°15'07"W, 1317.30 feet; thence N89°50'35"E, 5.00 feet; thence N00°15'07"W, 1257.30 feet; thence N89°51'55"E, 368.10 feet, parallel with and 60.00 feet South of the north line of said Section 7; thence S21°57'36"W, 141.13 feet; thence S40°17'31"W, 377.36 feet; thence S00°08'36"E, 48.94 feet; thence N90°00'00"E, 139.99 feet; thence S84°55'23"E, 388.88 feet; thence S23°07'56"E, 70.08 feet; thence S21°48'37"W, 169.43 feet; thence S38°11'07"E, 649.09 feet; thence N16°19'21"E, 153.03 feet; thence N28°05'47"E, 191.55 feet; thence S88°52'52"E, 61.21 feet; thence S60°10'21"E, 397.32 feet; thence S11°10'40"E, 284.95; thence N77°59'18"E, 218.91 feet; thence N89°52'48"E, 134.02 feet; thence S50°34'40"E, 76.03 feet; thence S12°47'45"E, 81.88 feet; thence S04°06'56"W, 395.78 feet; thence S21°24'37"W, 42.71 feet; thence S54°25'15"W, 173.64 feet; thence S73°57'26"W, 84.74 feet; thence S18°38'06"E, 377.48 feet; thence S10°44'59"E, 177.21 feet to the south line of said Northwest Quarter; thence S89°49'14"W, 1864.64 feet to the point of beginning, containing 74.06 acres.

FOX engineering

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I hereby certify that this land surveying document was prepared 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.

R. Bradley Stumbo 3/04/2020

R. BRADLEY STUMBO, PLS — DATE
License number 17161
My license renewal date is December 31, 2021.

R. BRADLEY STUMBO LICENSED 17161 IOWA PROFESSIONAL LAND SURVEYOR

JOB# 5470-18A DATE: 3/04/20 PAGE 1 OF 1

Traffic Impact Study

Final Report

Dotson Farms Development

Story County, Iowa

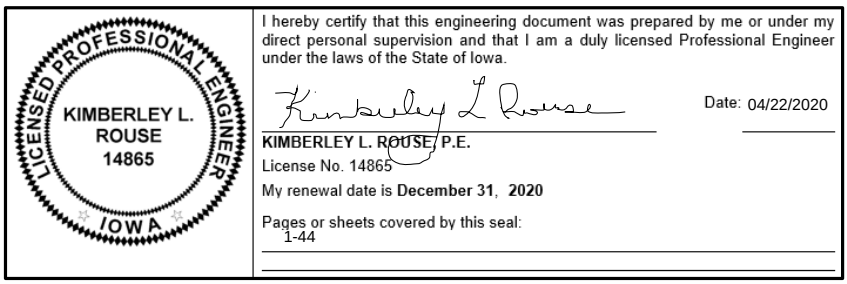
April 2020

Completed For:

Story County

By:

Kimberley L. Rouse Engineering



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Introduction

The purpose of this traffic study is to identify and evaluate the impacts that the Dotson Farms Development will have on 170th Street in Story County.

Analysis of Existing Conditions

The site for the proposed Dotson Farms development is approximately 1.5 miles west of the City of Gilbert and 1.0 mile west of Hwy 69. See **Figure 1**, for site location.

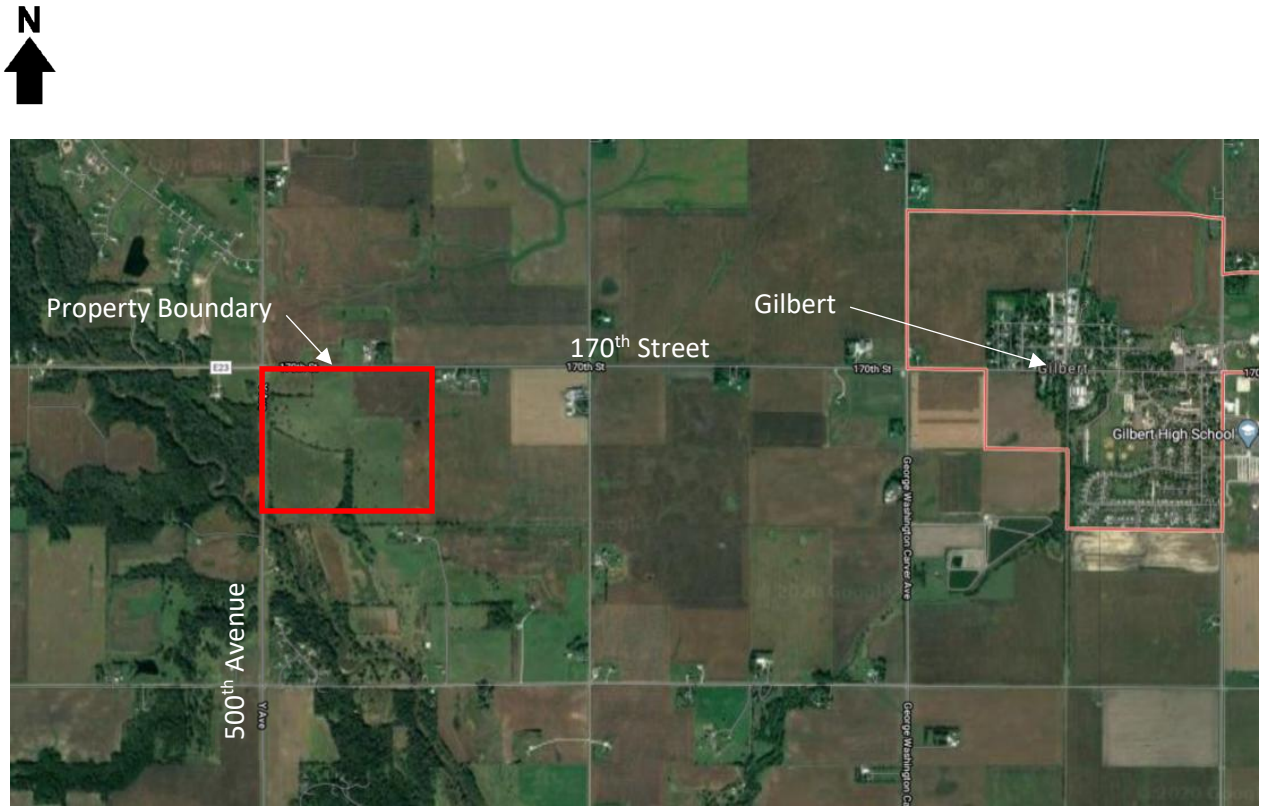


Figure 1 – Site Location

Traffic Data

Manual traffic counts were performed during the hours of 7:00-9:00 am and 4:00-6:00 pm at the intersection of 500th Avenue and 170th Street. Approximately 1.5% of traffic during the peak hours was truck traffic. **Figures 2 and 3** show the 2020 peak hour traffic volumes at both intersections. Story County traffic maps show that the 2015 ADT for the area near the site is 1,150 vehicles per day. According to population and growth statistics for this area, the growth rate for the area is approximately 1.25% per year.

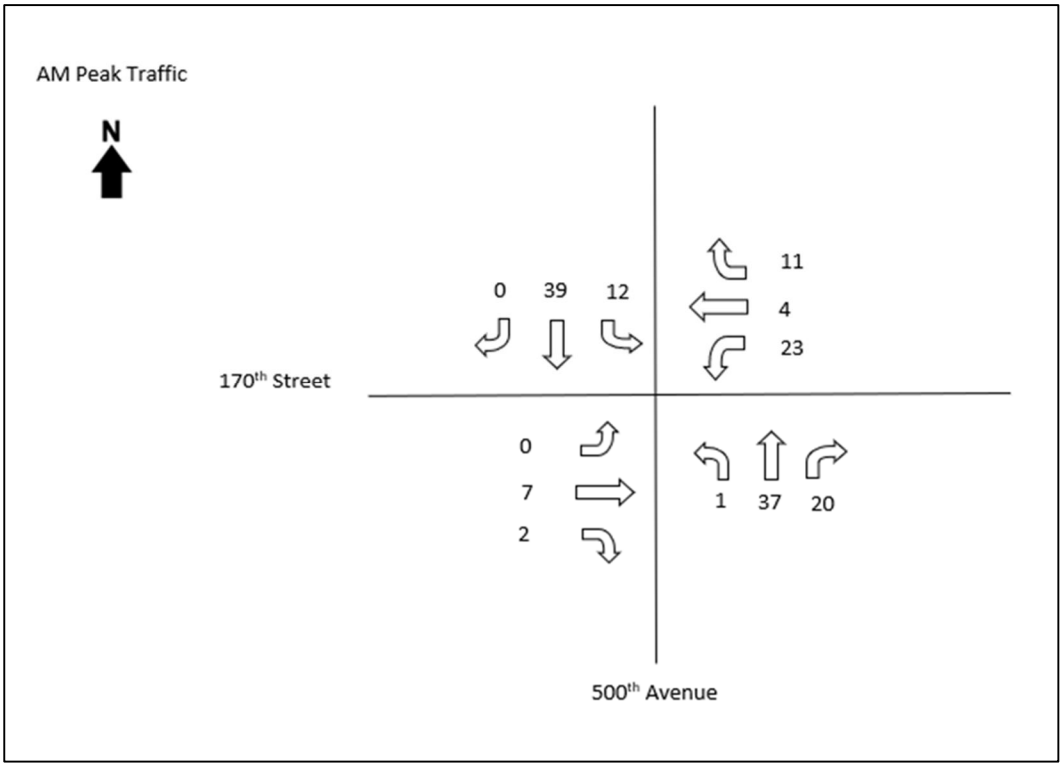


Figure 2 – AM Peak 2020 (7:30-8:30 AM)

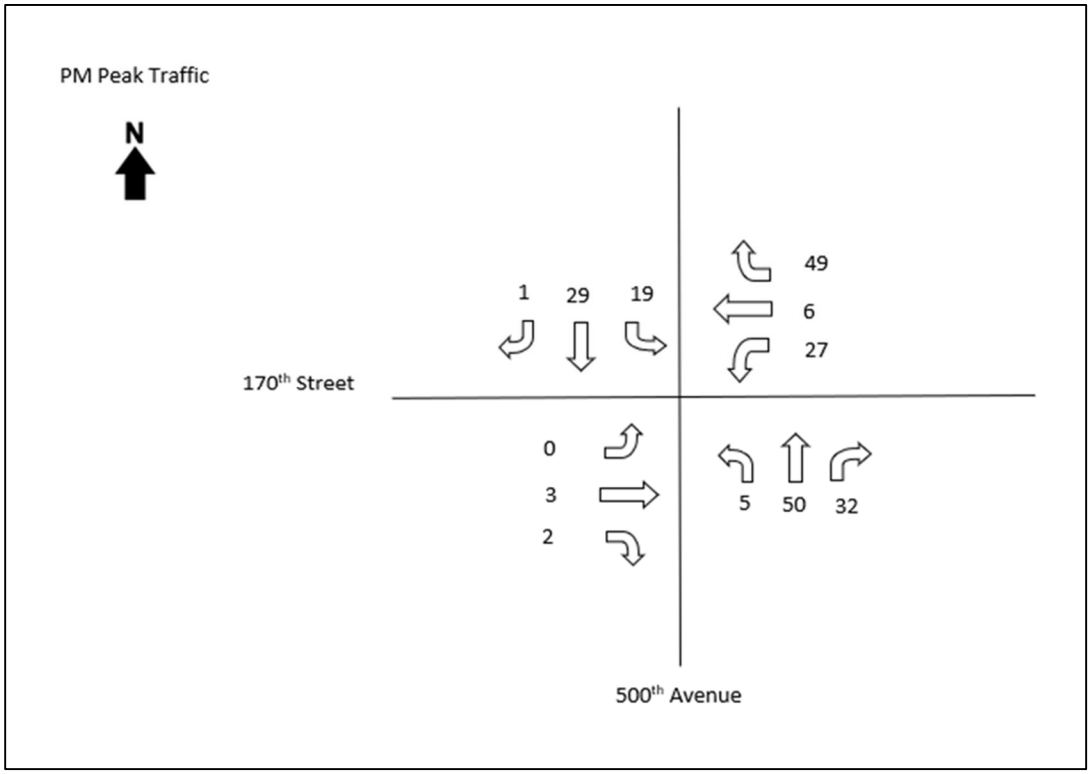


Figure 3 – PM Peak 2020 (4:45-5:45 PM)

Proposed Development

The proposed Dotson Farms development at full build-out will consist of 70 single family lots. **Figure 4** shows the site plan for the development at full build-out. The Dotson Farms development will be constructed in four phases. Phase 1 will develop lots 1-28, phase 2 lots 29-41, phase 3 lots 42-55 and phase 4 lots 56-70. A full-size sheet of the development layout can be found in the Appendix.

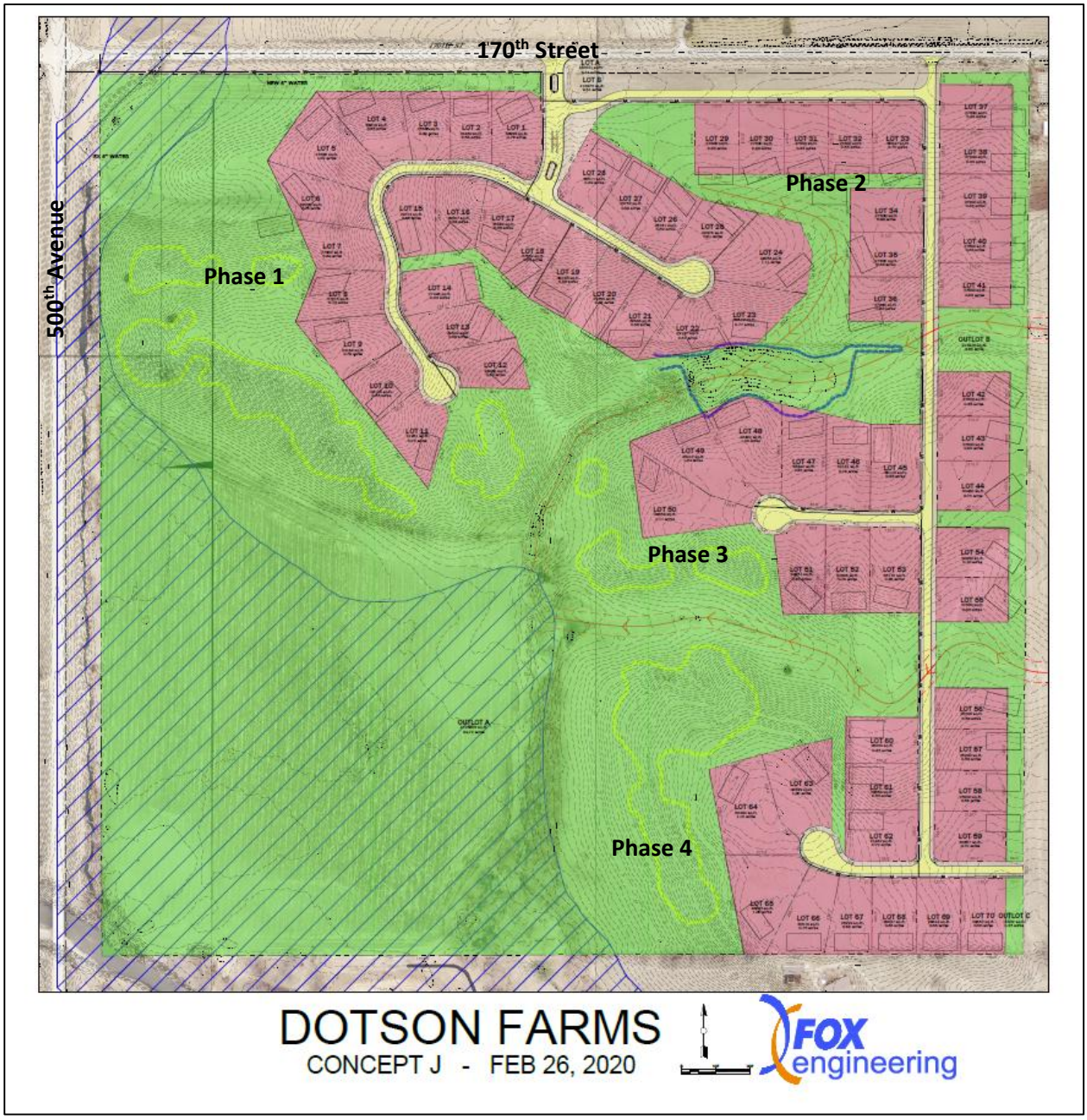


Figure 4 – Site Plan

Trip Generation

Trip generation rates recommended in the *Institute of Transportation Engineers' (ITE) Trip Generation, 10th Edition*, were used to develop estimates of trips to and from the site based on the proposed land uses. **Table 1** shows the daily, AM peak hour, and PM peak hour trip generation for the proposed land use for each phase.

Table 1 – Trip Generation

Trip Generaion									
Land Use Code		Use	Total SF/Units/	Factor	Percent	Entering	Percent	Exit	Pass By
				Daily					
210	Phase 1 - Lots 1-28	Single Family Residential	28.00	9.44	50%	132	50%	132	
210	Phase 2 - Lots 29-41	Single Family Residential	13.00	9.44	50%	61	50%	61	
210	Phase 3 - Lots 42-55	Single Family Residential	14.00	9.44	50%	66	50%	66	
210	Phase 4 - Lots 56-70	Single Family Residential	15.00	9.44	50%	71	50%	71	
						330		330	
				AM					
210	Phase 1 - Lots 1-28	Single Family Residential	28.00	0.74	25%	5	75%	16	
210	Phase 2 - Lots 29-41	Single Family Residential	13.00	0.74	25%	2	75%	7	
210	Phase 3 - Lots 42-55	Single Family Residential	14.00	0.74	25%	3	75%	8	
210	Phase 4 - Lots 56-70	Single Family Residential	15.00	0.74	25%	3	75%	8	
						13		39	
				PM					
210	Phase 1 - Lots 1-28	Single Family Residential	28.00	0.99	63%	17	37%	10	
210	Phase 2 - Lots 29-41	Single Family Residential	13.00	0.99	63%	8	37%	5	
210	Phase 3 - Lots 42-55	Single Family Residential	14.00	0.99	63%	9	37%	5	
210	Phase 4 - Lots 56-70	Single Family Residential	15.00	0.99	63%	9	37%	5	
						44		26	

Trip Distribution and Assignments

Based on the trip generation of the proposed land uses, the trip ends were assigned to the entrances/exits of the site. Assignments were based on assumed travel behaviors, location of trip destinations, and accessibility from/to various routes considering normal overall travel patterns.

Using the existing split of traffic on 170th Street, it is estimated that during the AM peak 50% of the trips will travel westbound and 50% eastbound. During the PM peak 60% of the trips will travel westbound and 40% eastbound. It is assumed that phase 1 will be fully developed in 5 years (2025), phase 2 in 7 years (2027), phase 3 in 9 years (2029) and phase 4 in 12 years (2032). Because the PM peak is the worst-case scenario for existing traffic and trip generation**, figures 5-8** show a breakdown of trip assignments for each phase. **Figure 9** shows the trip assignments for the AM peak at full build-out.

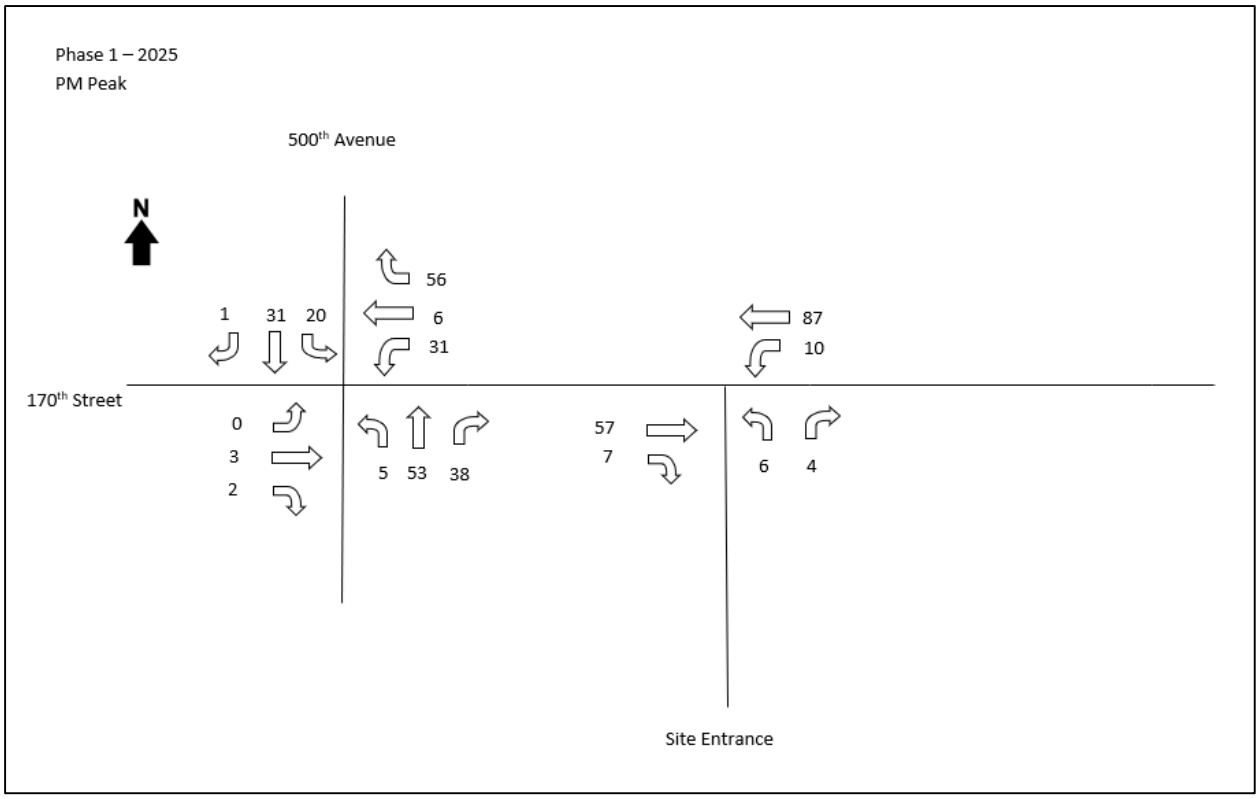


Figure 5 – PM Peak - Phase 1 - 2025

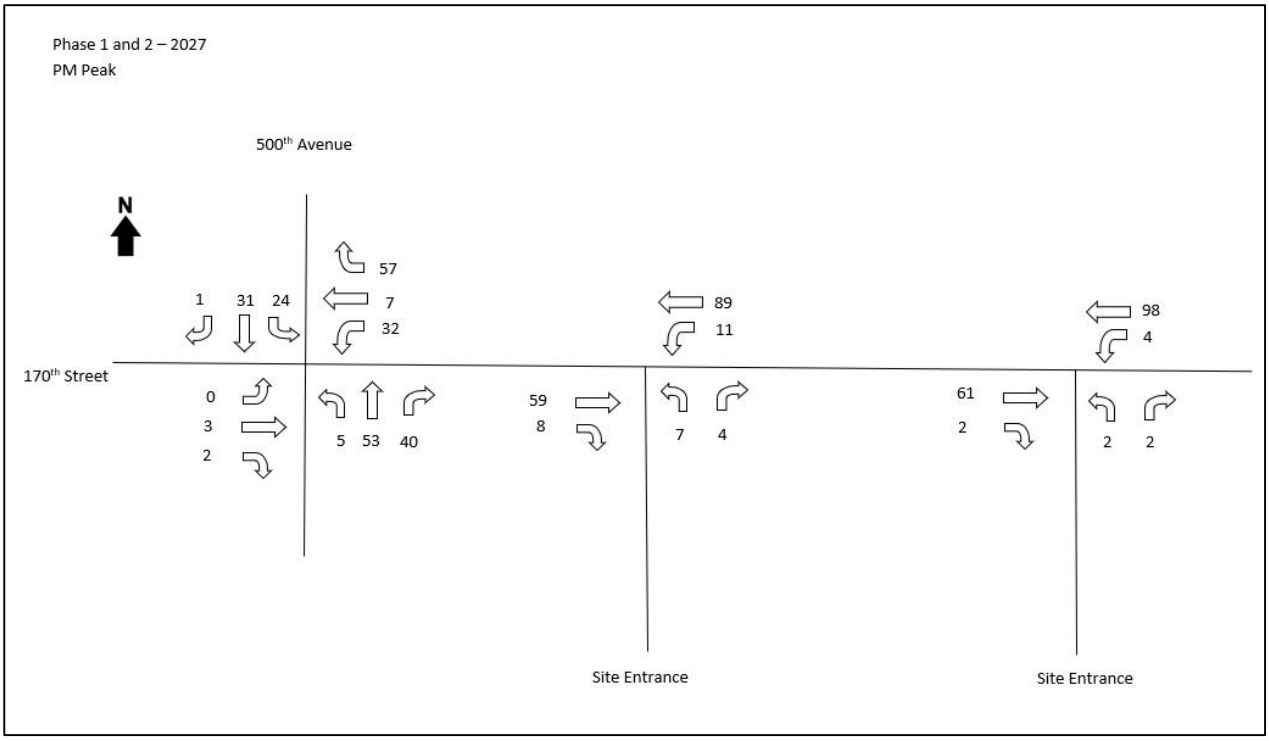


Figure 6 – PM Peak - Phase 1 and 2 - 2027

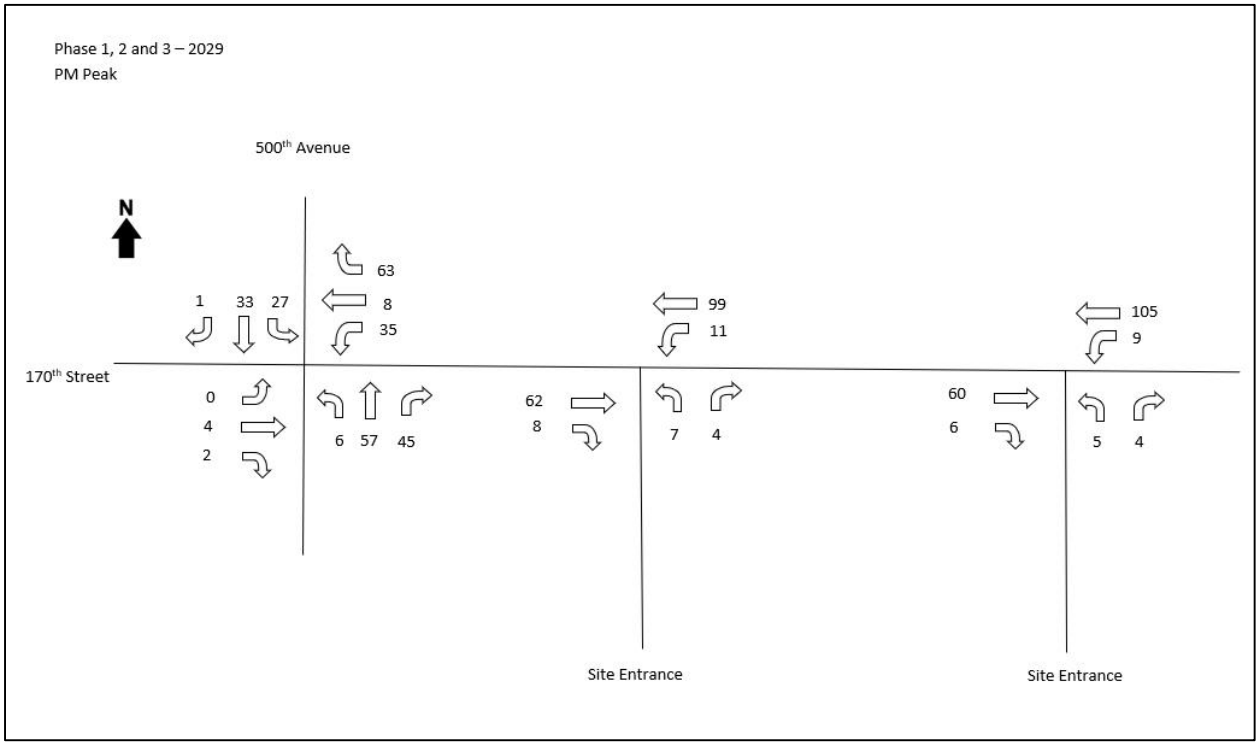


Figure 7 – PM Peak - Phase 1, 2, and 3 – 2029

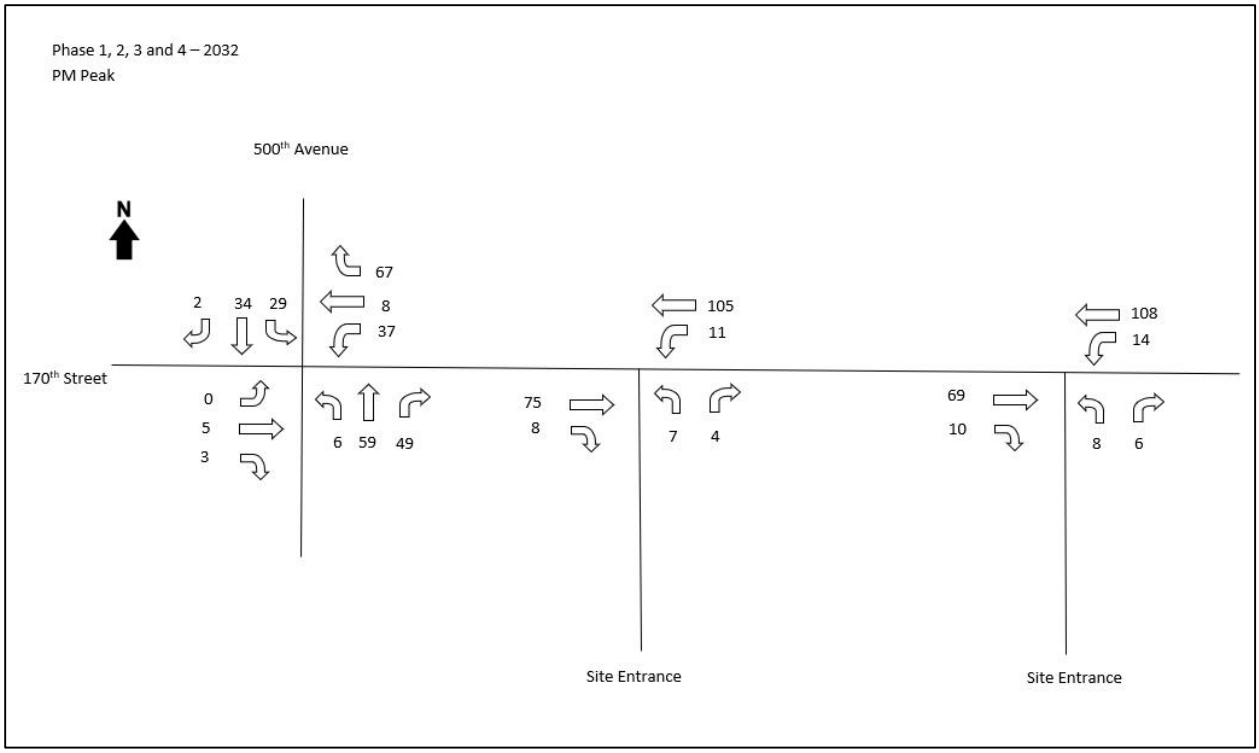


Figure 8 – PM Peak - Phase 1, 2, 3, and 4 - 2032

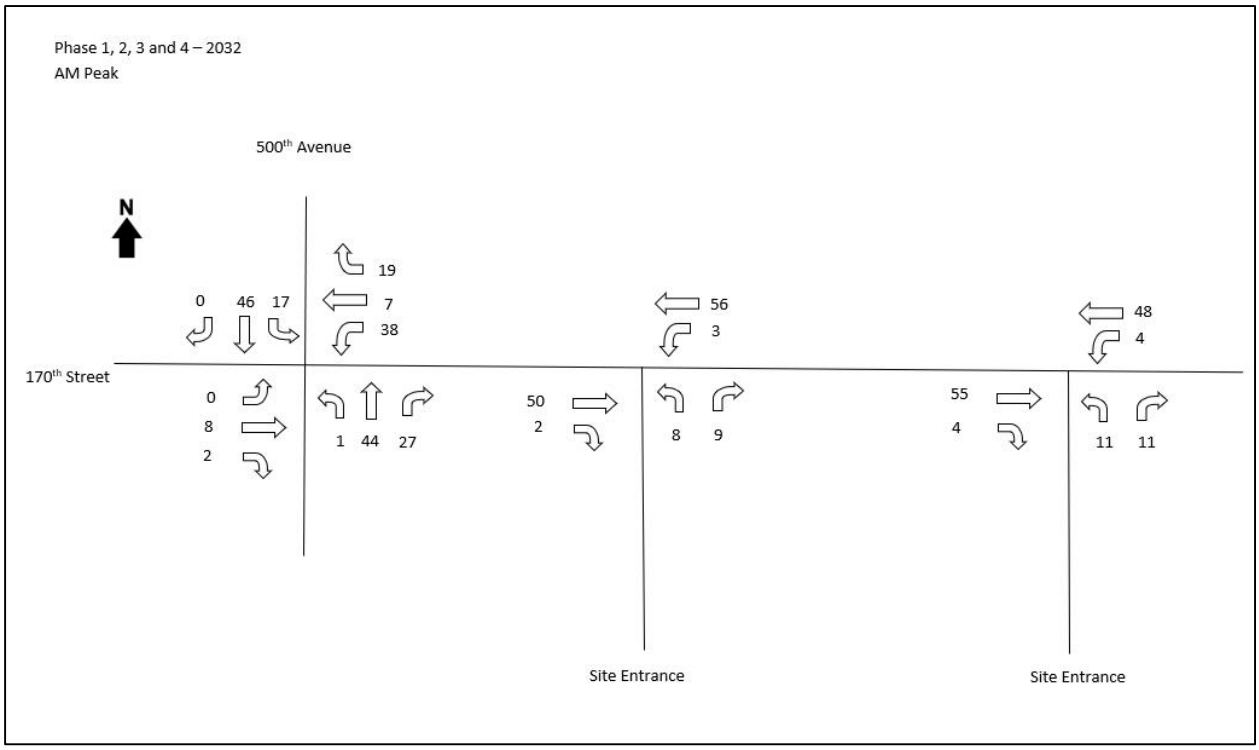


Figure 9 – AM Peak - Phase 1, 2, 3, and 4 – 2032

Turn Lane Warrants

"NCHRP Report 457: Evaluating Intersection Improvements: An Engineering Study Guide" was used to evaluate the need for right turning bays at the two entrances into the site and 170th Street. The PM peak was evaluated because it was the worst-case scenario for the intersections. Because there was very little change in volumes only phase 1 and full-build out were evaluated for right turn bays on 500th Avenue. **Figures 10 and 11** show that right-turn lanes are likely not warranted at 500th Avenue after development. However, due to the fact that right-turn lanes are within one vehicle of being warranted, the intersection should be watched to determine if a right-turn lane may be warranted as the site reaches full build-out. **Figures 12 and 13** show that no right turn lane is warranted on 170th Street at either of the entrances at full build-out of the site. **Figures 14 and 15** show that by the end of phase 2 of development a right turn lane will likely be warranted on 170th Street at 500th Avenue.

Left-turn lanes were evaluated for the 500th Avenue and 170th Street intersection as well as the two entrances into the site. **Figures 16 and 17** show that a left-turn lane would likely not be warranted on 500th Avenue after full build out of the site. **Figures 18-20** show that a left-turn lane would likely not be warranted on 170th Street after full build out of the site at either of the two entrances into the site or at 500th Avenue.

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	96
Right-turn volume, veh/h:	38

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	57
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

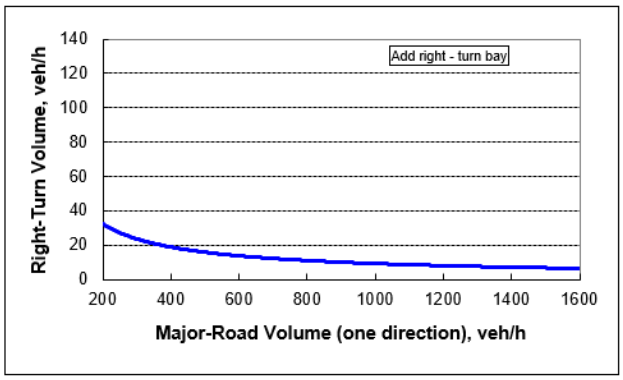


Figure 10 – Guideline for Determining the Need for a Major Road Right Turn Bay – Northbound – Phase 1 – PM Peak – 500th Avenue

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	114
Right-turn volume, veh/h:	49

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	50
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

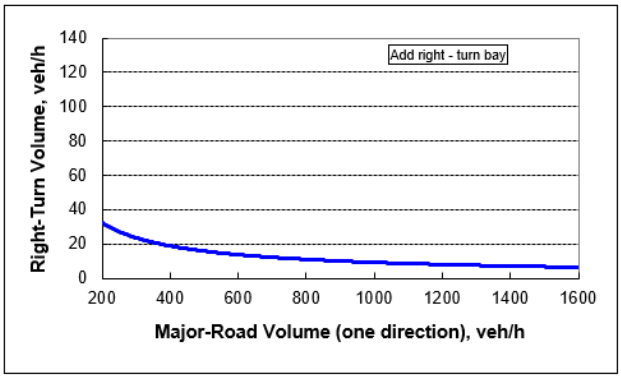


Figure 11 – Guideline for Determining the Need for a Major Road Right Turn Bay – Northbound – Full build-out – PM Peak – 500th Avenue

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	83
Right-turn volume, veh/h:	8

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	64
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

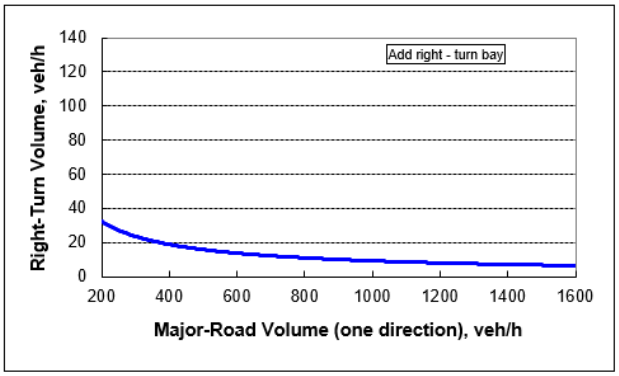


Figure 12 – Guideline for Determining the Need for a Major Road Right Turn Bay – Northbound – Full build-out – PM Peak – West Entrance

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	79
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	66
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

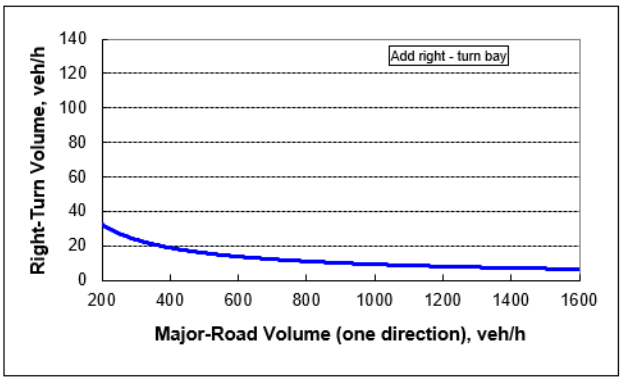


Figure 13– Guideline for Determining the Need for a Major Road Right Turn Bay – Northbound – Full build-out – PM Peak – East Entrance

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	93
Right-turn volume, veh/h:	56

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	58
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

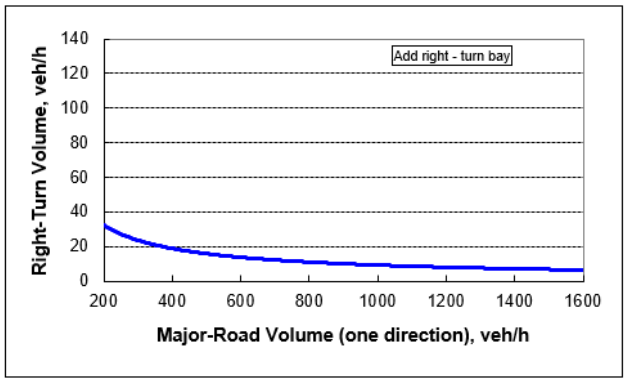


Figure 14– Guideline for Determining the Need for a Major Road Right Turn Bay – Westbound – Phase 1 – PM Peak – 170th Street

INPUT

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	55
Major-road volume (one direction), veh/h:	96
Right-turn volume, veh/h:	57

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	57
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

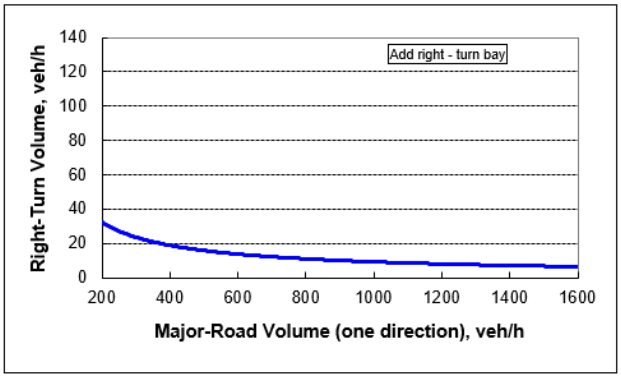


Figure 15– Guideline for Determining the Need for a Major Road Right Turn Bay – Westbound – Phase 1 and 2 – PM Peak – 170th Street

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	39%
Advancing volume (V_A), veh/h:	53
Opposing volume (V_O), veh/h:	51

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	265
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

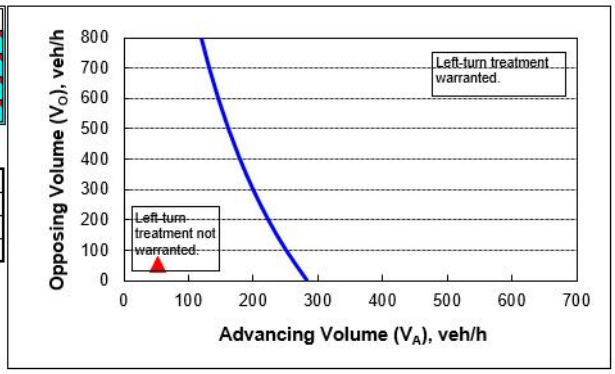


Figure 16 – Guideline for Determining the Need for a Major Road Left Turn Bay – Southbound-Phase 1 – PM Peak - 500th Avenue

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	45%
Advancing volume (V_A), veh/h:	65
Opposing volume (V_O), veh/h:	59

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	257
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

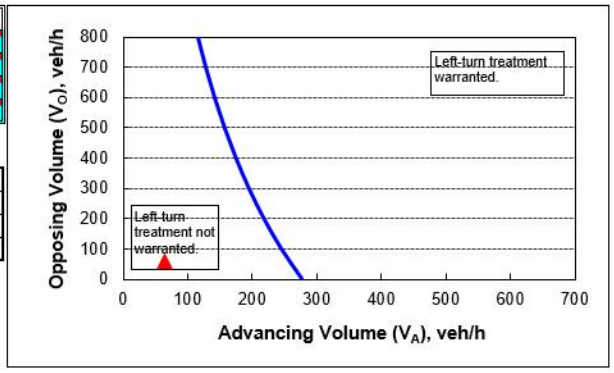


Figure 17 – Guideline for Determining the Need for a Major Road Left Turn Bay – Southbound-Full Build Out – PM Peak - 500th Avenue

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	10%
Advancing volume (V_A), veh/h:	116
Opposing volume (V_O), veh/h:	75

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	419
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

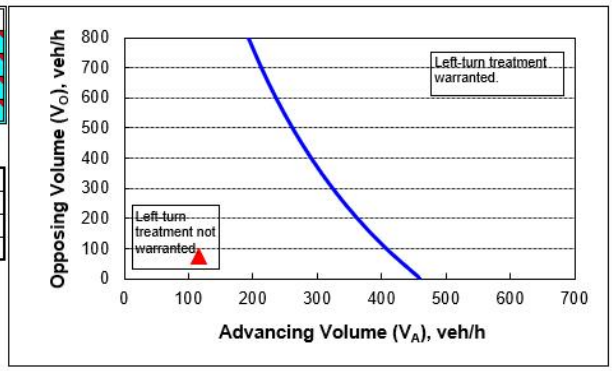


Figure 18 – Guideline for Determining the Need for a Major Road Left Turn Bay – Westbound-Full Build Out – PM Peak – 170th Street – West Entrance

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	122
Opposing volume (V_O), veh/h:	69

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	404
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

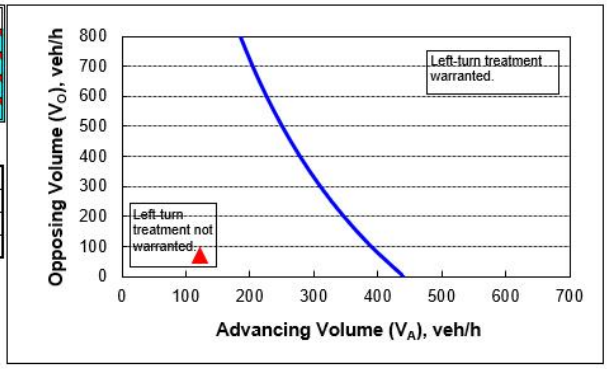


Figure 19 – Guideline for Determining the Need for a Major Road Left Turn Bay – Westbound-Full Build Out – PM Peak – 170th Street – East Entrance

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	55
Percent of left-turns in advancing volume (V_A), %:	33%
Advancing volume (V_A), veh/h:	112
Opposing volume (V_O), veh/h:	5

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	291
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

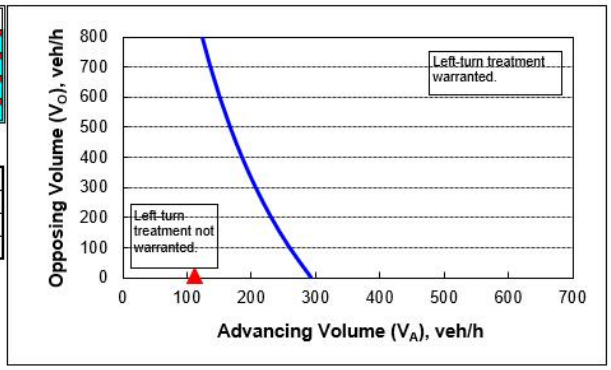


Figure 20 – Guideline for Determining the Need for a Major Road Left Turn Bay – Westbound-Full Build Out – PM Peak – 170th Street

Intersection Analysis

An AM and PM peak traffic analysis was completed using *Synchro and Simtraffic, Version 8*, software and the Highway Capacity Manual 2010 methodology, with the trips from the proposed Dotson Farms development distributed onto the network. The intersections of 500th Avenue, West Entrance, and East Entrance with 170th Street were analyzed for level of service (LOS).

Level of service at intersections is primarily a function of peak hour turning movement volumes, intersection lane configuration, and traffic control. For intersection analysis, the Highway Capacity Manual (HCM) defines LOS in terms of the average control delay at the intersection in seconds per vehicle. The results of an HCM analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative estimate of the operational efficiency or effectiveness of the corridor. Much like an academic report card, LOS A represents the best range of operating conditions (i.e., motorists experiencing little delay or congestion) and LOS F represents the worst (i.e., extreme delay or severe congestion). **Table 2** shows the level of service for all three intersections during the PM peak for the existing traffic and each phase of development. As can be seen in the table, the intersections operate at a level of service A currently and will continue to do so after the development is completed. The roadways also operate at a LOS A for every level of development. **Figure 21** shows the level of service and volumes for the internal streets in the development.

Table 2 – Level of Service

Intersection	Delay (seconds)	Overall	EBLTR	WBLTR	NBL	NBTR	SBL	SBTR
500th Avenue and 170th Street - Existing Counts - AM Peak	4.5	A	A	A	A	A	A	A
500th Avenue and 170th Street - Existing Counts - PM Peak	4.5	A	A	A	A	A	A	A
500th Avenue and 170th Phase 1 - PM Peak	4.6	A	A	A	A	A	A	A
West Entrance and 170th Street - Phase 1 - PM Peak	1.0	A		A	A			
500th Avenue and 170th Phase 1 and 2 - PM Peak	4.7	A	A	A	A	A	A	A
West Entrance and 170th Street - Phase 1 and 2 - PM Peak	1.0	A		A	A			
East Entrance and 170th Street - Phase 1 and 2 - PM Peak	0.4	A		A	A			
500th Avenue and 170th Phase 1, 2 and 3 - PM Peak	4.8	A	A	A	A	A	A	A
West Entrance and 170th Street - Phase 1, 2, and 3 - PM Peak	0.9	A		A	A			
East Entrance and 170th Street - Phase 1, 2, and 3 - PM Peak	0.8	A		A	A			
500th Avenue and 170th Phase 1, 2, 3, and 4 - PM Peak	4.9	A	A	A	A	A	B	A
West Entrance and 170th Street - Phase 1, 2, 3, and 4 - PM Peak	0.9	A		A	A			
East Entrance and 170th Street - Phase 1, 2, 3, and 4 - PM Peak	1.1	A		A	A			
500th Avenue and 170th Phase 1, 2, 3, and 4 - AM Peak	4.1	A	A	A	A	A	A	A
West Entrance and 170th Street - Phase 1, 2, 3, and 4 - AM Peak	1.4	A		A	A			
East Entrance and 170th Street - Phase 1, 2, 3, and 4 - AM Peak	1.7	A		A	A			

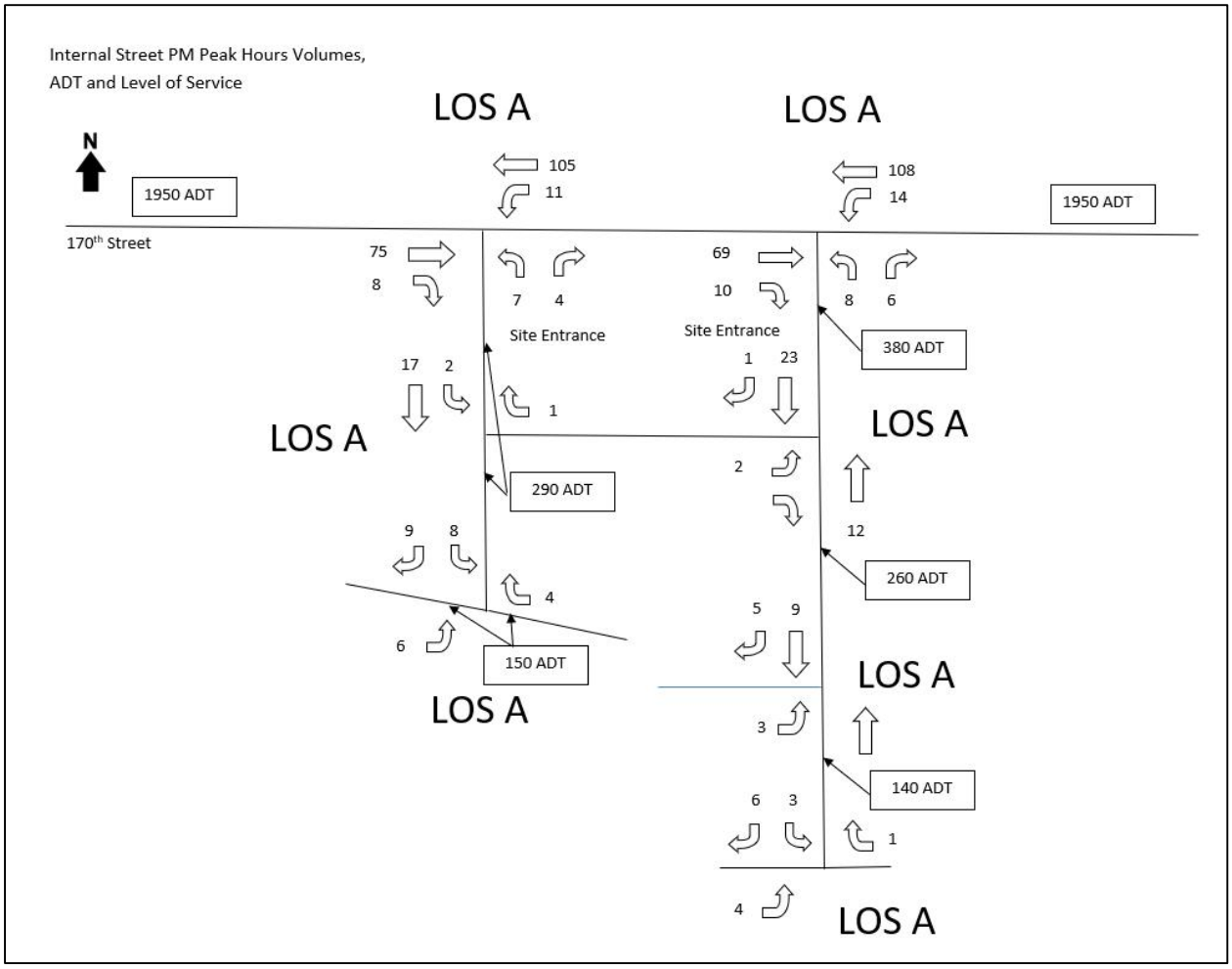


Figure 21 –Internal Street Volumes and Level of Service

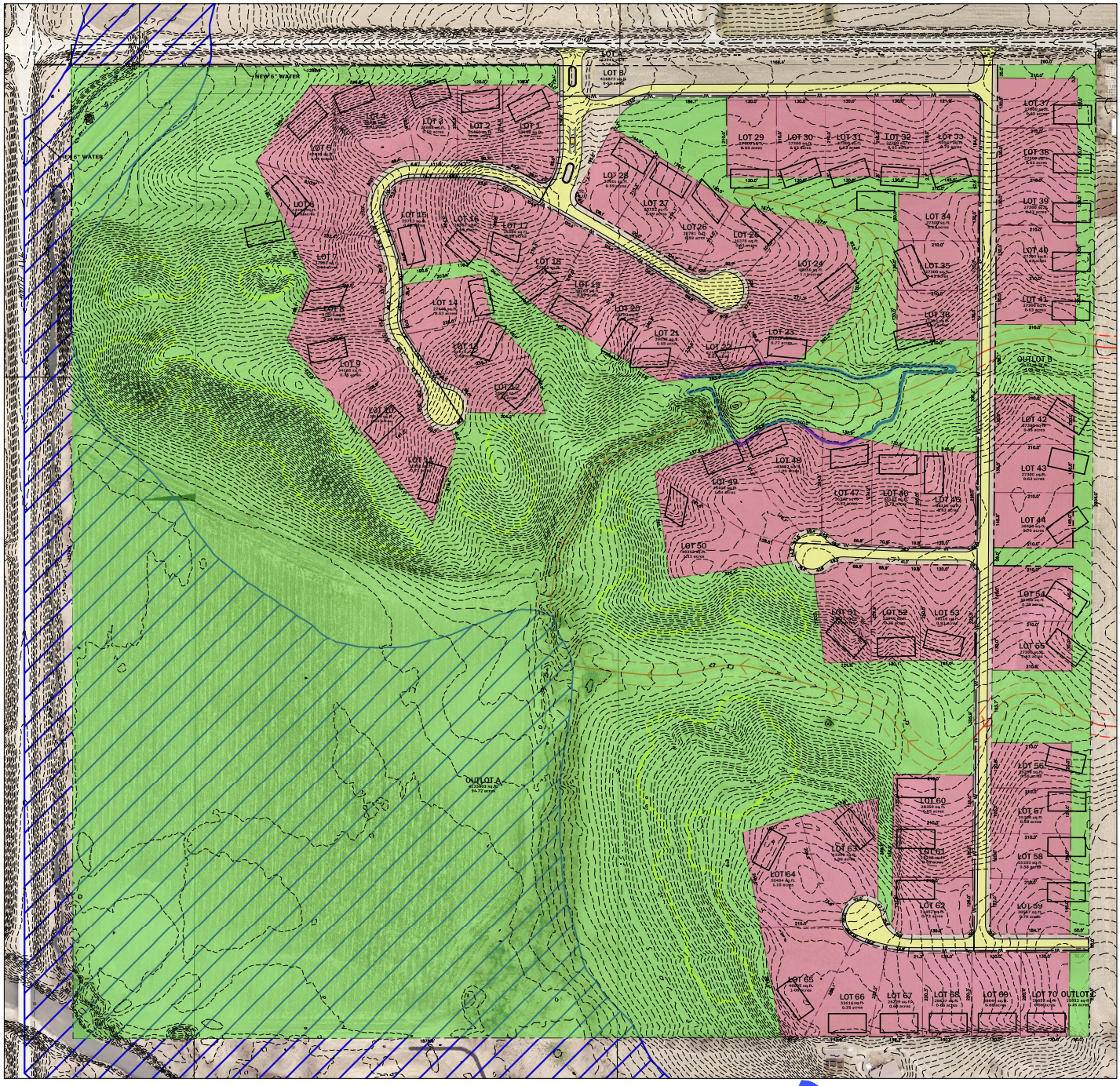
Crash Data

Crash data was evaluated for the years of 2010-2020 along 500th Avenue and 170th Street near the site. There were 12 crashes in those 10 years. Of the 12 crashes, 11 involved an animal and one was considered a run off of the road to the right and hit a traffic sign. According to the Iowa Department of Transportation crash data website, most of those crashes occurred in the years 2016 and 2017 with 3 crashes each per year for a total of six. Seven out of the 12 crashes occurred between the hours of 6:00 and 10:00 PM.

Conclusion and Recommendations

Based on the assumptions stated in the report and resulting analysis there are no improvements warranted at this time. As the site develops a westbound right-turn lane with a minimum storage length of 100' will likely be warranted on 170th after the completion of phase 2. Careful attention should be given to northbound traffic on 500th Avenue as the site fully develops. Analysis shows that a right-turn could possibly be warranted at full-build out.

Appendix



DOTSON FARMS

CONCEPT J - FEB 26, 2020

FOX engineering

Iowa Crash Analysis Tool
Quick Report
2010-2020

Crash Severity	12
Fatal Crash	0
Suspected Serious Injury Crash	0
Suspected Minor Injury Crash	0
Possible/Unknown Injury Crash	1
Property Damage Only	11

Injury Status Summary	1
Fatalities	0
Suspected serious/incapacitating	0
Suspected minor/non-incapacitating	0
Possible (complaint of pain/injury)	1
Unknown	0

Property/Vehicles/Occupants	
Property Damage Total (dollars):	46,700.00
Average (per crash dollars):	3,891.67
Total Vehicles:	12.00
Average (per crash):	1.00
Total Occupants:	14.00
Average (per crash):	1.17

Average Severity	
Fatalities/Fatal Crash:	0.00
Fatalities/Crash:	0.00
Injuries/Crash:	0.08
Major Injuries/Crash:	0.00
Minor Injuries/Crash:	0.00
Possible/Unknown Injuries/Crash:	0.08

Iowa Crash Analysis Tool
Quick Report
2010-2020

Major Cause			**12**
Animal	11	Ran traffic signal	0
Ran stop sign	0	Failed to yield to emergency vehicle	0
FTYROW: At uncontrolled intersection	0	FTYROW: Making right turn on red signal	0
FTYROW: From stop sign	0	FTYROW: From yield sign	0
FTYROW: Making left turn	0	FTYROW: From driveway	0
FTYROW: From parked position	0	FTYROW: To pedestrian	0
FTYROW: Other	0	Drove around RR grade crossing gates	0
Disregarded RR Signal	0	Crossed centerline (undivided)	0
Crossed median (divided)	0	Traveling wrong way or on wrong side of road	0
Aggressive driving/road rage	0	Driving too fast for conditions	0
Exceeded authorized speed	0	Improper or erratic lane changing	0
Operating vehicle in an reckless, erratic, ca...	0	Followed too close	0
Passing: On wrong side	0	Passing: Where prohibited by signs/markings	0
Passing: With insufficient distance/inadequa...	0	Passing: Through/around barrier	0
Passing: Other passing	0	Made improper turn	0
Driver Distraction: Manual operation of an e...	0	Driver Distraction: Talking on a hand-held d...	0
Driver Distraction: Talking on a hands free ...	0	Driver Distraction: Adjusting devices (radio...	0
Driver Distraction: Other electronic device ...	0	Driver Distraction: Passenger	0
Driver Distraction: Unrestrained animal	0	Driver Distraction: Reaching for object(s)/f...	0
Driver Distraction: Inattentive/lost in thou...	0	Driver Distraction: Other interior distracti...	0
Driver Distraction: Exterior distraction	0	Ran off road - right	1
Ran off road - straight	0	Ran off road - left	0
Lost control	0	Swerving/Evasive Action	0
Over correcting/over steering	0	Failed to keep in proper lane	0
Failure to signal intentions	0	Traveling on prohibited traffic way	0
Vehicle stopped on railroad tracks	0	Other: Vision obstructed	0
Other: Improper operation	0	Other: Disregarded warning sign	0
Other: Disregarded signs/road markings	0	Other: Illegal off-road driving	0
Downhill runaway	0	Separation of units	0
Towing improperly	0	Cargo/equipment loss or shift	0
Equipment failure	0	Oversized load/vehicle	0
Other: Getting off/out of vehicle	0	Failure to dim lights/have lights on	0
Improper backing	0	Improper starting	0
Illegally parked/unattended	0	Driving less than the posted speed limit	0
Operator inexperience	0	Other	0
Unknown	0	Not reported	0
Other: No improper action	0		

Iowa Crash Analysis Tool
Quick Report
2010-2020

Time of Day/Day of Week

Day of Week	12 AM to 2 AM	2 AM to 4 AM	4 AM to 6 AM	6 AM to 8 AM	8 AM to 10 AM	10 AM to Noon	Noon to 2 PM	2 PM to 4 PM	4 PM to 6 PM	6 PM to 8 PM	8 PM to 10 PM	10 PM to 12 AM	Not reported	**Total**
Sunday	1	0	0	0	1	0	0	0	0	0	0	0	0	2
Monday	0	1	0	1	0	0	0	0	0	0	2	0	0	4
Tuesday	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Friday	0	0	1	0	0	0	0	0	0	0	1	0	0	2
Saturday	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Total	1	1	1	1	1	0	0	0	1	2	4	0	0	12

Manner of Crash Collision	**12**
Non-collision (single vehicle)	6
Head-on (front to front)	0
Rear-end (front to rear)	0
Angle, oncoming left turn	0
Broadside (front to side)	0
Sideswipe, same direction	0
Sideswipe, opposite direction	0
Rear to rear	0
Rear to side	0
Not reported	6
Other	0
Unknown	0

Surface Conditions	**12**
Dry	1
Wet	0
Ice/frost	0
Snow	0
Slush	0
Mud, dirt	0
Water (standing or moving)	0
Sand	0
Oil	0
Gravel	0
Not reported	11
Other	0
Unknown	0

Fixed Object Struck			**12**
Bridge overhead structure	0	Bridge pier or support	0
Bridge/bridge rail parapet	0	Curb/island/raised median	0
Ditch	0	Embankment	0
Ground	0	Culvert/pipe opening	0
Guardrail - face	0	Guardrail - end	0
Concrete traffic barrier (median or right sid...	0	Other traffic barrier	0
Cable barrier	0	Impact attenuator/crash cushion	0
Utility pole/light support	0	Traffic sign support	1
Traffic signal support	0	Other post/pole/support	0
Fire hydrant	0	Mailbox	0
Tree	0	Landscape/shrubbery	0
Snow bank	0	Fence	0
Wall	0	Building	0
Other fixed object	0	None (no fixed object struck)	11

Driver Age/Driver Gender

Driver Age - 5 year Bins	Female	Male	Not reported	Unknown	Total
< 14	0	0	0	0	0
= 14	0	0	0	0	0
= 15	0	0	0	0	0
= 16	0	0	0	0	0
= 17	0	0	0	0	0
= 18	0	0	0	0	0
= 19	1	0	0	0	1
= 20	0	0	0	0	0
>= 21 and <= 24	1	3	0	0	4
>= 25 and <= 29	2	0	0	0	2
>= 30 and <= 34	0	0	0	0	0
>= 35 and <= 39	0	1	0	0	1
>= 40 and <= 44	0	0	0	0	0
>= 45 and <= 49	1	1	0	0	2
>= 50 and <= 54	0	1	0	0	1
>= 55 and <= 59	0	0	0	0	0
>= 60 and <= 64	0	0	0	0	0
>= 65 and <= 69	0	0	0	0	0
>= 70 and <= 74	0	1	0	0	1
>= 75 and <= 79	0	0	0	0	0
>= 80 and <= 84	0	0	0	0	0
>= 85 and <= 89	0	0	0	0	0
>= 90 and <= 94	0	0	0	0	0
>= 95	0	0	0	0	0
Not reported	0	0	0	0	0
Unknown	0	0	0	0	0
Total	5	7	0	0	12

Drug/Alcohol Related	**12**
Drug	0
Alcohol (< Statutory)	0
Alcohol (Statutory)	0
Drug/Alcohol (< Statutory)	0
Drug/Alcohol (Statutory)	0
Refused	0
Under Influence of Alcohol/Drugs/Medications	1
None Indicated	11

Alcohol Test Given	**12**
None	12
Blood	0
Urine	0
Breath	0
Vitreous	0
Refused	0
Not reported	0

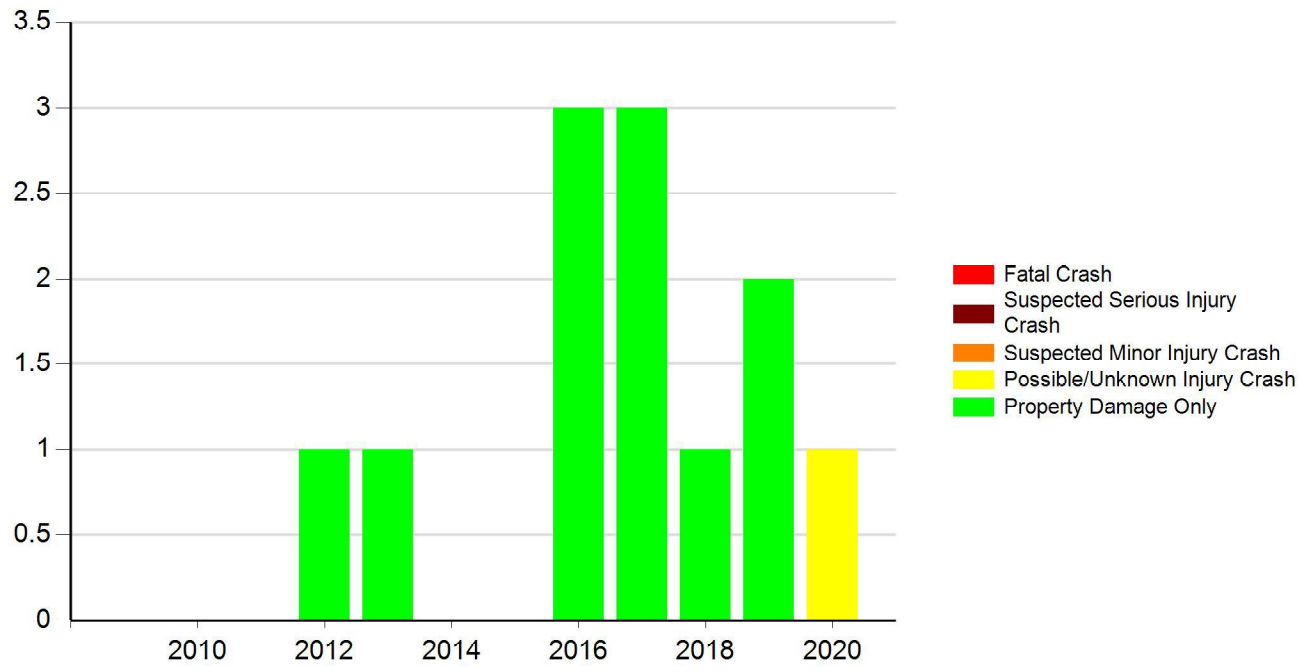
Drug Test Given	**12**
None	12
Blood	0
Urine	0
Breath	0
Vitreous	0
Refused	0
Not reported	0

Drug Test Result	**12**
Negative	0
Cannabis	0
Central Nervous System depressants	0
Central Nervous System stimulants	0
Hallucinogens	0
Inhalants	0
Narcotic Analgesics	0
Dissociative Anesthetic (PCP)	0
Prescription Drug	0
Not reported	12
Other	0

Crash Severity - Annual

Crash Year	Fatal Crash	Suspected Serious Injury Crash	Suspected Minor Injury Crash	Possible/Unknown Injury Crash	Property Damage Only	**Total**
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	0	0	1	1
2013	0	0	0	0	1	1
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	3	3
2017	0	0	0	0	3	3
2018	0	0	0	0	1	1
2019	0	0	0	0	2	2
2020	0	0	0	1	0	1
Total	0	0	0	1	11	12

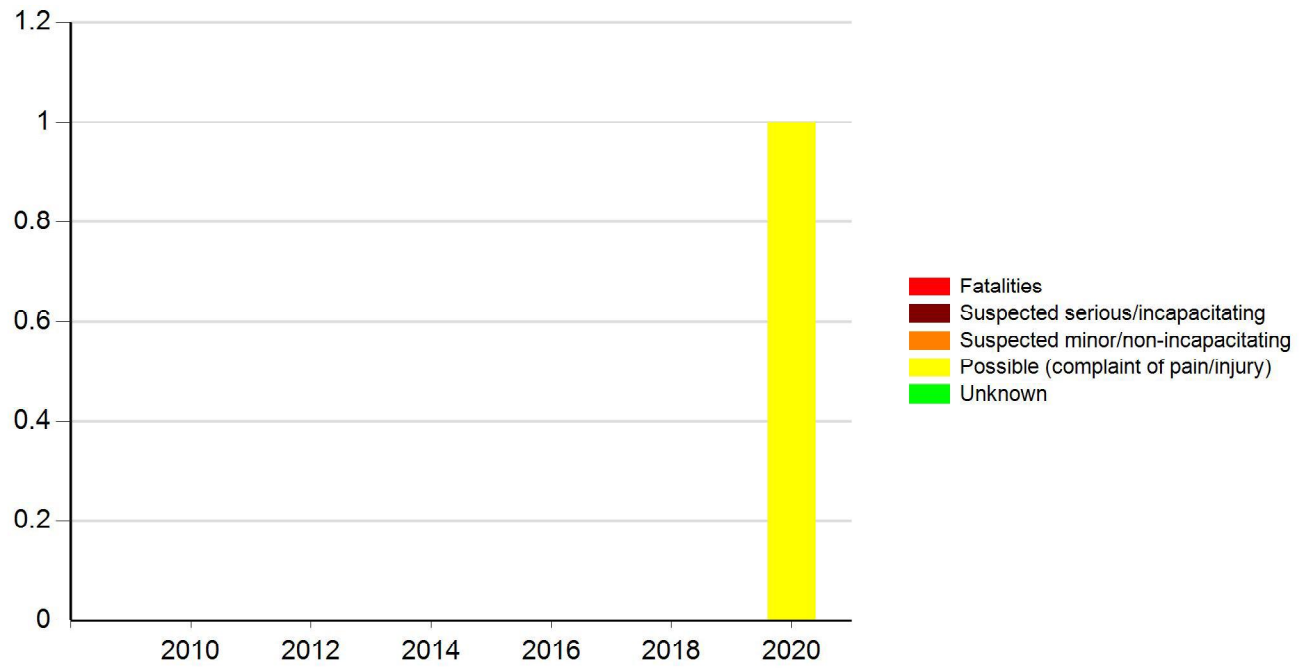
Severity/Year



Injury Status - Annual

Crash Year	Fatalities	Suspected serious/incapacitating	Suspected minor/non-incapacitating	Possible (complaint of pain/injury)	Unknown	**Total**
2009	0	0	0	0	0	0
2010	0	0	0	0	0	0
2011	0	0	0	0	0	0
2012	0	0	0	0	0	0
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	0	0	0	0	0	0
2020	0	0	0	1	0	1
Total	0	0	0	1	0	1

Injury Status/Year



Meeting the following criteria

Jurisdiction: Counties (Story)
Year: 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020
Map Selection: Yes
Filter: None

Analyst Information

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	3	2	27	6	49	5	50	32	19	29	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	2	29	7	53	5	54	35	21	32	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	186	173	32	159	157	72	33	0	0	89	0	0
Stage 1	73	73	-	83	83	-	-	-	-	-	-	-
Stage 2	113	100	-	76	74	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	775	720	1042	807	735	990	1579	-	-	1506	-	-
Stage 1	937	834	-	925	826	-	-	-	-	-	-	-
Stage 2	892	812	-	933	833	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	719	708	1042	792	723	990	1579	-	-	1506	-	-
Mov Cap-2 Maneuver	719	708	-	792	723	-	-	-	-	-	-	-
Stage 1	934	822	-	922	824	-	-	-	-	-	-	-
Stage 2	835	810	-	914	821	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	9.5	0.4	2.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1579	-	-	812	892	1506	-	-
HCM Lane V/C Ratio	0.003	-	-	0.007	0.1	0.014	-	-
HCM Control Delay (s)	7.3	0	-	9.5	9.5	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0	-	-

Intersection	
Int Delay, s/veh	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	0	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	0	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	3	2	31	6	56	5	53	38	20	31	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	2	34	7	61	5	58	41	22	34	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	201	188	34	169	167	78	35	0	0	99	0	0
Stage 1	78	78	-	89	89	-	-	-	-	-	-	-
Stage 2	123	110	-	80	78	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	757	707	1039	795	726	983	1576	-	-	1494	-	-
Stage 1	931	830	-	918	821	-	-	-	-	-	-	-
Stage 2	881	804	-	929	830	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	696	694	1039	780	713	983	1576	-	-	1494	-	-
Mov Cap-2 Maneuver	696	694	-	780	713	-	-	-	-	-	-	-
Stage 1	928	818	-	915	819	-	-	-	-	-	-	-
Stage 2	817	802	-	910	818	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.5	9.6	0.4	2.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1576	-	-	800	885	1494	-	-
HCM Lane V/C Ratio	0.003	-	-	0.007	0.114	0.015	-	-
HCM Control Delay (s)	7.3	0	-	9.5	9.6	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	57	7	10	87	6	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	62	8	11	95	7	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	70	0	182	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	116	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1531	-	807	998
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	909	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1531	-	801	998
Mov Cap-2 Maneuver	-	-	-	-	801	-
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	902	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	870	-	-	1531	-
HCM Lane V/C Ratio	0.012	-	-	0.007	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	-

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	0	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	0	0	0	0
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	-	-

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	3	2	32	7	57	5	53	40	24	31	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	2	35	8	62	5	58	43	26	34	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	211	198	34	179	177	79	35	0	0	101	0	0
Stage 1	86	86	-	90	90	-	-	-	-	-	-	-
Stage 2	125	112	-	89	87	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	746	698	1039	783	717	981	1576	-	-	1491	-	-
Stage 1	922	824	-	917	820	-	-	-	-	-	-	-
Stage 2	879	803	-	918	823	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	682	683	1039	766	702	981	1576	-	-	1491	-	-
Mov Cap-2 Maneuver	682	683	-	766	702	-	-	-	-	-	-	-
Stage 1	919	809	-	914	818	-	-	-	-	-	-	-
Stage 2	813	801	-	896	808	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.6	9.7	0.4	3.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1576	-	-	791	874	1491	-	-
HCM Lane V/C Ratio	0.003	-	-	0.007	0.119	0.017	-	-
HCM Control Delay (s)	7.3	0	-	9.6	9.7	7.5	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0.1	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	59	8	11	89	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	64	9	12	97	8	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	73	0	189	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	121	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1527	-	800	995
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	904	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1527	-	794	995
Mov Cap-2 Maneuver	-	-	-	-	794	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	897	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	857	-	-	1527	-
HCM Lane V/C Ratio	0.014	-	-	0.008	-
HCM Control Delay (s)	9.3	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	61	2	4	98	2	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	66	2	4	107	2	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	68	0	182	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	115	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1533	-	807	997
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	910	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1533	-	805	997
Mov Cap-2 Maneuver	-	-	-	-	805	-
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	907	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	891	-	-	1533	-
HCM Lane V/C Ratio	0.005	-	-	0.003	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	4	2	35	8	63	6	57	45	27	33	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	2	38	9	68	7	62	49	29	36	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	233	219	36	197	195	86	37	0	0	111	0	0
Stage 1	95	95	-	99	99	-	-	-	-	-	-	-
Stage 2	138	124	-	98	96	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	722	679	1037	762	700	973	1574	-	-	1479	-	-
Stage 1	912	816	-	907	813	-	-	-	-	-	-	-
Stage 2	865	793	-	908	815	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	652	662	1037	742	683	973	1574	-	-	1479	-	-
Mov Cap-2 Maneuver	652	662	-	742	683	-	-	-	-	-	-	-
Stage 1	907	800	-	902	809	-	-	-	-	-	-	-
Stage 2	792	789	-	883	799	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	9.9	0.4	3.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1574	-	-	753	857	1479	-	-
HCM Lane V/C Ratio	0.004	-	-	0.009	0.134	0.02	-	-
HCM Control Delay (s)	7.3	0	-	9.8	9.9	7.5	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	62	8	11	99	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	67	9	12	108	8	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	76	0	204	72
Stage 1	-	-	-	-	72	-
Stage 2	-	-	-	-	132	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1523	-	784	990
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	894	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1523	-	778	990
Mov Cap-2 Maneuver	-	-	-	-	778	-
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	887	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	844	-	-	1523	-
HCM Lane V/C Ratio	0.014	-	-	0.008	-
HCM Control Delay (s)	9.3	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	60	6	9	105	5	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	65	7	10	114	5	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	72	0	202	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1528	-	787	995
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1528	-	781	995
Mov Cap-2 Maneuver	-	-	-	-	781	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	886	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	864	-	-	1528	-
HCM Lane V/C Ratio	0.011	-	-	0.006	-
HCM Control Delay (s)	9.2	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	5	3	37	8	67	6	59	49	29	34	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	3	40	9	73	7	64	53	32	37	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	246	231	38	209	206	91	39	0	0	117	0	0
Stage 1	101	101	-	104	104	-	-	-	-	-	-	-
Stage 2	145	130	-	105	102	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	708	669	1034	748	691	967	1571	-	-	1471	-	-
Stage 1	905	811	-	902	809	-	-	-	-	-	-	-
Stage 2	858	789	-	901	811	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	635	651	1034	726	672	967	1571	-	-	1471	-	-
Mov Cap-2 Maneuver	635	651	-	726	672	-	-	-	-	-	-	-
Stage 1	900	793	-	897	805	-	-	-	-	-	-	-
Stage 2	781	785	-	872	793	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	10	0.4	3.3
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1571	-	-	756	847	1471	-	-
HCM Lane V/C Ratio	0.004	-	-	0.012	0.144	0.021	-	-
HCM Control Delay (s)	7.3	0	-	9.8	10	7.5	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	75	8	11	105	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	9	12	114	8	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	224	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	138	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1505	-	764	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	889	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1505	-	757	973
Mov Cap-2 Maneuver	-	-	-	-	757	-
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	881	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	823	-	-	1505	-
HCM Lane V/C Ratio	0.015	-	-	0.008	-
HCM Control Delay (s)	9.4	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	69	6	14	108	8	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	75	7	15	117	9	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	82	0	226	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1515	-	762	983
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	880	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1515	-	754	983
Mov Cap-2 Maneuver	-	-	-	-	754	-
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	870	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	838	-	-	1515	-
HCM Lane V/C Ratio	0.018	-	-	0.01	-
HCM Control Delay (s)	9.4	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	8	2	38	7	19	1	44	27	17	46	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	9	2	41	8	21	1	48	29	18	50	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	166	166	50	157	152	63	50	0	0	77	0	0
Stage 1	87	87	-	65	65	-	-	-	-	-	-	-
Stage 2	79	79	-	92	87	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	798	727	1018	809	740	1002	1557	-	-	1522	-	-
Stage 1	921	823	-	946	841	-	-	-	-	-	-	-
Stage 2	930	829	-	915	823	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	768	718	1018	792	730	1002	1557	-	-	1522	-	-
Mov Cap-2 Maneuver	768	718	-	792	730	-	-	-	-	-	-	-
Stage 1	920	813	-	945	840	-	-	-	-	-	-	-
Stage 2	902	828	-	892	813	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	9.7	0.1	2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1557	-	-	763	836	1522	-	-
HCM Lane V/C Ratio	0.001	-	-	0.014	0.083	0.012	-	-
HCM Control Delay (s)	7.3	0	-	9.8	9.7	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	50	2	3	56	8	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	2	3	61	9	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	57	0	122	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	67	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1547	-	873	1012
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1547	-	871	1012
Mov Cap-2 Maneuver	-	-	-	-	871	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	954	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	940	-	-	1547	-
HCM Lane V/C Ratio	0.02	-	-	0.002	-
HCM Control Delay (s)	8.9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	55	4	4	48	11	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	60	4	4	52	12	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	64	0	123	62
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	61	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1538	-	872	1003
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1538	-	869	1003
Mov Cap-2 Maneuver	-	-	-	-	869	-
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	959	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	931	-	-	1538	-
HCM Lane V/C Ratio	0.026	-	-	0.003	-
HCM Control Delay (s)	9	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

INSTRUMENT PREPARED BY:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010 (515) 288-2500
RETURN TO:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010

EASEMENTS

KNOW ALL PERSONS BY THESE PRESENTS:

That **THE QUARRY ESTATES, L.L.C.**, for good and valuable consideration, does hereby grant unto **STORY COUNTY, IOWA**, and its successors and assigns, public utility easements upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The undersigned further grants unto **STORY COUNTY, IOWA**, and its successors and assigns, conservation easements (as situated on each referenced lot, a "Conservation Easement") upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The undersigned further grants unto **STORY COUNTY, IOWA**, and its successors and assigns, protective subdrain easements upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The undersigned further grants unto the **STORY COUNTY, IOWA**, and its successors and assigns, stormwater easements upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The undersigned further grants unto the **STORY COUNTY, IOWA**, and its successors and assigns, access easements upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The undersigned further grants unto the **STORY COUNTY, IOWA**, and its successors and assigns, lateral field easements upon, underground, over or across the following-described real estate:

_____; AND,

_____,

all of the foregoing in **PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA**.

The foregoing rights are granted upon the express condition that the undersigned shall not erect or place within the easement areas identified herein any building or other structure or improvement, including, but not limited to, a retaining wall or fence, or any trees, shrubs, or other landscape plantings other than grass or comparable ground cover except with the consent of Story County, Iowa. Story County, Iowa shall have the right to trim or remove trees and shrubs within the easement areas identified herein to prevent damage to utility service lines of Story County, Iowa located within said easement areas. Any and all areas encumbered by a Conservation Easement shall be managed in such a manner consistent with: (a) the provisions of the Outlot Use Restrictions and Management/Ownership Agreement of even date herewith and filed contemporaneous with the Final Plat of Prairie Valley Subdivision First Addition, Story County, Iowa (the "Final Plat"); (b) the Restrictive Covenants and Regulations for Prairie Valley Subdivision First Addition, Story County, Iowa of even date herewith and filed contemporaneous with the Final Plat; and (c) applicable provisions of Chapter 457A of the Iowa Code and/or the Code of Ordinances of Story County, Iowa related to "conservation easements" and the requirements related thereto.

The foregoing rights are granted upon the express condition that the users of the granted rights will assume liability for all damage to the real estate described herein and any adjacent real estate caused by the failure to use due care in the exercise of the granted rights.

Dated this ___ day of April, 2020.

(SIGNATURE PAGE FOLLOWS)

SIGNATURE PAGE OF
EASEMENTS

THE QUARRY ESTATES, L.L.C.

By: _____ By: _____
Kurt W. Friedrich, Manager Richard J. Johansen, Manager

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Kurt W. Friedrich, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Richard J. Johansen, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

DRAFT - WORKING COPY 04/23/2020

INSTRUMENT PREPARED BY:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010 (515) 288-2500
RETURN TO:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010

RESTRICTIVE COVENANTS AND REGULATIONS FOR PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA

WHEREAS, the undersigned are the owners of Lots One (1) through Twenty-eight (28) ("Lot" or the "Lots") contained in Prairie Valley Subdivision First Addition, Story County, Iowa (the "Subdivision"); and

WHEREAS, all of the Lots shall be developed as residential lots and governed by these restrictive covenants and regulations; and

WHEREAS, for their own protection and for the benefit of subsequent owners of said Lots within said Subdivision, the said owner desires to restrict the use thereof in certain particulars;

NOW, THEREFORE, the parties hereto, in consideration of the covenants and agreements contained herein, by these presents, covenant, bargain and agree for themselves for their successors and assigns, as follows:

1. All Lots shall be known and described as residential lots and shall not be improved, used, or occupied for other than private single-family residential purposes.

2. All owners of Lots shall be members of Prairie Valley Property Owners Association, Inc. (the "Association"). The Association shall be governed by Bylaws and other organizational documents that set forth the duties and obligations of such owners with respect to the ownership of Lots within the Subdivision, including, but not limited to, the terms and provisions of the Outlot Use Restrictions and Management/Ownership Agreement (the "Management Agreement") (the Management Agreement is incorporated herein by this reference as if fully set forth) of even date herewith related to the Subdivision and applicable provisions within the County Code of Ordinances (as that term is defined herein) specifically related to development within a GB-C Greenbelt-Conservation District.

   All outlots within the Subdivision that are owned by the Association (collectively the "Outlots" and individually, an "Outlot") and all lots within the Subdivision dedicated and conveyed to Story County, Iowa (the "County") as part of the platting of the Subdivision (collectively, the "County Lots" and individually, a "County Lot") that

contain greenspace and/or Conservation Easements (as that term is defined herein) shall be managed as native prairie lots and plantings thereon shall be in strict compliance with the requirements of the SCCB (as that term is defined herein), and such management shall include, but not be limited to, mowing, haying, grazing, or by prescribed fire.

3. The residences to be constructed or to be permitted to remain on the Lots shall meet the following requirements:

   a. One (1) story residences shall have a ground floor finished area of not less than one thousand three hundred (1,300) square feet.

   b. One and one-half (1½) story residences or split-level residences shall have a ground floor finished area of not less than eight hundred (800) square feet and a total finished area on the ground floor and the second floor of not less than one thousand six hundred (1,600) square feet.

   c. Two (2) story residences shall have a ground floor finished area of not less than eight hundred (800) square feet and a total finished area on the ground floor and the second floor of not less than one thousand six hundred (1,600) square feet.

   d. The computation of the finished area shall not include porches, breezeways, or garages.

4. No Lot shall be subdivided for the purpose of constructing more than one (1) residence per Lot; however, parts of Lots may be conveyed to adjoining Lot owners for any other purpose. No structure or improvement shall be placed or otherwise maintained on any Lot in any area identified on the Final Plat of the Subdivision as an easement area or a setback area.

5. No building, fence, wall or other structure shall be commenced, erected or maintained on any Lot, nor shall any exterior addition, change or alteration be made until the plans and specifications showing the nature, kind, shape, height, materials and location of the same have been submitted to and approved in writing by the managers, members or officers, as the case may be, of The Quarry Estates, LLC (the "Developer"), or by an Architectural Committee appointed by the Developer. The primary guidelines for approval are that the plans and specifications reflect harmony of external design and location in relation to surrounding structures and drainage patterns in accordance with the Storm Water Management Pplan (the "SWMP") submitted as part of the platting of the Subdivision. When dwellings have been constructed on all Lots within the Subdivision, the requirements imposed by this paragraph shall terminate.

6. The following restrictions shall also constitute covenants:

   a. There shall be no mobile homes placed or erected on any Lot.

b. No pre-erected dwelling shall be moved to any Lot.

c. All dwellings must have, at a minimum, a double attached garage or double detached garage. No detached buildings or other structures, including, but not limited to, garages, storage or utility buildings, sheds, windmills, solar panel housing, or playhouses, shall be built on any Lot without the prior written consent of the Developer or the Committee, and if approved by the Developer or the Committee, any and all detached buildings or other structures must nonetheless match or be in harmony with the architectural style and color of the primary residence.

d. No more than twelve (12) inches of concrete block, poured concrete or wood foundation shall be exposed on any building unless the exposed material is covered with brick, stone veneer or siding. Exposed foundations must be painted to blend with exterior wall finishes.

e. All building structures or improvements of any kind must be completed within twelve (12) months of the commencement date of the construction. All excess dirt from the excavation shall be hauled from the Lot or used as a part of the final landscape plan. Any excess dirt, concrete or other debris may not be placed on other land within the Subdivision. **IF CONSTRUCTION HAS NOT BEGUN ON A LOT WITHIN TWELVE (12) MONTHS OF THE DATE ON THE DEED FROM THE DEVELOPER, THEN THE OWNER OF RECORD, AT DEVELOPER'S REQUEST, AGREES TO DEED THE LOT BACK TO THE DEVELOPER FOR NINETY PERCENT (90%) OF THE ORIGINAL PURCHASE PRICE WITH NO ADJUSTMENT FOR TAXES, CLOSING COSTS OR INTEREST AT THE TIME THE DEED IS CONVEYED TO THE DEVELOPER. DEVELOPER WILL PAY ONLY FOR DEED PREPARATION, RECORDING FEES AND TRANSFER TAXES. ON ISSUANCE OF AN OCCUPANCY PERMIT FOR A RESIDENCE, THIS RIGHT TO REPURCHASE SHALL TERMINATE AS TO THAT LOT.**

f. All homes must be built by a recognized homebuilder, defined as a homebuilder who completes at least three (3) homes per year.

g. All finished Lots and house grades shall conform to the Developer's grading plan which may be obtained from the Developer during construction.

h. All mailboxes shall be placed in accordance with United States Postal Service regulations. Individual mailboxes will not be permitted. Cluster mailboxes will be provided by the United States Postal Service.

i. No above ground or non-permanent swimming pool shall be permitted on any Lot.

j. No building or structure of a temporary character and no trailer, basement, tent, shack, garage or outbuilding shall be used at any time as a residential dwelling on any Lot, either temporarily or permanently.

k. No recreational vehicle, camper, boat or truck rated larger than three quarters (¾) of a ton shall be parked on a Lot for a period of time exceeding forty-eight (48) consecutive hours or for more than thirty (30) days in any calendar year.

l. No rubbish containers shall be visible from the street except on pickup day and one (1) day before and one (1) day after pickup day. Construction waste containers shall be exempt from this provision; however, the builder or Lot owner shall be responsible for keeping the construction debris contained on the Lot and in the construction waste containers.

m. No extension towers or antennas of any kind shall be constructed, modified or permitted on any Lot except television or radio antennas of less than ten (10) feet are permitted on dwellings or garages as long as they are not visible from the street. Satellite dishes in excess of thirty-six (36) inches in diameter used to receive television or other signals from satellites shall not be permitted. The satellite dishes or parabolic devices shall be mounted on the rear elevation or the rear half of the side elevation only. In no event shall a satellite dish or parabolic device be mounted on the front elevation or the front half of a side elevation.

n. No noxious or offensive activities or odors shall be permitted on or to escape from any Lot, nor shall anything be done on any Lot which is or may become an annoyance or nuisance, either temporarily or permanently.

o. No animals, livestock or poultry of any kind shall be raised, bred or kept on any Lot, except that dogs, cats and other common household pets may be kept so long as they are not kept, bred or maintained for commercial purposes. Dogs must be tied, fenced or kept in a dog run or on a leash at all times.

p. Within three (3) months after occupancy of the residential dwelling on any Lot, the yards shall be sodded or seeded. In addition to seeding and sodding, the builder or Lot owner shall expend a minimum of one thousand dollars ($1,000.00) for landscaping. Landscaping shall include at least one (1) one and one-half (1½) inch caliper tree.

q. All retaining walls shall be constructed of stone or masonry product. No wood landscaping timbers shall be used to construct retaining walls, except that window well retaining walls that are not visible above grade may be constructed using wood landscaping timbers.

r. Roof materials should be slate, tile, cedar shakes, or composite shingles. Composite shingles shall be architectural grade, minimum thirty (30) year warranty. Shingle colors shall be compatible with and complimentary to the exterior materials and colors. White or white blend roof materials are not

acceptable.

s. All outdoor light fixtures shall be designed, installed and maintained to prevent light trespass beyond the boundaries of the Lot. "Full cutoff" outdoor light fixtures which emit no light at or above the horizontal plane of the fixture shall be utilized for all dusk to dawn light fixtures exceeding three hundred (300) lumens and for all manually switched or occupancy sensor switched fixtures exceeding one thousand (1,000) lumens. Christmas lighting or other temporary outdoor lighting shall be exempt from this provision, but shall remain in place no longer than six (6) weeks annually.

t. Each Lot owner shall keep the Lot free of weeds and debris and shall take all necessary steps to control erosion from the Lot. All Lot owners shall implement appropriate erosion control measures before, during and after construction. These measures may include silt fences, ground cover and seeding over exposed areas. If, in the opinion of the Developer, erosion is not properly controlled, corrective action may be taken and the costs assessed against the Lot owner.

u. Chain link fences are not permitted. If a fence is installed, it must be a two (2) pattern fence. The plans for the fence shall be submitted for approval by the Developer in accordance with Paragraph 5. All Lots abutting any Conservation Easement (as that term is defined herein) or any County Lot or Outlot shall have, along the common property lines thereof, a three (3) rail split fence. If any said fence is installed to protect an Outlot, as identified in the Fence Plan (the "Fence Plan") submitted by the Developer with the Final Plat of the Subdivision, the construction of said fence shall be the responsibility of the Lot owner and shall be installed at the time of the construction of the dwelling on the Lot as a condition of any building or other permit. If any said fence is installed to protect a County Lot, as identified in the Fence Plan, the construction of said fence shall be the responsibility of the Developer. The owner of any Lot in which a fence is installed shall be responsible for the maintenance of said fence.

v. Once a dwelling is sold and occupied, signage shall be limited to (i) address signage, (ii) owner identification signs, (iii) "For Sale" signs, (iv) "Garage Sale" signs, (v) special event signs (such as birthdays, graduations, or anniversaries, hereafter "Event Signs") (vi) political signs and (vii) other signs approved in writing by the Developer. "For Sale" signs shall only be displayed while a dwelling is for sale and must be removed the day following the closing of the sale. "Garage Sale" and Event Signs shall only be displayed one (1) day before the sale or event and during the sale or event and must be removed by the day following the sale or event. Political signs shall only be displayed up to two (2) weeks prior to an election, the day of the election, and must be removed by the day following the election. Political signs not related to an election shall be displayed for a maximum of two (2) weeks. Other signs permitted by the Developer shall be displayed for such times as authorized by the Developer. All signs shall be limited to no more than thirty-nine (39) inches in width by twenty-four (24) inches in height and

shall be professionally constructed. No hand painted signs will be allowed. Except for address and owner identification signs, no signs shall be erected on any building elevation, erected so that is visible through window or glass openings or, except for vehicles with professionally made business signage on the vehicles, attached to vehicles parked within the neighborhood.

w. Any and all plumbing systems, septic tanks, and sewage disposal fields installed on a Lot shall comply with the standards, requirements, rules, or regulations of all applicable governmental authorities. Additionally, all existing field drainage tiles upon or under any of the Lots shall remain unobstructed and the free flow of water through said tiles shall not, in any manner, be restricted, blocked, or impeded. The existing drainage tile system shall at all times be preserved during the construction of residences or other approved structures on a Lot. Said drainage tiles are necessary for adjacent property owners and the proper repair of said drainage tiles is necessary to prevent drainage issues for adjacent property owners. Any drainage tile located during construction shall be repaired at the sole cost and expense of the Lot owner and the repair shall be observed by an engineer designated by the Developer prior to backfilling. Drainage tiles that need to be rerouted will be upsized to the next pipe size, but to a minimum of two (2) inches in diameter. Drainage tiles that are relocated around basements shall be a minimum of twenty (20) feet from the exterior of the residence, garage, or other approved structure. In no event shall a drainage tile run under a residence or other approved structure. The Association shall be responsible for the maintenance and repair of the subdrains identified in the Protection Subdrain Plan submitted by the Developer with the Final Plat of the Subdivision. Additionally, drainage tiles shall be a minimum of fifteen (15) feet from any septic system drain, tile, or tank.

x. All wastewater systems must comply with all state and local regulations in effect at the time of installation and be approved by the Story County Health Department prior to construction of a residential dwelling on a Lot. Lot owners shall be responsible for the installation of any permitted on-site wastewater treatment systems. Mechanical on-site wastewater treatment systems shall be used only if soil-based secondary on-site wastewater treatment systems cannot be installed and operated and use of such mechanical systems shall comply with state law requirement of maintenance agreements. The Association shall contract for pumping, routine maintenance, and inspections every five (5) years of all on-site wastewater treatment systems by an inspector qualified to conduct septic system reviews in the County. The reports shall be forwarded to the Story County Health Department. Inspection fees shall be a part of the annual assessments of the Association. The owners of the Lots shall pay for all pumping, maintenance, and repair required to comply with all county and state regulations.

y. The use or application of any fertilizer or lawn additive that contains phosphates is prohibited on all Lots.

z. No Lot owner shall plant or grow, in any manner, any invasive plant species on a Lot. The Association shall not plant or grow on any Outlot, in any manner, any invasive plant species (as defined by the Iowa Department of Natural Resources Forestry Invasive Species Guide). All shrubs and trees on Lots or Outlots shall be native species. The Story County Conservation Board must preapprove the use of any seed mixes proposed to be used on any Outlot.

aa. The Association shall be responsible for the maintenance of the storm water management systems, as identified in the SWMP. Maintenance shall include the following: (i) visual inspection of the site to ensure that no erosion is occurring, (ii) visual inspection of on-site storm sewer during rainfall events to ensure they are properly working, (iii) removal of any sediment that has collected in designated storm water detention and/or retention areas and removal of any debris that may have blocked the outlet orifices, (iv) repair or replacement of any damaged structures designed to control storm water runoff and provided water quality measures for the site, (v) regularly mowing lawn areas (except with respect to native species areas), (vi) clearing detention facilities of any volunteer trees, and (vii) completing annual inspections of detention facilities and maintaining inspection reports for three (3) years.

bb. No debris, hazardous materials, household hazardous waste, or unapproved plants or soil shall be placed, at any time, on any Lot, Outlot, or County Lot.

7. Any construction or earth moving on any Lot shall be in compliance with all laws relating to storm water discharge permitting. The Lot owner shall be the sole responsible permittee for the Lot with respect to compliance with the terms, provisions and requirements of any NPDES Storm Water Discharge Permit No. 2 and any storm water pollution prevention plan that includes the Lot.

During the ownership of the Lot, the Lot owner shall protect, defend, indemnify and hold the Developer and other Lot owners harmless from any and all damages, claims, liabilities, fines, penalties, cleanup costs and/or attorneys' and consultants' fees caused by, or in any manner related to: (1) any discharges of soil, silt, sediment, petroleum product, hazardous substances or solid waste from the Lot; and/or (2) any alleged violation of any NPDES or storm water discharge rule or regulation.

8. For purposes of this Paragraph 8 the term "Conservation Easement" shall mean the definition referenced in Chapter 457A of the Iowa Code and/or the definition referenced with respect to "Easement, public" in Section 85.08(89) of the Code of Ordinances of Story County, Iowa (the "County Code of Ordinances"). The legal descriptions of any and every Conservation Easement granted to the County upon the platting of the Subdivision shall be noted on the Final Plat of the Subdivision and on an easement document to be recorded with the Final Plat of the Subdivision. Each Lot owner shall strictly comply with the restrictions set forth in Section 86.12 of the County Code of Ordinances and other provisions within the County Code of Ordinances specifically related to development within a GB-C Greenbelt-Conservation District with respect to any areas within the Subdivision encumbered by

a Conservation Easement. The Association shall be charged with enforcing said restrictions on any Lot not owned by the Association, and furthermore, the Association shall be ultimately responsible for the enforcement of said restrictions on any Outlots and/or as required under the Management Agreement. In furtherance of said charge, the owners of Lots shall be liable for dues to the Association in such amounts as the Association deems adequate to comply with the requirements set forth herein.

The erection or placement of any building or other structure or improvement, including, but not limited to, a retaining wall or fence, or any trees, shrubs, or other landscape plantings other than grass or comparable ground cover within any area of an Outlot or a Count Lot, or any area of a Lot identified as being encumbered by a Conservation Easement, is prohibited except with the prior consent of the County. Neither the Association or any Lot owner may mow, burn, spray, or engage in other similar management activities on the Outlots or the County Lots.

9. All of these restrictions shall be deemed to be covenants running with the land and shall endure and be binding upon all parties hereto, their successors and assigns, for a period of twenty-one (21) years from the date of the recording of these covenants, unless claims to continue any interest in the covenants are filed as provided by law.

10. In case of violation of any of the covenants, any person then owning a Lot in said Subdivision, the SCCB, and/or the County is authorized to resort to an action at law or in equity for relief, either by injunction or in damages, against the person so violating said covenants and is entitled to attorneys' fees and costs related thereto.

11. Invalidation of any of these covenants by judgment or court order shall in no way affect the validity of any of the other provisions, but they shall remain in full force and effect.

12. This instrument may be amended upon the recording of a written instrument executed by the owners of at least seventy-five percent (75%) of the Lots within the Subdivision. Any amendment to this instrument must be filed for record in the office of the Recorder of Story County, Iowa. For the purposes of this Paragraph 12, each Lot shall be deemed to have one (1) owner, and each said owner shall be entitled to one (1) vote for each Lot owned.

13. The provisions of this instrument and any amendments hereto may be extended for an additional period beyond the initial twenty-one (21) year period by the owners of seventy-five percent (75%) of the Lots within the Subdivision by filing a verified claim in the office of the Recorder of Story County, Iowa, within the initial twenty-one (21) year period. For the purposes of this Paragraph 13, each Lot shall be deemed to have one (1) owner, all as provided in the preceding paragraph.

Dated at Ames, Iowa this ___ day of April, 2020.

(SIGNATURE PAGE FOLLOWS)

SIGNATURE PAGE OF
RESTRICTIVE COVENANTS AND REGULATIONS FOR
PRAIRIE VALLEY SUBDIVISION FIRST ADDITION, STORY COUNTY, IOWA

THE QUARRY ESTATES, L.L.C.

By: _____ By: _____
Kurt W. Friedrich, Manager Richard J. Johansen, Manager

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Kurt W. Friedrich, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Richard J. Johansen, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

DRAFT - WORKING COPY 04/23/2020

INSTRUMENT PREPARED BY:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010 (515) 288-2500
RETURN TO:	Brian D. Torresi, 2605 Northridge Pkwy., Ames, IA 50010

OUTLOT USE RESTRICTIONS AND MANAGEMENT/OWNERSHIP AGREEMENT

THIS OUTLOT USE RESTRICTIONS AND MANAGEMENT/OWNERSHIP AGREEMENT (this "Agreement") is being made and entered into between Story County, Iowa (the "County"), the Story County Conservation Board ("SCCB"), and The Quarry Estates, L.L.C. (the "Developer") related to the development of Prairie Valley Subdivision, Story County, Iowa (the "Subdivision").

1. The Developer hereby understands. acknowledges, and agrees that any and all development within the Subdivision (said term includes any and every addition thereof) shall be in accordance with the following provisions and/or instruments:

a. the Stormwater Management Plan (the "SWMP") submitted as part of the preliminary plat of the Subdivision (the "Preliminary Plat");

b. the Erosion Control Plan (the "ECP") submitted as part of the Preliminary Plat;

c. the Protection Subdrain Plan (the "PSP") submitted as part of the Preliminary Plat;

d. the Fence Plan (the "Fence Plan") submitted as part of the Preliminary Plat;

e. the access easement granted in favor of SCCB submitted as part of the Preliminary Plat;

f. applicable provisions of the Code of Ordinances of Story County, Iowa (the "Code");

g. the Iowa Statewide Urban Design and Specifications ("SUDAS");

h. as applicable, the terms and provisions of the Restrictive Covenants and Regulations for Prairie Valley Subdivision First Addition, Story County, Iowa (collectively, with the similar restrictive covenant instruments for each future addition of the Subdivision, the "Covenants") with respect to the duties and requirements of the Developer and/or the Association (as that term is defined in the Covenants) as identified therein; and

i. any and every supplement and/or amendment to the SWMP, the ECP, the PSP, the Fence Plan, the Code, and SUDAS related to future additions of the Subdivision.

2. The Developer agrees to the following conditions and restrictions with respect to outlots within the Subdivision that are owned by the Association (collectively, the "Outlots" and individually, an "Outlot") and with respect to lots within the Subdivision dedicated and conveyed by the Developer to the County as part of the platting of the Subdivision (collectively, the "County Lots" and individually, a "County Lot"):

a. the Developer shall convey the applicable County Lots to the County by warranty deed with each phase of the Subdivision;

b. all Outlots and County Lots that contain greenspace and/or Conservation Easements (as that term is defined in the Covenants) shall be managed as native prairie lots and plantings thereon shall be in strict compliance with the requirements of the SCCB, such management shall include, bot not be limited to: (i) the prohibition on planting or growing, in any manner, any invasive plant species (as defined by the Iowa Department of Natural Resources Forestry Invasive Species Guide) on any Outlot, (ii) the requirement that all shrubs and trees planted on any Outlot be of a native species, and (iii) the requirement of preapproval by the SCCB of any seed mixes used on any Outlot;

c. water quality within the County Lots shall be tested by the SCCB and/or the County, and in the event the testing indicates the use of fertilizers and/or lawn additives that contain phosphates in violation of the Covenants, the SCCB and/or the County is authorized, pursuant to the Covenants, to resort to an action at law or in equity for relief, either by injunction or in damages, against any person then owning a Lot (as that term is defined in the Covenants) in the Subdivision so violating the Covenants in said manner, and is entitled to attorneys' fees and costs related thereto;

d. no construction materials, debris, hazardous materials, household items, or unapproved plants or soil shall be placed, at any time, on any of the Outlots or the County Lots;

e. the County Lots shall be limited to light foot traffic, and no sledding, biking, hunting, trapping, or other activities prohibited by the SCCB shall be permitted on the County Lots;

f. the SCCB and/or the County shall be responsible for: (i) the construction and creation of a trail system within or across any County Lot, (ii) the construction and creation of shelters or other structures for public use on the County Lots, as may be shown and identified on the Preliminary Plat, as agreed to by the SCCB, the Developer, and the Association, (iii) the construction of an access gate to designated portions of any County Lot, and (iv) the construction and creation of public parking areas with respect to the Subdivision and the County Lots located therein; and

g. the Developer shall be responsible for: (i) the construction of three (3) split-rail fences on the common property lines of the County Lots and the Outlots in order

to protect environmentally sensitive areas as identified in the Fence Plan, and (ii) the construction of the protection subdrain as identified in the PSP.

3. The parties agree that this Agreement may be modified, amended or supplemented only by written agreement of the parties. This Agreement shall run with the real property made part of the Subdivision and shall be binding upon Developer, its successors and assigns. Time is of the essence in this Agreement. The failure to promptly assert any rights herein shall not, however, be a waiver of such rights or a waiver of any existing or subsequent default. To facilitate execution, this Agreement may be executed in as many counterparts as may be required. It shall not be necessary that the signature on behalf of the parties hereto appear on each counterpart. All counterparts shall collectively constitute a single Agreement. The laws of the State of Iowa shall govern this Agreement. Any dispute relating to this Agreement shall be adjudicated in the Iowa District Court for Story County.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed as of the dates set forth below.

Dated this __ day of April, 2020.

(SIGNATURE PAGE FOLLOWS)

DRAFT - WORKING COPY 04/23/2020

SIGNATURE PAGE OF
OUTLOT USE RESTRICTIONS AND DEVELOPMENT AGREEMENT

THE QUARRY ESTATES, L.L.C.

By: _____
Kurt W. Friedrich, Manager

By: _____
Richard J. Johansen, Manager

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Kurt W. Friedrich, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Richard J. Johansen, as a Manager of The Quarry Estates, L.L.C.

_____
Notary Public in and for the State of Iowa
My commission expires _____

STORY COUNTY, IOWA

By: _____
Linda Murken, Chair. Board of Supervisors

By: _____
Lucy Martin, Story County Auditor

STATE OF IOWA, STORY COUNTY, SS:

This record was acknowledged before me on this ___ day of April, 2020, by Linda Murken and Lucy Martin, the Chair of the Board of Supervisors and the County Auditor, respectively, of Story County, Iowa.

_____
Notary Public in and for the State of Iowa
My commission expires _____

ALLIANT ENERGY.

March 13, 2020

Kurt Friedrich
Dotson Farm Plat
Gilbert, IA 50105

RE: Dotson Farm Plat Proposed Subdivision

Dear Kurt:

Please accept this letter as confirmation that the proposed Dotson Farms residential subdivision is within Alliant Energy service territory for gas service. Alliant is currently investigating options to service this property. The closest gas main is at 170th & George Washington Carver. And we are needing to work with Northern Natural Gas on the ability to increase gas capacity.

If Alliant Energy can not provide gas service at this time, then the subdivision has the ability to be serviced with individual Liquid Petroleum (LP) gas tanks.

Sincerely,

Jacob Clark
Field Engineering Specialist II
Alliant Energy
1284 XE Place
Ames, Iowa 50014
515-268-3412

Amelia Q. Schoeneman

From: John Gade <jmg@foxeng.com>
Sent: Thursday, April 23, 2020 11:05 AM
To: Amelia Q. Schoeneman
Subject: Fwd: Dotson Farms - Story County Subdivision

[External Sender - Please Use Caution]

FYI...Alliant Energy is planning to supply Gas Service to Prairie Valley.

John Gade, P.E.
FOX Engineering Associates, Inc.
414 South 17th Street | Suite 107 | Ames, IA 50010
Office | 515.233.0000 | Cell | 515.291.2470
www.foxeng.com

From: "Paul Ryan" <RyanPaul@alliantenergy.com>
To: "John Gade" <jmg@foxeng.com>
Cc: "Clark, Jacob" <JacobClark@alliantenergy.com>
Sent: Thursday, April 23, 2020 10:55:40 AM
Subject: RE: Dotson Farms - Story County Subdivision

Hi John,
Our team has finally done finished our study on extending natural gas to the Dotson Subdivision. To extend gas main from GW Carver Ave along 170th west and into the subdivision along all new roads, we are looking at a figure around $297,000.

This project would fall under an extension agreement signed by the developer which is good for 10 years. Under this agreement, as gas meter is installed to a customer there would be a refund of roughly $1,114 per meter to the developer. Friedrich has done this agreement in the past so they should be familiar.

If you have any questions feel free to reach our to myself or Jacob

Thanks

Ryan Paul | TL Field Engineering

ALLIANT ENERGY
1284 XE Place | Ames, IA 50014
Office: (515) 268-3487 | Fax: (515)268-3594
alliantenergy.com | ryanpaul@alliantenergy.com

From: John Gade <jmg@foxeng.com>
Sent: Thursday, March 12, 2020 11:26 AM
To: Paul, Ryan <RyanPaul@alliantenergy.com>
Subject: Re: Dotson Farms - Story County Subdivision

[This is an external email. Be cautious with links, attachments and responses.]

Paul,

We are submitting the Preliminary Plat this week. Can we please get a letter from Alliant Energy regarding servicing this property? This is a platting requirement.

Thanks for your help.

John Gade, P.E.
FOX Engineering Associates, Inc.
414 South 17th Street | Suite 107 | Ames, IA 50010
Office | 515.233.0000 | Cell | 515.291.2470
www.foxeng.com

From: "John Gade" <jmg@foxeng.com>
To: "Paul Ryan" <ryanpaul@alliantenergy.com>
Sent: Tuesday, March 3, 2020 1:21:22 PM
Subject: Fwd: Dotson Farms - Story County Subdivision

John Gade, P.E.
FOX Engineering Associates, Inc.
414 South 17th Street | Suite 107 | Ames, IA 50010
Office | 515.233.0000 | Cell | 515.291.2470
www.foxeng.com

From: "John Gade" <jmg@foxeng.com>
To: ryanpaul@alliantenery.com
Cc: "Kurt Friedrich" <kfriedrich@friedrich-realty.com>
Sent: Thursday, February 27, 2020 5:49:15 PM
Subject: Dotson Farms - Story County Subdivision

Ryan,

Hope all is well. FOX is working with Kurt Friedrich on a proposed residential subdivision in Story County called Dotson Farms. The project is located at the SE corner of 500th Ave (County Line Road) & 170th Street. The development is approximately 1.5 miles west of Gilbert.

As part of the Preliminary Plat submittal to Story County, they require a letter from Alliant Energy acknowledging they will electrical and gas service the property (see example from Cameron Estates).

The development consists of 70 single family lots varying is lot size from a minimum of 0.60 acres to 1.0-acres. 100-acres will be dedicated to Story County as Greenbelt Conservation. The project is likely to be built in four (4) phases.

Phase 1: Lots 1-28
Phase 2: Lots 29-41
Phase 3: Lots 42-51
Phase 4: Lots 56-70

Thanks for your consideration and let me know if you have any questions.

John Gade, P.E.
FOX Engineering Associates, Inc.
414 South 17th Street | Suite 107 | Ames, IA 50010
Office | 515.233.0000 | Cell | 515.291.2470
www.foxeng.com

March 9, 2020

Story County Planning Department
900 6th St.
Nevada, IA 50201

To Whom it May Concern:

Xenia Rural Water District has reviewed the plat for Dotson Farms, a rural subdivision consisting of 70 single family homes located at the SE corner of 500th Ave and 170th Street in Story County. Xenia has the capacity to provide domestic water service to this property.

If you have any questions, please contact me at (515) 676-2117 ext. 116 or via email at ciben@xeniawater.org.

Sincerely,

Corey Iben

Corey Iben
HR & Administration Manager
Xenia Rural Water District

GILBERT - FRANKLIN TOWNSHIP
FIRE & EMERGENCY RESPONSE
AGENCY

P.O. BOX 1
GILBERT, IOWA 50105

March 3, 2020

To whom it may concern:

I've reviewed the images of the proposed development and acknowledge Gilbert-Franklin Twp. Fire Department will have the primary responsibility to cover the emergency response for this area, it is, after all, within Franklin Twp. and I would find it inappropriate to deny service.

I would like to mention that we are a volunteer fire & EMS department. Our members live and/or work (generally) in Franklin Twp., Gilbert & some in Ames. We respond via pager. I bring this up as a heads-up regarding the time involved with responding to the development area.
From the time we are toned out for a fire until someone reaches the station can be 2-5 minutes. Confirmed structure fires will be dispatched as a box alarm automatically paging mutual aid from Story City and Roland additional mutual aid can be called in from any number of surrounding departments. With this in mind, I would highly recommend all homeowners subscribe to, and have a monitored security system (such as ADT) installed & tied in with smoke detectors. Early, advanced alerting of a possible fire, especially in new construction, has a marked benefit of getting personnel & equipment moving before a fire can dig itself in without being noticed, or
if no one is home. Most homeowners insurance providers offer discounts on the premium for having a monitored security service.

Medical emergencies will have similar response times, however some personnel do respond by personal vehicle. Our ambulance service is primarily out of Mary Greely Medical Center in Ames but we have occasionally had Story County Hospital in Nevada or Huxley Ambulance respond when Ames units are tied up.

I am aware other developments near this area have installed fire hydrants. If these are planned within this development, please be aware that we cannot pump directly from these into our fire engine to attack a fire - the negative pressure that would be subjected to the water main would be enough to collapse the main. What we can do is attach a hose to allow water to free-flow into a portable tank from which we would be pumping water. The rate of flow from the rural water is questionable. Mutual aid water tenders would also be dumping into this portable tank.

I look forward to seeing this project advance. Please keep me in the loop as it progresses.

Thank you.
David Zeisneiss
Chief
Gilbert-Franklin Twp. Fire Department
gffdchief1105@gmail.com
515-290-7145

Midland Power Cooperative

To Whom it may concern:

The Dotson Farm development in Story County located at the southeast corner of 500th Ave and 170th St, is located within Midland Power Cooperative's territory. Midland Power will serve all lots located in the Dotson Farm development.

Sincerely,

Casey Huff
Director of Engineering

1005 East Lincoln Way
P.O. Box 420, Jefferson, IA 50129-0420
Phone (515) 386-4111 • Fax (515) 386-2385
www.midlandpower.coop

Your Touchstone Energy® Cooperative
The power of human connections®

Stormwater Management Plan

Dotson Farms Subdivision

Story County Iowa

FOX PN: 5470-18A

March 4, 2020

LICENSED PROFESSIONAL ENGINEER
ERIC L. THOMPSON 21937
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.

ERIC L. THOMPSON P.E. — DATE 3/4/20
License number 21937

My license renewal date is December 31, 2020.

Pages or sheets covered by this seal:
all

FOX engineering

414 South 17th Street, Suite 107
Ames, Iowa 50010
515.233.0000

Site Characteristics

A. Pre-Development Conditions

The existing site is currently in a mix of agricultural use conditions. A large portion of the site is in meadow and located in the floodplain. The floodplain and associated meadow will be undisturbed. The total site area is approximately 160 acres. A NRCS soil survey returned a predominantly B soil type. For the purpose of estimating site runoff, the B hydrologic soil group will be used.

Per the Story County Code 88.05, the site was reviewed, and the allowed discharge was determined to be the existing condition, (row crop agriculture cover, contoured in good condition), limited to the existing 5-yr release rate. This was a result of the 100-yr meadow condition found to have a higher site discharge than the 5-yr existing release rate. Therefore, the more restrictive rate was selected. For HSG B, the CN for the site will be **75** to establish allowed runoff.

There is also adjacent runoff from approximately 614 acres of agricultural land, CN 75, that will be bypassed, as overland flow, at the existing rates.

B. Post-Developed Conditions

The proposed site will be developed as a rural residential conservation subdivision. The proposed site will have a composite CN value of 66. This will be accomplished by preserving existing natural resources, minimizing pavement, and restoring the majority of the site to meadow. This plan is consistent with low impact development guidelines.

Proposed drainage patterns for the site will be similar to the existing conditions. The post-developed runoff will be managed through dry detention ponds located throughout the site. The storm water management design is outlined in section 4.

C. Contributing off-site flows

There are 3 off-site areas analyzed in the report. The basins were routed to account for restrictions offsite, this included culvers at 170th, and field depressions which create storage volume.

D. Floodplains, Floodways, and Wetlands

According the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) provided by FEMA, the proposed project site is located within the floodway. Additionally, there is no evidence of wetlands within the disturbed project limits.

E. Pre-development Runoff

1. Watershed Area
   Stormwater currently leaves the site as overland flow south to Squaw Creek. Refer to section 7, Map Appendix, for F.01 - Existing Conditions.

2. Time of Concentration
   The NRCS Lag method was used to determine time of concentration for this project. Refer to Section 8 for the time of concentration calculations.

   a. Small areas were limited to a minimum time of 10 minutes.

3. Precipitation Model
   The precipitation model used for this project was the rainfall Intensity-Duration-Frequency (IDF) curves, based on historic rainfall data for central Iowa, Region 5. IDF curve data was entered into Hydraflow software for hydraulic calculations.

4. Rainfall Loss Method
   SCS Curve Numbers (CN) were utilized to account for infiltration and rainfall loss. CN values were determined from Section 2C-5, Table 2 of the Iowa Stormwater Management Manual. To establish a pre-developed runoff rate, a CN value of 75 was used for an existing condition of row crops contoured in good condition. The 56.16 acres of undisturbed meadow was excluded from the site runoff analysis. The developed on-site area analyzed totals **103.48** acres. The CN value assumes hydrologic soil group B. Refer to Section 8 for calculations.

5. Runoff Model
   Runoff discharges for a range of storm events were calculated using Hydraflow software with the SCS Method for peak flows. Calculations are included in the Appendix. The calculated runoffs were used to establish the pre-development release rate from the site. To insure that proposed development will not cause a downstream detriment, the proposed release rate will not exceed the pre-development condition.

6. Summary of Pre-Development Runoff
   The release rate for pre-development condition, on-site, at the 5-year rate was calculated to be **82.44 cfs**. Total discharge from the site, is tabulated as follows:

Table 1.1 – Pre-Development Release Rates

		Duration	*SCS*	*1-year*	*5-year*	*100-year*
		24hr	**CN value**	**2.67**	**3.81**	**7.12**
Location	**Area (AC)**	**TC (min)**	**Composite**	**Q1 (cfs)**	**Q5 (cfs)**	**Q100 (cfs)**
EXISTING BASIN A	17.23	79	**75**	6.68	14.82	42.94
EXISTING BASIN B	40.42	74	**75**	16.44	36.45	105.59
EXISTING BASIN C	16.06	58	**75**	7.19	15.90	45.88
EXISTING BASIN D	6.58	26	**75**	4.84	10.47	29.96
EXISTING BASIN E	1.85	6	**75**	2.34	4.80	13.13
OFF-SITE B (ROUTED)	602.98		**75**	48	85.57	185.35
Off-Site BASIN C 1	2.66	20	**75**	2.144	4.601	13.13
Off-Site BASIN C 2	8.14	36	**75**	4.35	9.54	27.45
			Total Release	**91.98**	**182.15**	**463.43**

Table 1.2 – Allowed Release Rates, with offsite by-pass

		Duration	*SCS*	*1-year*	*5-year*	*100-year*
		24hr	**CN value**	**2.67**	**3.81**	**7.12**
Location	**Area (AC)**	**TC (min)**	**Composite**	**Q1 (cfs)**	**Q5 (cfs)**	**Q100 (cfs)**
On-Site Allowed Release	82.14	n/a	**75**	37.49	82.44	82.44
Off-site Bypass	613.79	n/a	**75**	54.49	99.71	225.93
			Existing Release	**91.98**	**182.15**	**308.37**

Post-Development Runoff Analysis

A. Watershed Area

The proposed site utilizes low impact development features such as, restoration of green space areas, preservation of existing meadow and wetlands within the floodplain, use of native vegetation into the landscaping plan, and preservation of native trees. Storm Water will be discharged from the site at three outfall locations. Generally, all the discharge from the site will be held in the dry detention basins and release at rates no greater than the existing 5-yr rate. Refer to Section 7 for the Post-Development Drainage Map.

B. Time of Concentration

The NRCS Lag method was used to determine time of concentration for this project. Refer to Section 8 for the time of concentration calculations.

a. Small areas were limited to a minimum time of 10 minutes.

C. Precipitation Model

The precipitation model used for post-development is the same as outlined in Section 1 for the existing site. The precipitation model used for this project was the rainfall Intensity-Duration-Frequency (IDF) curves, based on historic rainfall data for central Iowa, Region 5. IDF curve data was entered into Hydraflow software for hydraulic calculations.

D. Rainfall Loss Method

The rainfall loss method used for post-development is the same as outlined in Section 1 for the existing site. SCS Curve Numbers (CN) were utilized to account for infiltration and rainfall loss. CN values were determined from Section 2C-5, Table 2 of the Iowa Stormwater Management Manual. Generally, the site is composed of impervious area and green space. The post-developed site (160 ac) was determined to have a composite Curve Number value of approximately 63. The area to be developed will have a CN of 70, and areas returned to meadow will be 58. Refer to Section 8 for calculations.

E. Runoff Model

Runoff discharges for a range of storm events were calculated using Hydraflow software with the SCS Method for peak flows. Stormwater routing was also completed using the SCS Method and Hydraflow software. Calculations are included in the Appendix.

F. Summary of Predevelopment Runoff

The allowable release rate for the site was established, in Section 1: Site Characteristics, to be **82.44 cfs** for the on-site 5-year event. The total allowed including by-pass is **182.15 cfs** for the 5-yr event and **308.37 cfs** for the 100-yr.

G. Summary of Post Development Runoff

A summary of site release rates are as follows:

Table 2.1 – Summary of Post-Development Discharge

		Duration	*SCS*	*1-year*	*5-year*	*100-year*
		24hr	**CN value**	**2.67**	**3.81**	**7.12**
Location	**Area (AC)**	**TC (min)**	**Composite**	**Q1 (cfs)**	**Q5 (cfs)**	**Q100 (cfs)**
Proposed Basin A	17.36	n/a	**66**	0.86	1.28	3.50
Proposed Basin B1	7.80	n/a	**66**	0.57	1.15	10.38
Proposd Basin B (Dam)	32.19	n/a	**67**	48.57	91.93	194.31
Proposed Basin C	18.75	n/a	**62**	6.14	11.63	47.14
Proposed Basin D	4.20	n/a	**69**	2.55	6.66	21.90
Proposed Basin E	1.85	n/a	**70**	1.25	3.11	9.93
Proposed Basin B (lots 10-11)	1.45	15	**68**	0.17	0.38	8.08
Proposed Basin B (lots 51-52)	2.35	15	**68**	0.17	0.38	13.08
			Total Release	**60.28**	**116.51**	**308.32**
			Total allowed	**91.98**	**182.15**	**308.37**
			Net Change	**-31.70**	**-65.64**	**-0.05**

Storm water Conveyance Design

A. Design Information References

The design for storm water facilities and utilities follow the Iowa Statewide Urban Design Standards for Public Improvements, 2019 Edition.

B. Storm Sewer

The storm sewer for this site was designed to convey at a minimum the 100-year post development event. The Rational Method was used to determine flow rates for each individual area. The Manning's Equation was used to size each pipe. Refer to Section 8 for storm sewer design calculations.

C. Culverts

There are two culverts located on the project. Both are sized to pass the 100-yr flow generated from the offsite areas as modeled in hydraflow. Culverts were sized to pass the 100-yr event without exceeding the top of culvert.

D. Storm Drainage Outlets and Downstream Analysis

Storm water will leave the site at two discharge locations. See Section 2, Table 2.1 for a summary of post-development discharge rates from the site. Refer to F.02 Post-Development Conditions for basin locations.

E. Hydraulic Model

The Rational Method was used to determine storm sewer capacity for this project. Storm sewer routing and pond capacity was analyzed using Bentley Flow Master, V8i and Hydraflow by AutoCAD.

Storm Water Management Design

A. Design Standards

The design for storm water facilities follows the current version of the Iowa Storm Water Management Manual.

B. Detention Basin Location

There are five detention locations. All detention locations are dry detention and located at the lower end of their associated sub basin. Each pond is named for the sub basin it is located in. The existing dam, located in the center of Basin B, will be left in place. Refer to Section 7, Map index.

C. Detention Basin Performance

The ponds have been sized and modeled using Hydraflow Hydrographs by AutoCAD using the SCS Method for stormwater routing. The Ponds were modeled taking into consideration the following components:

1. Water Quality Volume
2. Channel Protection Volume
3. Extreme Flood Protection

Water Quality is accomplished on this site through extended detention and infiltration. Additionally, SQR will be incorporated in all green space areas to a minimum depth of 8-inches. This will mitigate environmental impacts on the area. Recharge calculations have been provided is Section 8 for reference of expected infiltration.

The Channel Protection volume is defined as providing detention to allow the smaller 1-year 24-hour duration storms to be held on site and slowly released over 24 to 48 hours. This will assist in protecting downstream channels from erosive velocities and unstable conditions.

The final component of the detention facility design was protecting downstream properties from the rare storm events up to the 100-year to ensure that runoff is not released at a rate greater than the pre-settlement rates.

D. Detention Basin Outlets

Pond A – 24” riser with a 15” outlet, primary low flow outlet of 6”, secondary outlet of 8”
Pond B1 – 24” riser with a 15” outlet, primary low flow outlet of 6”
Pond B2 – 24” riser with a 24” outlet, primary low flow outlet of 15”
Pond B3 – 24” riser with a 24” outlet, primary low flow outlet of 4”
Pond C3 – 30” riser with a 30” outlet, primary low flow outlet of 15”

E. Spillway and Embankment Protection

All detention ponds have an emergency spillway designed to pass extreme events while maintaining a minimum of one foot of free board.

F. Runoff Model

Peak discharges for Pre-Developed and Post-Developed conditions were determined for the detention facilities with Hydraflow Hydrographs by AutoCAD using the SCS Method for stormwater routing. Peak pond elevations were also determined for each rainfall event. Peak discharges were analyzed for both on-site flows and contributing off site flow routing. Refer to Section 8 for routing calculations. The following tables are a summary of the results:

Table 3.1 - Summary of Pond A Storage

Pond A		
	Required	**Provided**
Water Quality Volume Treated (cf)	18,117.33	61,837.78
CPv Release Rate (cfs)	6.68	0.86
CPv Storage Provided (cf)		6,723.00
CPv Water Surface Elevation		932.26
5-year Release Rate (cfs)	14.82	1.28
5-year Storage Provided (cf)		27,031.00
5-year Water Surface Elevation		933.36
100-year Release Rate (cfs)	14.82	3.50
100-year Storage Provided (cf)		116,512.00
100-year Water Surface Elevation		935.42

Table 3.2 - Summary of Pond B1 Storage

Pond B1		
	Required	**Provided**
Water Quality Volume Treated (cf)	41,734.56	153,313.78
CPv Release Rate (cfs)	16.44	0.57
CPv Storage Provided (cf)		2,716.00
CPv Water Surface Elevation		934.70
5-year Release Rate (cfs)	36.45	1.15
5-year Storage Provided (cf)		9,523.00
5-year Water Surface Elevation		935.99
100-year Release Rate (cfs)	36.45	10.38
100-year Storage Provided (cf)		35,289.00
100-year Water Surface Elevation		938.74

Table 3.3 - Summary of Pond B2 Storage

Pond B2		
	Required	**Provided**
Water Quality Volume Treated (cf)	41,734.56	153,313.78
CPv Release Rate (cfs)	16.44	1.92
CPv Storage Provided (cf)		2,818.00
CPv Water Surface Elevation		938.80
5-year Release Rate (cfs)	36.45	4.52
5-year Storage Provided (cf)		8,878.00
5-year Water Surface Elevation		939.49
100-year Release Rate (cfs)	36.45	13.57
100-year Storage Provided (cf)		45,904.00
100-year Water Surface Elevation		941.89

Table 3.4- Summary of Pond B3 Storage

Pond B3		
	Required	**Provided**
Water Quality Volume Treated (cf)	41,734.56	153,313.78
CPv Release Rate (cfs)	16.44	0.39
CPv Storage Provided (cf)		1,545.00
CPv Water Surface Elevation		938.11
5-year Release Rate (cfs)	36.45	0.55
5-year Storage Provided (cf)		6,697.00
5-year Water Surface Elevation		939.00
100-year Release Rate (cfs)	36.45	0.83
100-year Storage Provided (cf)		33,523.00
100-year Water Surface Elevation		941.26

Table 3.5 - Summary of Existing Dam

EXISTING DAM		
	Required	**Provided**
Water Quality Volume Treated (cf)	N/A	153,313.78
CPv Release Rate (cfs)	64.44	48.57
CPv Storage Provided (cf)		207,180.00
CPv Water Surface Elevation		942.70
5-year Release Rate (cfs)	122.02	81.93
5-year Storage Provided (cf)		227,590.00
5-year Water Surface Elevation		942.99
100-year Release Rate (cfs)	221.80	194.31
100-year Storage Provided (cf)		296,169.00
100-year Water Surface Elevation		943.76

Table 3.5 - Summary of Pond C3 Storage

Pond C3		
	Required	**Provided**
Water Quality Volume Treated (cf)	19,567.97	74,017.15
CPv Release Rate (cfs)	7.19	6.14
CPv Storage Provided (cf)		7,990.00
CPv Water Surface Elevation		938.07
5-year Release Rate (cfs)	15.90	11.63
5-year Storage Provided (cf)		32,224.00
5-year Water Surface Elevation		939.49
100-year Release Rate (cfs)	45.88	47.14
100-year Storage Provided (cf)		100,913.00
100-year Water Surface Elevation		941.49

WQV provided is based on the total volume SQR available on site in that perspective basin. See soil management plan and Section 8 for soil management plans.

SECTION 5
Permits

Contents

- NPDES Permit

SECTION 6
References

Contents

- Works Cited
- NRCS Soils Map
- National Wetland Inventory Map

Works Cited

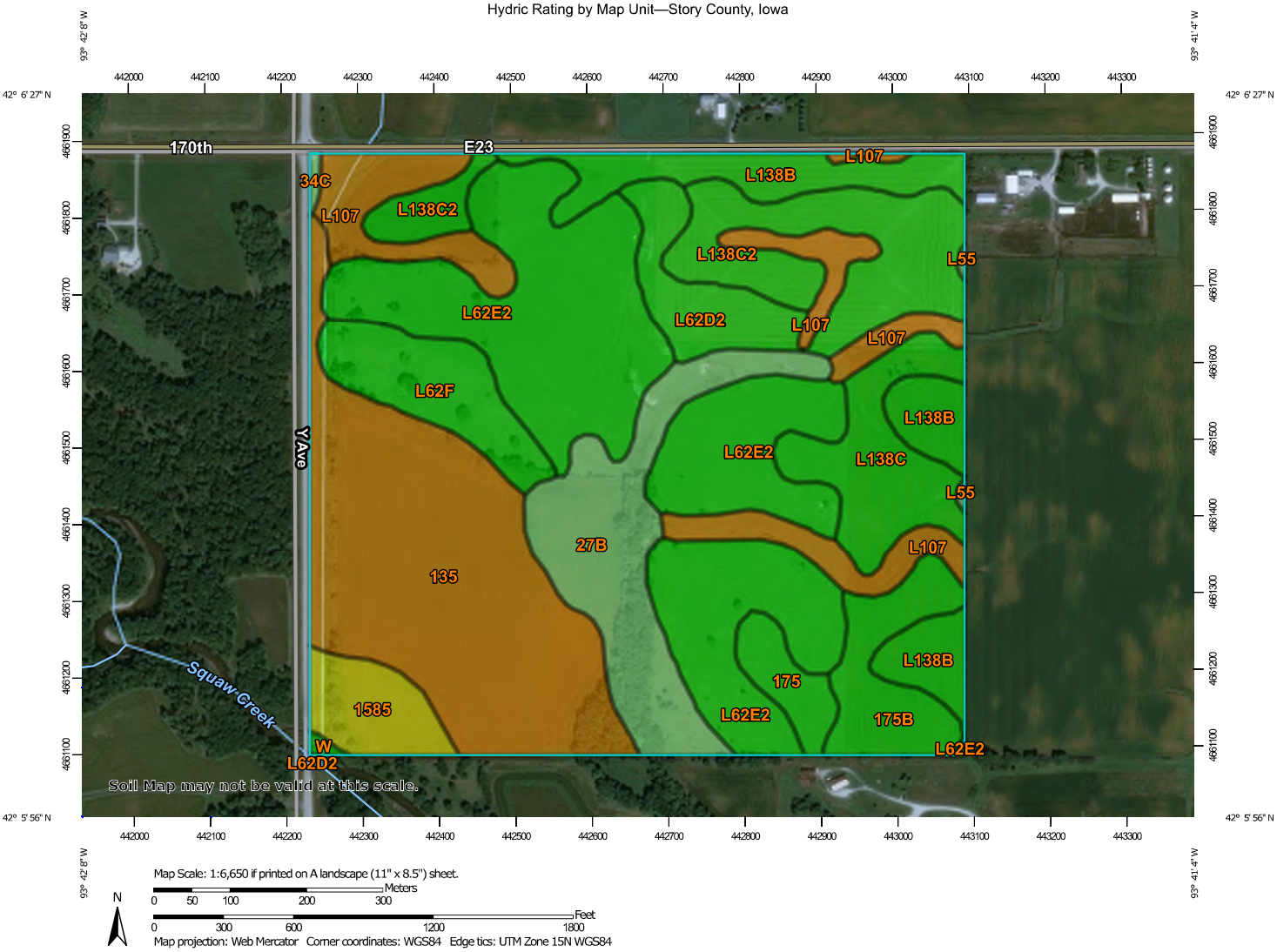
1. Statewide Urban Design and Specifications. (2020, January). Iowa Statewide Urban Design for Public Improvements 2020 Edition. http://www.iowasudas.org/design

2. Iowa Department of Natural Resources. (October 28, 2019). *Iowa Storm water Management Manual 2019 Edition*.

3. Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2016. [Computer Software].

4. Natural Resource Conservation Service. (n.d.) Hydrologic Soil Group-Story County, Iowa. Retrieved April 19, 2019, from http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Hydric Rating by Map Unit—Story County, Iowa



Map Scale: 1:6,650 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Lines

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Soil Rating Points

Hydric (100%)

Hydric (66 to 99%)

Hydric (33 to 65%)

Hydric (1 to 32%)

Not Hydric (0%)

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Story County, Iowa
Survey Area Data: Version 31, Sep 14, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 26, 2012—Sep 28, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
27B	Terril loam, 2 to 6 percent slopes	8	15.2	9.1%
34C	Estherville sandy loam, 2 to 6 percent slopes	1	0.2	0.1%
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	90	32.3	19.3%
175	Dickinson fine sandy loam, 0 to 2 percent slopes	0	3.0	1.8%
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	0	6.7	4.0%
1585	Spillville-Coland complex, channeled, 0 to 2 percent slopes	40	4.7	2.8%
L55	Nicollet loam, 1 to 3 percent slopes	5	0.2	0.1%
L62D2	Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded	0	5.8	3.5%
L62E2	Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded	0	42.2	25.3%
L62F	Belview loam, Bemis moraine, 16 to 30 percent slopes	0	7.5	4.5%
L107	Webster clay loam, Bemis moraine, 0 to 2 percent slopes	95	13.4	8.1%
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	0	11.7	7.0%
L138C	Clarion loam, Bemis moraine, 6 to 10 percent slopes	0	8.8	5.3%
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	0	14.9	8.9%
W	Water	0	0.2	0.1%
Totals for Area of Interest			**166.9**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

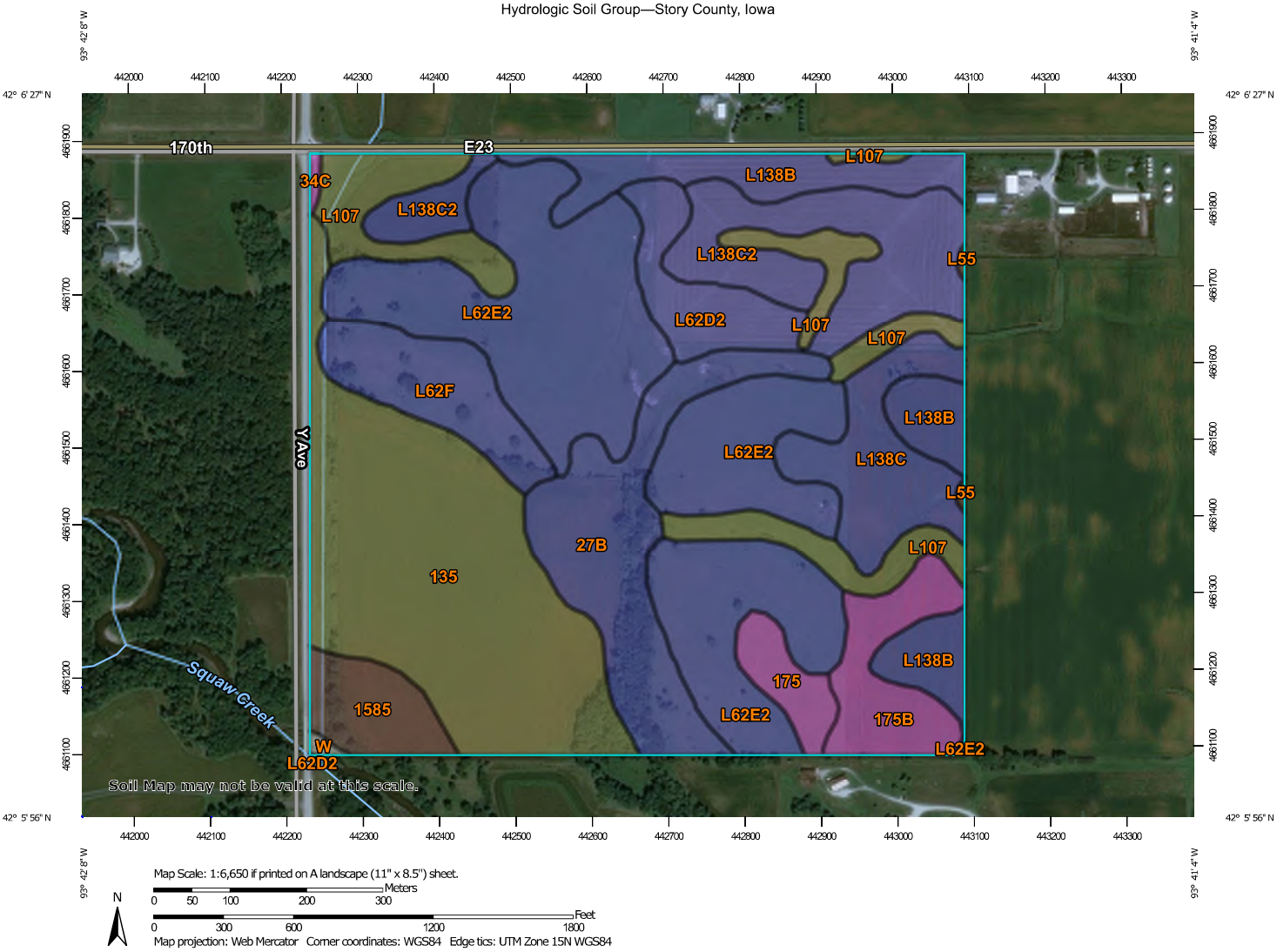
Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Story County, Iowa



Map Scale: 1:6,650 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Story County, Iowa
Survey Area Data: Version 31, Sep 14, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 26, 2012—Sep 28, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
27B	Terril loam, 2 to 6 percent slopes	B	15.2	9.1%
34C	Estherville sandy loam, 2 to 6 percent slopes	A	0.2	0.1%
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	C/D	32.3	19.3%
175	Dickinson fine sandy loam, 0 to 2 percent slopes	A	3.0	1.8%
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	A	6.7	4.0%
1585	Spillville-Coland complex, channeled, 0 to 2 percent slopes	B/D	4.7	2.8%
L55	Nicollet loam, 1 to 3 percent slopes	B/D	0.2	0.1%
L62D2	Storden loam, Bemis moraine, 10 to 16 percent slopes, moderately eroded	B	5.8	3.5%
L62E2	Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded	B	42.2	25.3%
L62F	Belview loam, Bemis moraine, 16 to 30 percent slopes	B	7.5	4.5%
L107	Webster clay loam, Bemis moraine, 0 to 2 percent slopes	C/D	13.4	8.1%
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	B	11.7	7.0%
L138C	Clarion loam, Bemis moraine, 6 to 10 percent slopes	B	8.8	5.3%
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	B	14.9	8.9%
W	Water		0.2	0.1%
Totals for Area of Interest			**166.9**	**100.0%**

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

U.S. Fish and Wildlife Service
National Wetlands Inventory

Dotson Farms, Story County, Iowa

November 20, 2019

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

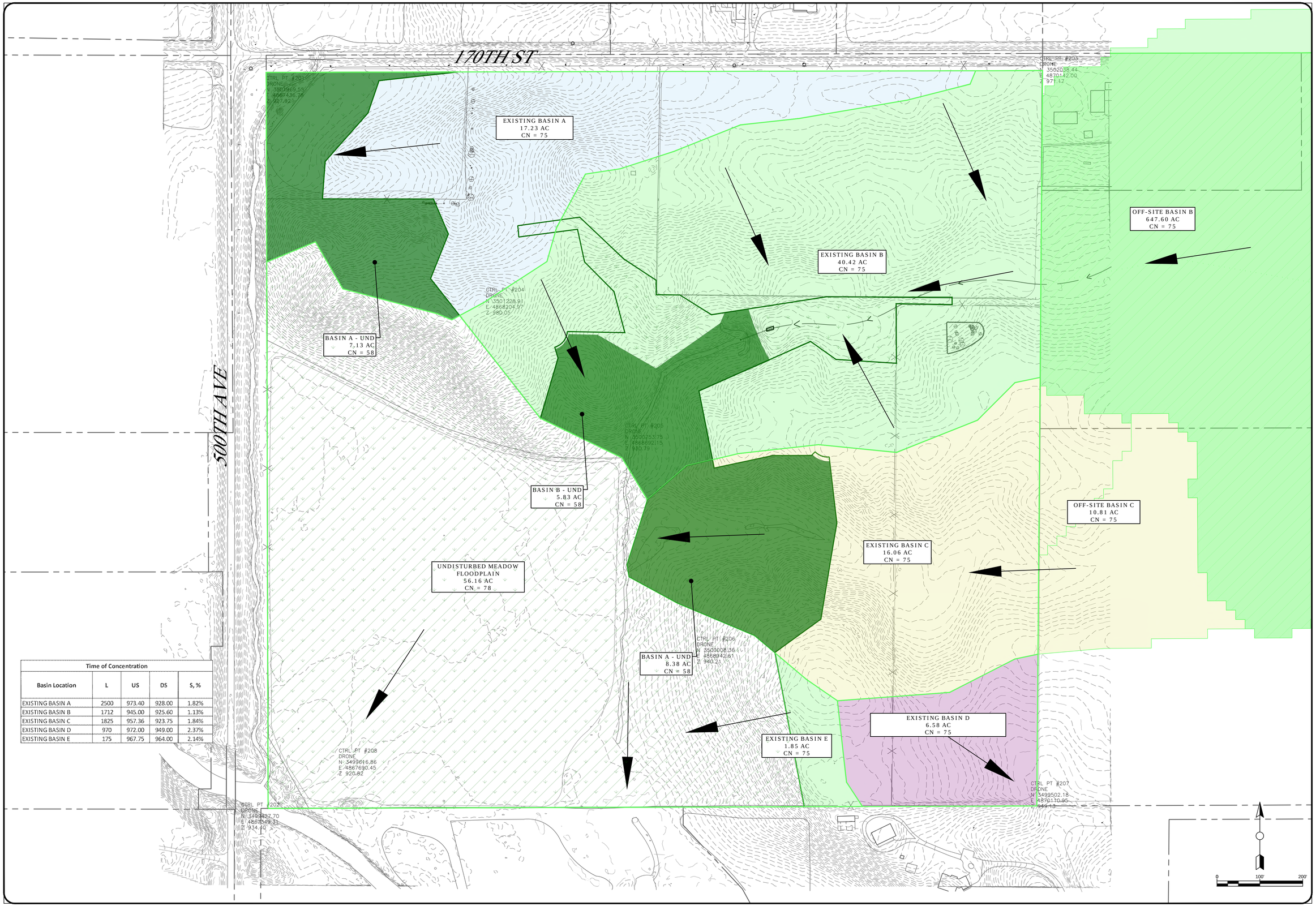
National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

SECTION 7
Map
Appendix

Contents

- Project Location Map
- Existing Conditions Map
- Post-Development Map
- Existing Off-Site Conditions Map

Project location
Gilbert



Time of Concentration				
Basin Location	L	US	DS	S, %
EXISTING BASIN A	2500	973.40	928.00	1.82%
EXISTING BASIN B	1712	945.00	925.60	1.13%
EXISTING BASIN C	1825	957.36	923.75	1.84%
EXISTING BASIN D	970	972.00	949.00	2.37%
EXISTING BASIN E	175	967.75	964.00	2.14%

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LAYOUT NAME: F.01

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		DRAWN:	ELT 03/20
		CHECKED:	
		LAST UPDATE: 3/4/20	

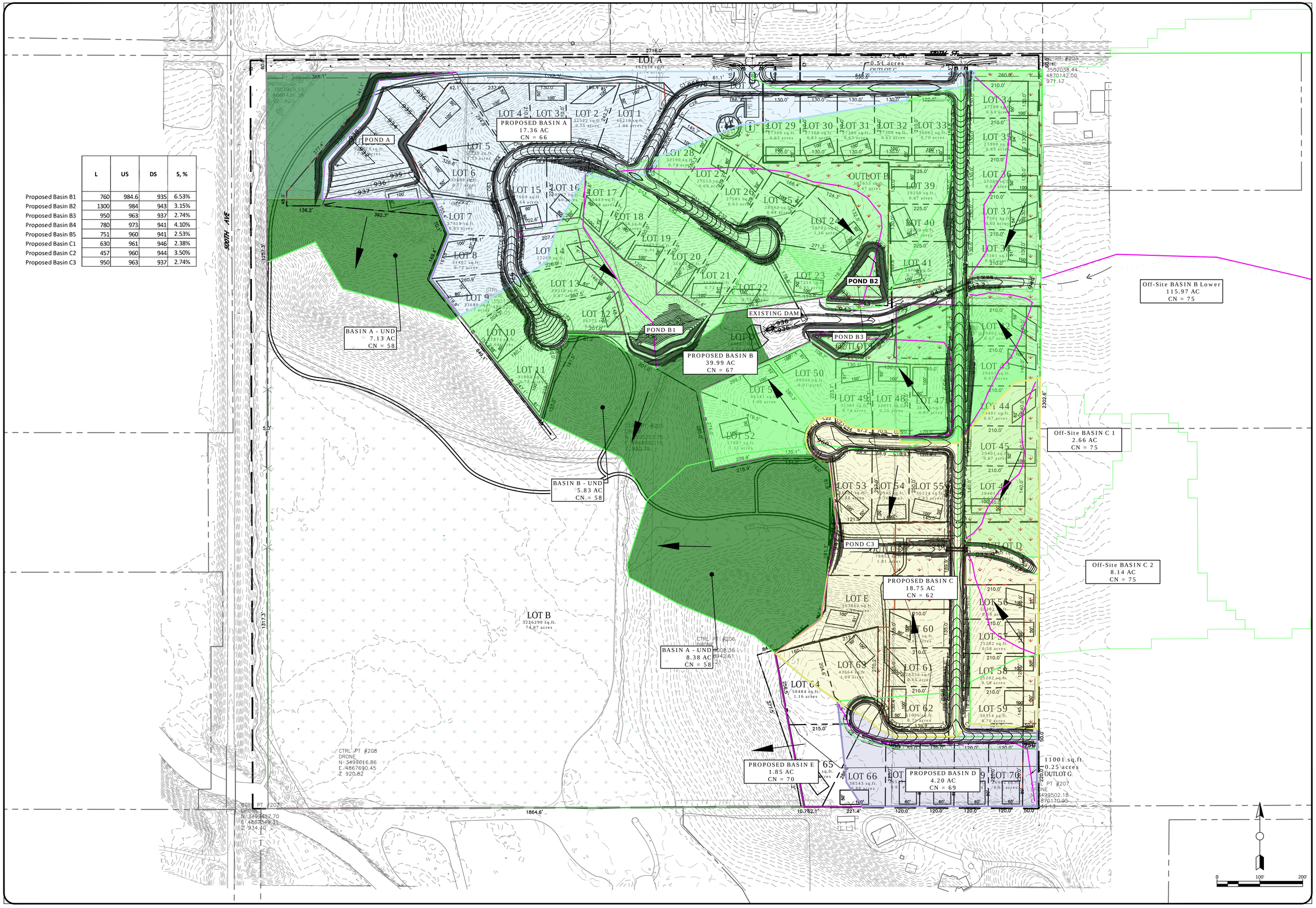
FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

EXISTING CONDITIONS
DOTSON FARMS
STORY COUNTY
2020

PROJECT NO.
5470-18A

SHEET
F.01

	L	US	DS	S, %
Proposed Basin B1	760	984.6	935	6.53%
Proposed Basin B2	1300	984	943	3.15%
Proposed Basin B3	950	963	937	2.74%
Proposed Basin B4	780	973	941	4.10%
Proposed Basin B5	751	960	941	2.53%
Proposed Basin C1	630	961	946	2.38%
Proposed Basin C2	457	960	944	3.50%
Proposed Basin C3	950	963	937	2.74%



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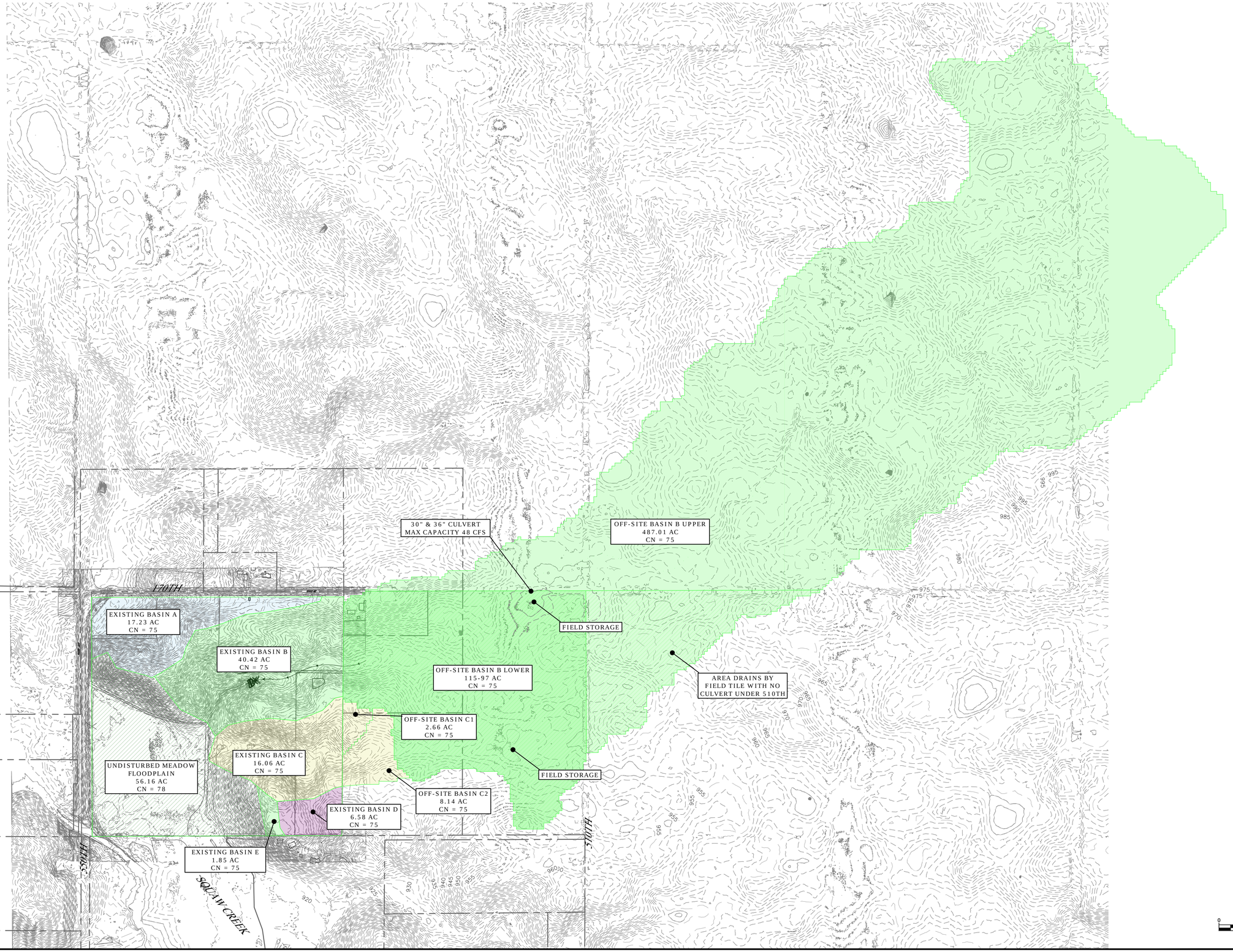
		DRAWN:	ELT 03/20
		CHECKED:	
		LAST UPDATE:	3/4/20

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103
FOX engineering

DEVELOPED CONDITIONS
DOTSON FARMS
STORY COUNTY
2020

PROJECT NO.
5470-18A

SHEET
F.02



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	CHECKED:		
	LAST UPDATE: 3/4/20		

FOX Engineering Associates, Inc.
414 South 17th Street, Suite 107
Ames, Iowa 50010
Phone: (515) 233-0000
FAX: (515) 233-0103

EXISTING OFF-SITE CONDITIONS

DOTSON FARMS
STORY COUNTY
2020

PROJECT NO.
5470-18A

SHEET
F.03

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LAYOUT NAME
F.03

SECTION 8
Calculation Appendix

Contents

- Technical Information
- Existing Conditions Report
- Post-Development Report

Table 1: Manning Coefficient for Sheet Flows

Surface Description	*n*
Smooth Surface (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated Soils:	
Residue cover ≤ 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[1]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[2]	
Light underbrush	0.40
Dense underbrush	0.80

Table 2: Velocity versus Slope for Shallow Concentrated Flow

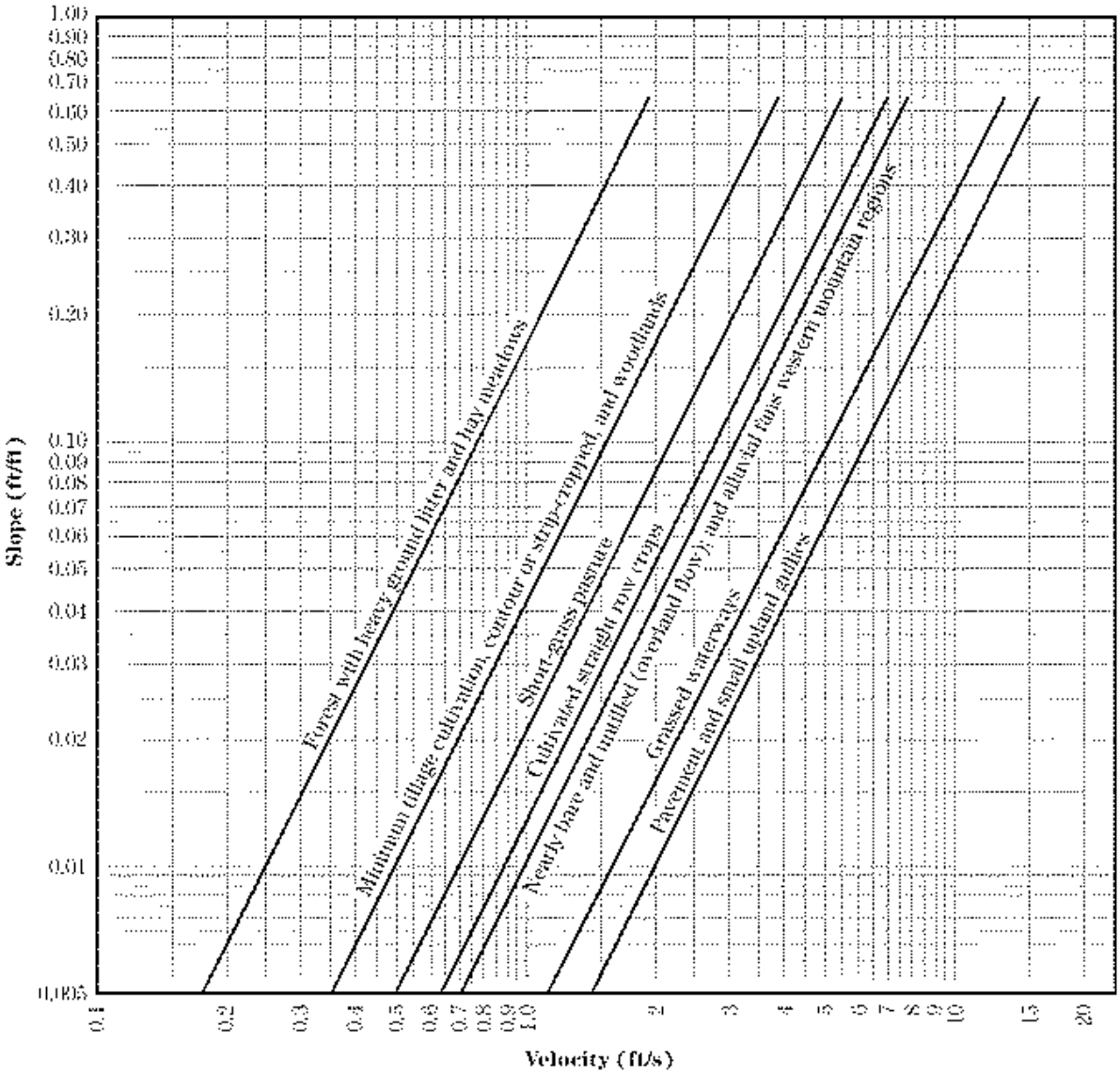

Table 3: Equations and assumptions developed from Table 2

Flow Type	Depth (feet)	Manning's n	Velocity Equation (ft/s)
Pavement and small upland gullies	0.2	0.025	$V = 20.238(s)^{0.5}$
Grassed waterways (and unpaved urban areas)	0.4	0.050	$V = 16.135(s)^{0.5}$
Nearly bare and untilled (overland flow); and alluvial fans	0.2	0.051	$V = 9.965(s)^{0.5}$
Cultivated straight row crops	0.2	0.058	$V = 8.762(s)^{0.5}$
Short-grass prairie	0.2	0.073	$V = 6.962(s)^{0.5}$
Minimum tillage cultivation, contour or strip-cropped, and woodlands	0.2	0.101	$V = 5.032(s)^{0.5}$
Forest with heavy ground litter and hay meadows	0.2	0.202	$V = 2.516(s)^{0.5}$

Table 4: Manning's Roughness Coefficients (n) for Open Channel Flow

Type of Channel and Description	n
A. Closed Conduits Flowing Partly Full	
1. Steel - Riveted and Spiral	0.016
2. Cast Iron - Coated	0.013
3. Cast Iron - Uncoated	0.014
4. Corrugated Metal - Subdrain	0.019
5. Corrugated Metal - Storm Drain	0.024
6. Concrete Culvert, straight and free of debris	0.011
7. Concrete Culvert, with bends, connections, and some debris	0.013
8. Concrete Sewer with manholes, inlet, etc., straight	0.015
9. Concrete, Unfinished, steel form	0.013
10. Concrete, Unfinished, smooth wood form	0.014
11. Wood - Stave	0.012
12. Clay - Vitrified sewer	0.014
13. Clay - Vitrified sewer with manholes, inlet, etc.	0.015
14. Clay - Vitrified subdrain with open joints	0.016
15. Brick - Glazed	0.013
16. Brick - Lined with cement mortar	0.015
B. Lined or Built-Up Channels	
1. Corrugated Metal	0.025
2. Wood - Planed	0.012
3. Wood - Unplaned	0.013
5. Concrete - Trowel finish	0.013
6. Concrete - Float finish	0.015
7. Concrete - Finished, with gravel on bottom	0.017
8. Concrete - Unfinished	0.017
9. Concrete Bottom Float Finished with sides of:	
a. Random stone in mortar	0.020
b. Cement rubble masonry	0.025
c. Dry rubble or rip rap	0.030
10. Gravel Bottom with sides of:	
a. Formed concrete	0.020
b. Dry rubble or rip rap	0.033
11. Brick - Glazed	0.013
12. Brick - In cement mortar	0.015
13. Masonry Cemented Rubble	0.025
14. Dry Rubble	0.032
15. Smooth Asphalt	0.013
16. Rough Asphalt	0.016
C. Excavated or Dredged Channel	
1. Earth, straight and uniform	
a. Clean, after weather	0.022
b. Gravel, uniform section, clean	0.025
c. With short grass, few weeds	0.027
2. Earth, winding and sluggish	
a. No vegetation	0.025
b. Grass, some weeds	0.030
c. Dense weeds or aquatic plants in deep channels	0.035
d. Earth bottom and rubble sides	0.030
e. Stony bottom and weedy banks	0.040
3. Channels not maintained, weeds and brush uncut	
a. Dense weeds, high as flow depth	0.080
b. Clean bottom, brush on sides	0.050
D. Natural Streams	
1. Clean, straight bank, full stage, no rifts or deep pools	0.030
2. As D.1 above, but some weeds and stones	0.035
3. Winding, some pools and shoals, clean	0.040
4. As D.3 above, but lower stages, more ineffective slope and sections	0.045
5. As D.3 above, but some weeds and stones	0.048
6. As D.4 above, but with stony sections	0.050
7. Sluggish river reaches, rather weedy or with very deep pools	0.070
8. Very weedy reaches	0.100

Proposed site Conditions Sub-Basin Area Calculations

Basin Name	Basin Area (sf)	Basin Area (ac)	Area Meadow (sf)	Area Meadow (ac)	Area Res 1/2 (sf)	Area Res (ac)	Meadow CN	Res CN	Composite CN
Proposed Basin A	756,037	17.36	240,870	5.53	516,413	11.86	58	70	66
Proposed Basin A-UND	310,743	7.13	310,743	7.13	0	0.00	58	70	58
Proposed Basin B	1,742,158	39.99	464,449	10.66	1,277,709	29.33	58	70	67
Proposed Basin B-UND	253,801	5.83	253,801	5.83	0	0.00	58	70	58
Proposed Basin C	816,647	18.75	200,012	4.59	552,271	12.68	58	70	62
Proposed Basin C-UND	365,011	8.38	365,011	8.38	0	0.00	58	70	58
Proposed Basin D	182,863	4.20	9,826	0.23	173,037	3.97	58	70	69
Proposed Basin E	80,379	1.85	0	0.00	80,379	1.85	58	70	70
UNDISTURBED MEADOW	2,446,211	56.16	2,446,211	56.16	0	0.00	58	70	58
CONTRIBUTING TOTALS	**6,953,850**	**159.64**	**1,844,713**	**42.35**	**2,599,809**	**59.68**		CN Total =	**63**
				26.53%		37.39%			

Basin Name	Basin Area (sf)	Basin Area (ac)	Area Meadow (sf)	Area Meadow (ac)	Area Res 1/2 (sf)	Area Res (ac)	Meadow CN	Res CN	Composite CN
Proposed Basin B1	339,973	7.80	103,496	2.38	236,478	5.43	58	70	66
Proposed Basin B2	507,848	11.66	107,460	2.47	400,388	9.19	58	70	67
Proposed Basin B3	214,925	4.93	64,013	1.47	150,913	3.46	58	70	66
Proposed Basin B4	201,000	4.61	48,512	1.11	152,489	3.50	58	70	67
Proposed Basin B5	111,950	2.57	27,844	0.64	84,106	1.93	58	70	67
Proposed Basin B (lots 10-11)	63,355	1.45	0	0.00	63,355	1.45	58	68	68
Proposed Basin B (lots 22-23)	41,781	0.96	0	0.00	41,781	0.96	58	70	70
Proposed Basin B (lots 51-52)	102,193	2.35	0	0.00	102,193	2.35	58	68	68
Proposed Basin B (UND TO DAM)	159,133	3.65	37,834	0.87	121,299	2.78	58	70	67
	1,742,158	**39.99**	**389,157**	**8.93**	**1,353,001**	**31.06**		CN Total =	**67**
Proposed Basin C1	146,778	3.37	62,326	1.43	84,452	1.94	58	70	65
Proposed Basin C2	165,849	3.81	46,370	1.06	119,479	2.74	58	70	67
Proposed Basin C3	504,020	11.57	166,918	3.83	337,102	7.74	58	70	66
Proposed Basin D1	182,863	4.20	10,940	0.25	171,923	3.95	58	70	69
Proposed Basin E1	80,379	1.85	0	0.00	80,379	1.85	58	70	70
CONTRIBUTING TOTALS	**6,953,850**	**159.64**	**4,292,347**	**98.54**	**2,662,749**	**61.13**		CN Total =	**67**

Table 2B-4.01: Runoff Coefficients for the Rational Method

Cover Type and Hydrologic Condition		Runoff Coefficients for Hydrologic Soil Group											
		A			***B***			***C***			***D***		
Recurrence Interval		***5***	***10***	***100***	***5***	***10***	***100***	***5***	***10***	***100***	***5***	***10***	***100***
Open Space (lawns, parks, golf courses, cemeteries, etc.)													
Poor condition (grass cover < 50%)		.25	.30	.50	.45	.55	.65	.65	.70	.80	.70	.75	.85
Fair condition (grass cover 50% to 75%)		.10	.10	.15	.25	.30	.50	.45	.55	.65	.60	.65	.75
Good condition (grass cover >75%)		.05	.05	.10	.15	.20	.35	.35	.40	.55	.50	.55	.65
Impervious Areas													
Parking lots, roofs, driveways, etc. (excluding ROW)		.95	.95	.98	.95	.95	.98	.95	.95	.98	.95	.95	.98
Streets and roads:													
Paved; curbs & storm sewers (excluding ROW)		.95	.95	.98	.95	.95	.98	.95	.95	.98	.95	.95	.98
Paved; open ditches (including ROW)		---	---	---	.70	.75	.85	.80	.85	.90	.80	.85	.90
Gravel (including ROW)		---	---	---	.60	.65	.75	.70	.75	.85	.75	.80	.85
Dirt (including ROW)		---	---	---	.55	.60	.70	.65	.70	.80	.70	.75	.85
Urban Districts (excluding ROW)													
Commercial and business (85% impervious)		---	---	---	---	---	---	.85	.85	.90	.90	.90	.95
Industrial (72% impervious)		---	---	---	---	---	---	.80	.80	.85	.80	.85	.90
Residential Districts by Average Lot Size (excluding ROW)[1]													
1/8 acre (36% impervious)		---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/4 acre (36% impervious)		---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/3 acre (33% impervious)		---	---	---	---	---	---	.55	.60	.70	.65	.70	.75
1/2 acre (20% impervious)		---	---	---	---	---	---	.45	.50	.65	.60	.65	.70
1 acre (11% impervious)		---	---	---	---	---	---	.40	.45	.60	.55	.60	.65
2 acres (11% impervious)		---	---	---	---	---	---	.40	.45	.60	.55	.60	.65
Newly Graded Areas (pervious areas only, no vegetation)													
Agricultural and Undeveloped													
Meadow - protected from grazing (pre-settlement)		.10	.10	.25	.10	.15	.30	.30	.35	.55	.45	.50	.65
Straight Row Crops													
Straight Row (SR)	*Poor Condition*	.33	.39	.55	.52	.58	.71	.70	.74	.84	.78	.81	.89
	Good Condition	.24	.30	.46	.45	.51	.66	.62	.67	.78	.73	.76	.86
SR + Crop Residue (CR)	*Poor Condition*	.31	.37	.54	.50	.56	.70	.67	.72	.82	.75	.79	.87
	Good Condition	.19	.25	.41	.38	.45	.61	.55	.60	.73	.62	.67	.78
Contoured (C).....	*Poor Condition*	.29	.35	.52	.47	.53	.70	.60	.65	.77	.70	.74	.84
	Good Condition	.21	.26	.43	.38	.45	.61	.55	.60	.73	.65	.69	.80
C+CR.....	*Poor Condition*	.27	.33	.50	.45	.51	.66	.57	.63	.75	.67	.72	.82
	Good Condition	.19	.25	.41	.36	.43	.59	.52	.58	.71	.62	.67	.78
Contoured & Terraced (C&T)	*Poor Condition*	.22	.28	.45	.36	.43	.59	.50	.56	.70	.55	.60	.73
	Good Condition	.16	.22	.38	.31	.37	.54	.45	.51	.66	.52	.58	.71
C&T + CR	*Poor Condition*	.13	.19	.35	.31	.37	.54	.45	.51	.66	.52	.58	.71
	Good Condition	.10	.16	.32	.27	.33	.50	.43	.49	.65	.50	.56	.70

[1] The average percent impervious area shown was used to develop composite coefficients.

Note: Rational coefficients were derived from SCS CN method

b. Composite Runoff Analysis: Care should be taken not to average runoff coefficients for large segments that have multiple land uses of a wide variety (i.e., business to agriculture). However, within similar land uses, it is often desirable to develop a composite runoff coefficient based on the percentage of different types of surface in the drainage area. The composite procedure can be applied to an entire drainage area, or to typical sample blocks as a guide to selection of reasonable values of the coefficient for an entire area.

Table 2B-4.03: Runoff Curve Numbers for Urban Areas[1]

Cover Type and Hydrologic Condition	Average Percent Impervious Area[2]	CN's for Hydrologic Soil Group			
		A	*B*	*C*	*D*
Fully Developed Urban Areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.):[3]					
Poor condition (grass cover < 50%)	----------	68	79	86	89
Fair condition (grass cover 50% to 75%)	----------	49	69	79	84
Good condition (grass cover >75%)	----------	39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	----------	98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)	----------	98	98	98	98
Paved; open ditches (including right-of-way)	----------	83	89	92	93
Gravel (including right-of-way)	----------	76	85	89	91
Dirt (including right-of-way)	----------	72	82	87	89
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town homes)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing Urban Areas					
Newly graded areas (pervious areas only, no vegetation)[4]	----------	77	86	91	94
Idle lands (CN's are determined using cover types similar to those in Table 2B-4.01)					

[1] Average runoff condition and I_a=0.2S

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figures 2B-4.01 or 2B-4.02.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figures 2B-4.01 or 2B-4.02 based upon the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Source: NRCS National Engineering Handbook, Part 630, Chapter 9

Table 2B-4.04: Runoff Curve Numbers for Cultivated Agricultural Lands[1]

Cover Description			CN's for Hydrologic Soil Group			
Cover Type	***Treatment***[2]	***Hydrologic Condition***[3]	***A***	***B***	***C***	***D***
Fallow	Bare Soil	---	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row Crops	Straight Row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small Grain	Straight Row (SR)	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	Contoured (C)	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	Contoured & terraced (C&T)	Poor	61	72	79	82
		Good	59	70	78	81
	C&T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close Seeded or Broadcast Legumes or Rotation Meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1] Average runoff condition and I_a=0.2S
[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.
[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good $\geq$20%), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Source: NRCS National Engineering Handbook, Part 630, Chapter 9

Table 2B-4.05: Runoff Curve Numbers for Other Agricultural Lands[1]

Cover Description		**CN's for Hydrologic Soil Group**			
Cover Type	***Hydrologic Condition[3]***	***A***	***B***	***C***	***D***
Pasture, grassland, or range - continuous forage for grazing[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow - continuous grass, protected from grazing and generally mowed for hay	---	30	58	71	78
Brush - brush-weed-grass mixture with brush the major element[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[4]	48	65	73
Woods - grass combination (orchard or tree farm)[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Farmsteads - buildings, lanes, driveways, and surrounding lots	---	59	74	82	86

[1] Average runoff condition and I_a=0.2S.
[2] *Poor*: <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.
[3] *Poor*: <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
[4] Actual curve number is less than 30; use CN = 30 for runoff computations
[5] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
[6] *Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed, but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing and litter and brush adequately cover the soil

2. **SCS Depth of Runoff:** Depth of runoff may be calculated through the SCS Curve Number Method. This method separates total rainfall into direct runoff, retention, and initial abstraction to yield the following equation for rainfall runoff.

$$Q = \frac{(P-I_a)^2}{(P-I_a)+S}$$ **Equation 2B-4.04**

where:

Q = Depth of direct runoff, in
P = Depth of 24 hour precipitation, in. for design year storm (e.g. 10 year, 24 hour)
S = Potential maximum retention after runoff begins, in
I_a = Initial abstraction, in

The initial abstraction (I_a) is all losses before runoff begins. It includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration during the early part of the storm. Interception and surface depression storage may be estimated from cover and surface conditions, but infiltration during the early part of the storm is highly variable and dependent on such factors as rainfall intensity, soil crusting, and soil moisture. Establishing a relationship for I_a

BASIN C RCP CULVERT

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	3.00	ft
Diameter	3.00	ft

Results

Discharge	66.69	ft^3/s
Flow Area	7.07	ft^2
Wetted Perimeter	9.42	ft
Hydraulic Radius	0.75	ft
Top Width	0.00	ft
Critical Depth	2.61	ft
Percent Full	100.0	%
Critical Slope	0.00912	ft/ft
Velocity	9.44	ft/s
Velocity Head	1.38	ft
Specific Energy	4.38	ft
Froude Number	0.00	
Maximum Discharge	71.74	ft^3/s
Discharge Full	66.69	ft^3/s
Slope Full	0.01000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

BASIN C RCP CULVERT

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.61	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00912	ft/ft

30" CMP Culvert Under 170th

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.024	
Channel Slope	0.31000	%
Normal Depth	30.00	in
Diameter	30.00	in

Results

Discharge	12.37	ft^3/s
Flow Area	4.91	ft^2
Wetted Perimeter	7.85	ft
Hydraulic Radius	7.50	in
Top Width	0.00	ft
Critical Depth	1.18	ft
Percent Full	100.0	%
Critical Slope	0.01509	ft/ft
Velocity	2.52	ft/s
Velocity Head	0.10	ft
Specific Energy	2.60	ft
Froude Number	0.00	
Maximum Discharge	13.31	ft^3/s
Discharge Full	12.37	ft^3/s
Slope Full	0.00310	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

30" CMP Culvert Under 170th

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	30.00	in
Critical Depth	1.18	ft
Channel Slope	0.31000	%
Critical Slope	0.01509	ft/ft

36" CMP Culvert Under 170th

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.024	
Channel Slope	0.82000	%
Normal Depth	36.00	in
Diameter	36.00	in

Results

Discharge	32.71	ft^3/s
Flow Area	7.07	ft^2
Wetted Perimeter	9.42	ft
Hydraulic Radius	9.00	in
Top Width	0.00	ft
Critical Depth	1.86	ft
Percent Full	100.0	%
Critical Slope	0.01655	ft/ft
Velocity	4.63	ft/s
Velocity Head	0.33	ft
Specific Energy	3.33	ft
Froude Number	0.00	
Maximum Discharge	35.19	ft^3/s
Discharge Full	32.71	ft^3/s
Slope Full	0.00820	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

36" CMP Culvert Under 170th

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	36.00	in
Critical Depth	1.86	ft
Channel Slope	0.82000	%
Critical Slope	0.01655	ft/ft

4'x4' BOX CULVERT

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	4.00	ft
Height	4.00	ft
Bottom Width	4.00	ft

Results

Discharge	182.88	ft^3/s
Flow Area	16.00	ft^2
Wetted Perimeter	16.00	ft
Hydraulic Radius	1.00	ft
Top Width	4.00	ft
Critical Depth	4.02	ft
Percent Full	100.0	%
Critical Slope	0.00673	ft/ft
Velocity	11.43	ft/s
Velocity Head	2.03	ft
Specific Energy	6.03	ft
Froude Number	1.01	
Discharge Full	182.88	ft^3/s
Slope Full	0.01000	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

4'x4' BOX CULVERT

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	4.00	ft
Critical Depth	4.02	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00673	ft/ft

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

BASIN A

Water Quality Volume

$$WQv = \frac{RV \times P \times A}{12} = (acre - ft)$$

RV = Volumetric Runoff Coefficient		
I = Percent Impervious Area (%)	**20**	%
RV = 0.05 + 0.009(I) = 0.23	**0.23**	
P = Water Quality Rainfall Depth =	**1.25**	inches
A = Total Drainage Area	**17.36**	acres
Impervious Area	3.558	acres

$$WQv = \frac{0.23 \times 1.25 \times 17.36}{12} \times \frac{43{,}560\ ft^2}{1\ acre} = 18{,}117.33\ ft^3$$

Runoff Curve Numbers

$$CN_{WQv} = \frac{1000}{10 + (5 \times P) + (10 \times Q_a) - 10\left(Q_a^{\,2} + 1.25 \times Q_a \times P\right)^{1/2}}$$

Q_a= Water Quality Runoff Volume = Rv+P = watershed inches

= 0.23 X 1.25 = 0.29 watershed inches

CN_{WQv} = **85**

$CN_{Composite}$= **66**

Water Quality Average Release Rate

$$Q_{WQv} = \frac{WQv}{24\ hrs \times 3600\ s/hr} = \frac{18{,}117.33}{86{,}400} = 0.21\ cfs$$

Water Quality Peak Release Rate

$Q_{WQv\ peak}$= 2 x Q_{WQv} = 2 X 0.21 = **0.42** cfs

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

BASIN B

Water Quality Volume

$$WQv = \frac{RV \times P \times A}{12} = (acre - ft)$$

RV = Volumetric Runoff Coefficient		
I = Percent Impervious Area (%)	**20**	%
RV = 0.05 + 0.009(I) = 0.23	**0.23**	
P = Water Quality Rainfall Depth =	**1.25**	inches
A = Total Drainage Area	**39.99**	acres
Impervious Area	8.799	acres

$$\mathbf{WQv} = \frac{\mathbf{0.23 \times 1.25 \times 39.99}}{\mathbf{12}} \times \frac{\mathbf{43{,}560\ ft^2}}{\mathbf{1\ acre}} = \mathbf{41{,}734.56}\ \mathbf{ft^3}$$

Runoff Curve Numbers

$$CN_{WQv} = \frac{1000}{10 + (5 \times P) + (10 \times Q_a) - 10\left(Q_a^{\,2} + 1.25 \times Q_a \times P\right)^{1/2}}$$

Q_a= Water Quality Runoff Volume = Rv+P = watershed inches

= 0.23 **X** 1.25 **=** 0.29 watershed inches

CN_{WQv} = **85**

$CN_{Composite}$= **66**

Water Quality Average Release Rate

$$Q_{WQv} = \frac{WQv}{24\ hrs \times 3600\ s/hr} = \frac{41{,}734.56}{86{,}400} = \mathbf{0.48}\ \mathbf{cfs}$$

Water Quality Peak Release Rate

$Q_{WQv\ peak}$= 2 x Q_{WQv} = 2 **X** 0.48 = **0.97** **cfs**

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

BASIN C

Water Quality Volume

$$WQv = \frac{RV \times P \times A}{12} = (acre - ft)$$

RV = Volumetric Runoff Coefficient		
I = Percent Impervious Area (%)	**20**	%
RV = 0.05 + 0.009(I) = 0.23	**0.23**	
P = Water Quality Rainfall Depth =	**1.25**	inches
A = Total Drainage Area	**18.75**	acres
Impervious Area	3.804	acres

WQv = $\frac{0.23 \times 1.25 \times 18.75}{12} \times \frac{43{,}560\ ft^2}{1\ acre} =$ **19,567.97** ft^3

Runoff Curve Numbers

$$CN_{WQv} = \frac{1000}{10 + (5 \times P) + (10 \times Q_a) - 10\left(Q_a^{\,2} + 1.25 \times Q_a \times P\right)^{1/2}}$$

Q_a= Water Quality Runoff Volume = Rv+P = watershed inches

= 0.23 **X** 1.25 **=** 0.29 watershed inches

CN_{WQv} = **85**

$CN_{Composite}$= **66**

Water Quality Average Release Rate

$$Q_{WQv} = \frac{WQv}{24\ hrs \times 3600\ s/hr} = \frac{19{,}567.97}{86{,}400} = \mathbf{0.23}\ cfs$$

Water Quality Peak Release Rate

$Q_{WQv\ peak}$= 2 x Q_{WQv} = 2 **X** 0.23 = **0.45** **cfs**

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

BASIN D

Water Quality Volume

$$WQv = \frac{RV \times P \times A}{12} = (acre - ft)$$

RV = Volumetric Runoff Coefficient		
I = Percent Impervious Area (%)	**20**	%
RV = 0.05 + 0.009(I) = 0.23	**0.23**	
P = Water Quality Rainfall Depth =	**1.25**	inches
A = Total Drainage Area	**4.2**	acres
Impervious Area	1.185	acres

WQv = (0.23 X 1.25 X 4.2) / 12 X (43,560 ft² / 1 acre) = 4,383.23 ft³

Runoff Curve Numbers

$$CN_{WQv} = \frac{1000}{10 + (5 \times P) + (10 \times Q_a) - 10\left(Q_a^{\,2} + 1.25 \times Q_a \times P\right)^{1/2}}$$

Q_a= Water Quality Runoff Volume = Rv+P = watershed inches

= 0.23 **X** 1.25 **=** 0.29 watershed inches

CN_{WQv} = **85**

$CN_{Composite}$= **66**

Water Quality Average Release Rate

Q_{WQv}= WQv / (24 hrs x 3600 s/hr) = 4,383.23 / 86,400 = **0.05 cfs**

Water Quality Peak Release Rate

$Q_{WQv\ peak}$= 2 x Q_{WQv} = 2 **X** 0.05 = **0.10 cfs**

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

BASIN E

Water Quality Volume

$$WQv = \frac{RV \times P \times A}{12} = (acre - ft)$$

RV = Volumetric Runoff Coefficient		
I = Percent Impervious Area (%)	**20**	%
RV = 0.05 + 0.009(I) = 0.23	**0.23**	
P = Water Quality Rainfall Depth =	**1.25**	inches
A = Total Drainage Area	**1.85**	acres
Impervious Area	0.555	acres

$$\mathbf{WQv} = \frac{\mathbf{0.23 \times 1.25 \times 1.85}}{\mathbf{12}} \times \frac{\mathbf{43{,}560\ ft^2}}{\mathbf{1\ acre}} = \mathbf{1{,}930.71}\ \mathbf{ft^3}$$

Runoff Curve Numbers

$$CN_{WQv} = \frac{1000}{10 + (5 \times P) + (10 \times Q_a) - 10\left(Q_a^{\,2} + 1.25 \times Q_a \times P\right)^{1/2}}$$

Q_a= Water Quality Runoff Volume = Rv+P = watershed inches

= 0.23 **X** 1.25 **=** 0.29 watershed inches

CN_{WQv} = **85**

$CN_{Composite}$= **66**

Water Quality Average Release Rate

$$Q_{WQv} = \frac{WQv}{24\ hrs \times 3600\ s/hr} = \frac{1{,}930.71}{86{,}400} = \mathbf{0.02}\ \mathbf{cfs}$$

Water Quality Peak Release Rate

$Q_{WQv\ peak}$= 2 x Q_{WQv} = 2 **X** 0.02 = **0.04** **cfs**

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

SQR Worksheet - Basin A

Soil Quality Restoration Calculations

% SOM By Weight	Bulk Density (gm/cm^3)	Available Water storage (in/in soil)	Available Water storage (in/4 in soil)	Available Water storage (in/6 in soil)	Available Water storage (in/8 in soil)
1	1.25	0.13	0.52	0.77	1.03
2	1.25	0.17	0.66	1.00	1.33
3	1.25	0.20	0.81	1.22	1.62
4	1.25	0.24	0.96	1.44	1.92
5	1.25	0.28	1.11	1.66	2.22
6	1.25	0.31	1.26	1.88	2.51
7	1.25	0.35	1.40	2.11	2.81
8	1.25	0.39	1.55	2.33	3.10

SQR Depth	**8.00**	in
% SOM By Weight	**4**	%
Available water storage	**1.920**	in
Total Area SQR (0.75 * (17.36-5.53))	**8.8725**	Acres

$$\textbf{SQR} = \frac{1.92}{12\text{ in}} \times \frac{8.87 \times 43{,}560\text{ ft}^2}{1\text{ acre}}$$

61,837.78 ft^3

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

SQR Worksheet - Basin B

Soil Quality Restoration Calculations

% SOM By Weight	Bulk Density (gm/cm^3)	Available Water storage (in/in soil)	Available Water storage (in/4 in soil)	Available Water storage (in/6 in soil)	Available Water storage (in/8 in soil)
1	1.25	0.13	0.52	0.77	1.03
2	1.25	0.17	0.66	1.00	1.33
3	1.25	0.20	0.81	1.22	1.62
4	1.25	0.24	0.96	1.44	1.92
5	1.25	0.28	1.11	1.66	2.22
6	1.25	0.31	1.26	1.88	2.51
7	1.25	0.35	1.40	2.11	2.81
8	1.25	0.39	1.55	2.33	3.10

SQR Depth	**8.00**	in
% SOM By Weight	**4**	%
Available water storage	**1.920**	in
Total Area SQR (0.75 * (39.99-10.66))	**21.9975**	Acres

$$\textbf{SQR} = \frac{1.92}{12\text{ in}} \times \frac{22.00 \times 43{,}560\text{ ft}^2}{1\text{ acre}}$$

153,313.78 ft^3

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

SQR Worksheet - Basin C

Soil Quality Restoration Calculations

% SOM By Weight	Bulk Density (gm/cm^3)	Available Water storage (in/in soil)	Available Water storage (in/4 in soil)	Available Water storage (in/6 in soil)	Available Water storage (in/8 in soil)
1	1.25	0.13	0.52	0.77	1.03
2	1.25	0.17	0.66	1.00	1.33
3	1.25	0.20	0.81	1.22	1.62
4	1.25	0.24	0.96	1.44	1.92
5	1.25	0.28	1.11	1.66	2.22
6	1.25	0.31	1.26	1.88	2.51
7	1.25	0.35	1.40	2.11	2.81
8	1.25	0.39	1.55	2.33	3.10

SQR Depth	**8.00**	in
% SOM By Weight	**4**	%
Available water storage	**1.920**	in
Total Area SQR (0.75 * (18.75-4.59))	**10.62**	Acres

$$\textbf{SQR} = \frac{1.92}{12\text{ in}} \times \frac{10.62 \times 43{,}560\text{ ft}^2}{1\text{ acre}}$$

74,017.15 ft^3

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

SQR Worksheet - Basin D

Soil Quality Restoration Calculations

% SOM By Weight	Bulk Density (gm/cm^3)	Available Water storage (in/in soil)	Available Water storage (in/4 in soil)	Available Water storage (in/6 in soil)	Available Water storage (in/8 in soil)
1	1.25	0.13	0.52	0.77	1.03
2	1.25	0.17	0.66	1.00	1.33
3	1.25	0.20	0.81	1.22	1.62
4	1.25	0.24	0.96	1.44	1.92
5	1.25	0.28	1.11	1.66	2.22
6	1.25	0.31	1.26	1.88	2.51
7	1.25	0.35	1.40	2.11	2.81
8	1.25	0.39	1.55	2.33	3.10

SQR Depth	**8.00**	in
% SOM By Weight	**4**	%
Available water storage	**1.920**	in
Total Area SQR (0.75 * (4.20-0.23))	**2.9775**	Acres

$$\textbf{SQR} = \frac{1.92}{12\text{ in}} \times \frac{2.98 \times 43{,}560\text{ ft}^2}{1\text{ acre}}$$

20,751.98 ft^3

DOTSON FARMS

FOX PN 5470-18A

Date 3/12/2020

SQR Worksheet - Basin E

Soil Quality Restoration Calculations

% SOM By Weight	Bulk Density (gm/cm^3)	Available Water storage (in/in soil)	Available Water storage (in/4 in soil)	Available Water storage (in/6 in soil)	Available Water storage (in/8 in soil)
1	1.25	0.13	0.52	0.77	1.03
2	1.25	0.17	0.66	1.00	1.33
3	1.25	0.20	0.81	1.22	1.62
4	1.25	0.24	0.96	1.44	1.92
5	1.25	0.28	1.11	1.66	2.22
6	1.25	0.31	1.26	1.88	2.51
7	1.25	0.35	1.40	2.11	2.81
8	1.25	0.39	1.55	2.33	3.10

SQR Depth	**8.00**	in
% SOM By Weight	**4**	%
Available water storage	**1.920**	in
Total Area SQR (0.75 * 1.85)	**1.3875**	Acres

$$\text{SQR} = \frac{1.92}{12\text{ in}} \times \frac{1.39 \times 43{,}560\text{ ft}^2}{1\text{ acre}}$$

9,670.32 ft^3

SECTION 8
Storm Water Runoff Analysis

Dotson Farms Subdivision
Story County, Iowa
FOX PN: 5470-18A

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Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	62.63	-------	-------	137.32	-------	-------	-------	406.78	Off-Site Basin B (upper)
2	SCS Runoff	------	2.144	-------	-------	4.601	-------	-------	-------	13.13	Off-Site Basin C1
3	SCS Runoff	------	4.346	-------	-------	9.540	-------	-------	-------	27.45	Off-Site Basin C2
4	SCS Runoff	------	26.48	-------	-------	59.04	-------	-------	-------	173.35	Off-Site Basin B (lower)
5	Reservoir	4	2.254	-------	-------	37.57	-------	-------	-------	137.35	Offsite Field Storage
6	SCS Runoff	------	6.681	-------	-------	14.82	-------	-------	-------	42.94	EXISTING BASIN A
7	SCS Runoff	------	16.44	-------	-------	36.45	-------	-------	-------	105.59	EXISTING BASIN B
8	SCS Runoff	------	7.192	-------	-------	15.90	-------	-------	-------	45.88	EXISTING BASIN C
9	SCS Runoff	------	4.838	-------	-------	10.47	-------	-------	-------	29.96	EXISTING BASIN D
10	SCS Runoff	------	2.342	-------	-------	4.798	-------	-------	-------	13.13	EXISTING BASIN E
11	SCS Runoff	------	2.200	-------	-------	6.942	-------	-------	-------	27.32	PROPOSED BASIN A
12	SCS Runoff	------	6.129	-------	-------	18.52	-------	-------	-------	69.81	PROPOSED BASIN B
13	SCS Runoff	------	1.473	-------	-------	5.958	-------	-------	-------	28.26	PROPOSED BASIN C
14	SCS Runoff	------	1.456	-------	-------	4.016	-------	-------	-------	13.70	PROPOSED BASIN D
15	SCS Runoff	------	1.432	-------	-------	3.487	-------	-------	-------	10.91	PROPOSED BASIN E
16	Reservoir	11	0.861	-------	-------	1.276	-------	-------	-------	3.502	!POND A RELEASE
17	SCS Runoff	------	2.781	-------	-------	8.777	-------	-------	-------	32.34	PROPOSED BASIN B1
18	SCS Runoff	------	2.750	-------	-------	8.407	-------	-------	-------	31.10	PROPOSED BASIN B2
19	SCS Runoff	------	1.178	-------	-------	3.817	-------	-------	-------	14.58	PROPOSED BASIN B3
20	SCS Runoff	------	1.669	-------	-------	5.035	-------	-------	-------	18.11	PROPOSED BASIN B4
21	SCS Runoff	------	0.841	-------	-------	2.557	-------	-------	-------	9.280	PROPOSED BASIN B5
22	SCS Runoff	------	0.908	-------	-------	2.448	-------	-------	-------	8.162	PROPOSED BASIN B (LOTS 10-11)
23	SCS Runoff	------	0.553	-------	-------	1.393	-------	-------	-------	4.506	PROPOSED BASIN B (LOTS 22-23)
24	SCS Runoff	------	1.471	-------	-------	3.967	-------	-------	-------	13.23	PROPOSED BASIN B (LOTS 51-52)
25	SCS Runoff	------	0.479	-------	-------	1.651	-------	-------	-------	6.529	PROPOSED BASIN B (UND TO DAM
26	Reservoir	17	0.562	-------	-------	1.153	-------	-------	-------	10.38	!POND B1 RELEASE
27	Reservoir	18	1.917	-------	-------	4.517	-------	-------	-------	13.57	POND B2 RELEASE
28	Diversion1	1	48.00	-------	-------	48.00	-------	-------	-------	48.00	Pass Through 170th
29	Diversion2	1	14.63	-------	-------	89.32	-------	-------	-------	358.78	Field Storage Volume
30	Reservoir	28	48.00	-------	-------	48.00	-------	-------	-------	48.00	Offsite Field Storage
31	Combine	5, 30	48.00	-------	-------	85.57	-------	-------	-------	185.35	Off-Site B Flow
32	Reach	31	48.00	-------	-------	84.97	-------	-------	-------	185.26	REACH TO DAM
33	Reservoir	19	0.389	-------	-------	0.549	-------	-------	-------	0.829	POND B3 RELEASE
34	SCS Runoff	------	0.838	-------	-------	2.888	-------	-------	-------	11.36	PROPOSED BASIN C1

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
35	Combine	2, 34	2.899	-------	-------	7.403	-------	-------	-------	24.28	FLOW TO POND C1
36	Combine	20, 21,	2.503	-------	-------	7.535	-------	-------	-------	27.26	COMBINE B4 B5
37	Reach	36	1.879	-------	-------	6.271	-------	-------	-------	24.81	REACH TO DAM
38	Combine	23, 25, 27, 32, 37	48.75	-------	-------	86.83	-------	-------	-------	195.69	TOTAL FLOW TO DAM
39	Reservoir	38	48.57	-------	-------	81.93	-------	-------	-------	194.31	!DAM RELEASE
40	SCS Runoff	------	1.830	-------	-------	5.334	-------	-------	-------	18.68	BASIN C2
41	SCS Runoff	------	4.125	-------	-------	13.02	-------	-------	-------	47.97	BASIN C3
42	Combine	3, 35, 40, 41	11.76	-------	-------	31.88	-------	-------	-------	109.07	TOTAL FLOW TO POND C3
43	Reach	42	11.31	-------	-------	31.24	-------	-------	-------	108.52	REACH TO POND C3
44	SCS Runoff	------	2.552	-------	-------	6.662	-------	-------	-------	21.90	!BASIN D1
45	SCS Runoff	------	1.247	-------	-------	3.111	-------	-------	-------	9.933	!BASIN E1
46	Reservoir	43	6.144	-------	-------	11.63	-------	-------	-------	47.14	!POND C3 RELEASE
47	SCS Runoff	------	0.536	-------	-------	4.474	-------	-------	-------	25.09	Proposed Basin A-UND
48	SCS Runoff	------	0.438	-------	-------	3.658	-------	-------	-------	20.51	Proposed Basin B-UND
49	SCS Runoff	------	0.630	-------	-------	5.258	-------	-------	-------	29.49	Proposed Basin C-UND
50	Reservoir	22	0.168	-------	-------	0.375	-------	-------	-------	8.081	INFILTRATION BERM
51	Reservoir	24	0.171	-------	-------	0.375	-------	-------	-------	13.08	INFILTRATION BERM

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	62.63	2	876	1,329,469	------	------	------	Off-Site Basin B (upper)
2	SCS Runoff	2.144	2	726	7,261	------	------	------	Off-Site Basin C1
3	SCS Runoff	4.346	2	736	21,969	------	------	------	Off-Site Basin C2
4	SCS Runoff	26.48	2	786	317,746	------	------	------	Off-Site Basin B (lower)
5	Reservoir	2.254	2	1406	20,096	4	955.93	298,494	Offsite Field Storage
6	SCS Runoff	6.681	2	750	46,690	------	------	------	EXISTING BASIN A
7	SCS Runoff	16.44	2	748	111,203	------	------	------	EXISTING BASIN B
8	SCS Runoff	7.192	2	742	43,450	------	------	------	EXISTING BASIN C
9	SCS Runoff	4.838	2	728	18,283	------	------	------	EXISTING BASIN D
10	SCS Runoff	2.342	2	718	4,735	------	------	------	EXISTING BASIN E
11	SCS Runoff	2.200	2	766	25,080	------	------	------	PROPOSED BASIN A
12	SCS Runoff	6.129	2	758	61,946	------	------	------	PROPOSED BASIN B
13	SCS Runoff	1.473	2	768	18,860	------	------	------	PROPOSED BASIN C
14	SCS Runoff	1.456	2	734	7,637	------	------	------	PROPOSED BASIN D
15	SCS Runoff	1.432	2	720	3,619	------	------	------	PROPOSED BASIN E
16	Reservoir	0.861	2	844	25,068	11	932.26	6,723	!POND A RELEASE
17	SCS Runoff	2.781	2	724	10,925	------	------	------	PROPOSED BASIN B1
18	SCS Runoff	2.750	2	738	17,969	------	------	------	PROPOSED BASIN B2
19	SCS Runoff	1.178	2	734	7,082	------	------	------	PROPOSED BASIN B3
20	SCS Runoff	1.669	2	728	7,186	------	------	------	PROPOSED BASIN B4
21	SCS Runoff	0.841	2	730	4,078	------	------	------	PROPOSED BASIN B5
22	SCS Runoff	0.908	1	721	2,445	------	------	------	PROPOSED BASIN B (LOTS 10-11)
23	SCS Runoff	0.553	2	724	1,831	------	------	------	PROPOSED BASIN B (LOTS 22-23)
24	SCS Runoff	1.471	1	721	3,962	------	------	------	PROPOSED BASIN B (LOTS 51-52)
25	SCS Runoff	0.479	2	732	2,768	------	------	------	PROPOSED BASIN B (UND TO DAM
26	Reservoir	0.562	2	756	9,984	17	934.70	2,716	!POND B1 RELEASE
27	Reservoir	1.917	2	758	16,605	18	938.80	2,818	POND B2 RELEASE
28	Diversion1	48.00	2	828	1,238,636	1	------	------	Pass Through 170th
29	Diversion2	14.63	2	876	90,834	1	------	------	Field Storage Volume
30	Reservoir	48.00	2	926	1,160,110	28	957.83	114,247	Offsite Field Storage
31	Combine	48.00	2	926	1,180,206	5, 30	------	------	Off-Site B Flow
32	Reach	48.00	2	936	1,180,194	31	------	------	REACH TO DAM
33	Reservoir	0.389	2	768	7,078	19	938.11	1,545	POND B3 RELEASE
34	SCS Runoff	0.838	2	730	4,529	------	------	------	PROPOSED BASIN C1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
35	Combine	2.899	2	726	11,790	2, 34	------	------	FLOW TO POND C1
36	Combine	2.503	2	728	11,264	20, 21,	------	------	COMBINE B4 B5
37	Reach	1.879	2	738	11,257	36	------	------	REACH TO DAM
38	Combine	48.75	2	878	1,212,655	23, 25, 27, 32, 37	------	------	TOTAL FLOW TO DAM
39	Reservoir	48.57	2	962	1,054,492	38	942.70	207,180	!DAM RELEASE
40	SCS Runoff	1.830	2	722	6,125	------	------	------	BASIN C2
41	SCS Runoff	4.125	2	724	16,205	------	------	------	BASIN C3
42	Combine	11.76	2	726	56,089	3, 35, 40, 41	------	------	TOTAL FLOW TO POND C3
43	Reach	11.31	2	730	56,086	42	------	------	REACH TO POND C3
44	SCS Runoff	2.552	2	722	7,876	------	------	------	!BASIN D1
45	SCS Runoff	1.247	2	722	3,732	------	------	------	!BASIN E1
46	Reservoir	6.144	2	752	56,083	43	938.07	7,990	!POND C3 RELEASE
47	SCS Runoff	0.536	2	726	4,691	------	------	------	Proposed Basin A-UND
48	SCS Runoff	0.438	2	726	3,835	------	------	------	Proposed Basin B-UND
49	SCS Runoff	0.630	2	726	5,513	------	------	------	Proposed Basin C-UND
50	Reservoir	0.168	1	734	1,957	22	945.48	575	INFILTRATION BERM
51	Reservoir	0.171	1	749	2,775	24	940.48	1,065	INFILTRATION BERM

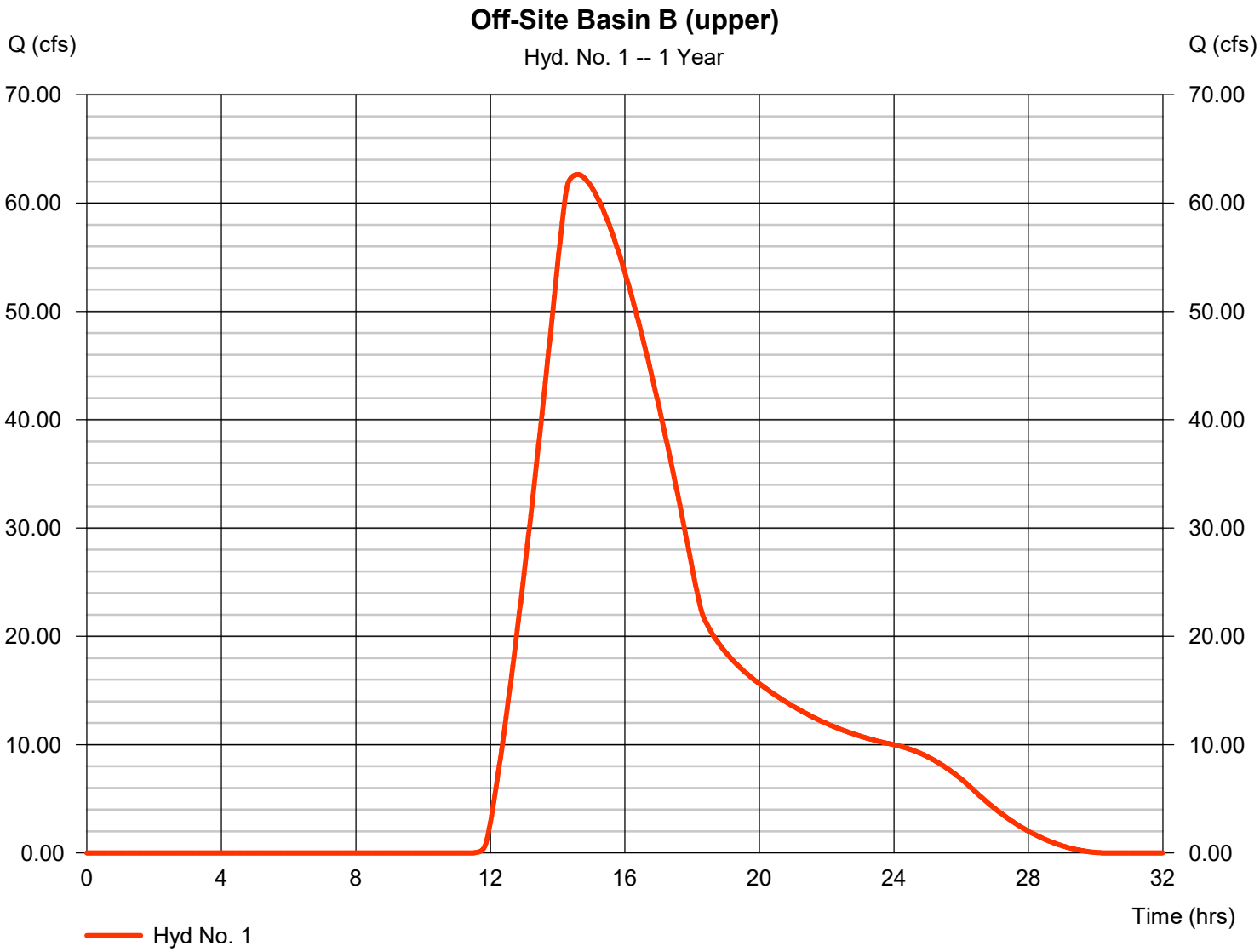
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 1

Off-Site Basin B (upper)

Hydrograph type	= SCS Runoff	Peak discharge	= 62.63 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.60 hrs
Time interval	= 2 min	Hyd. volume	= 1,329,469 cuft
Drainage area	= 487.010 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 8797 ft
Tc method	= LAG	Time of conc. (Tc)	= 243.10 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



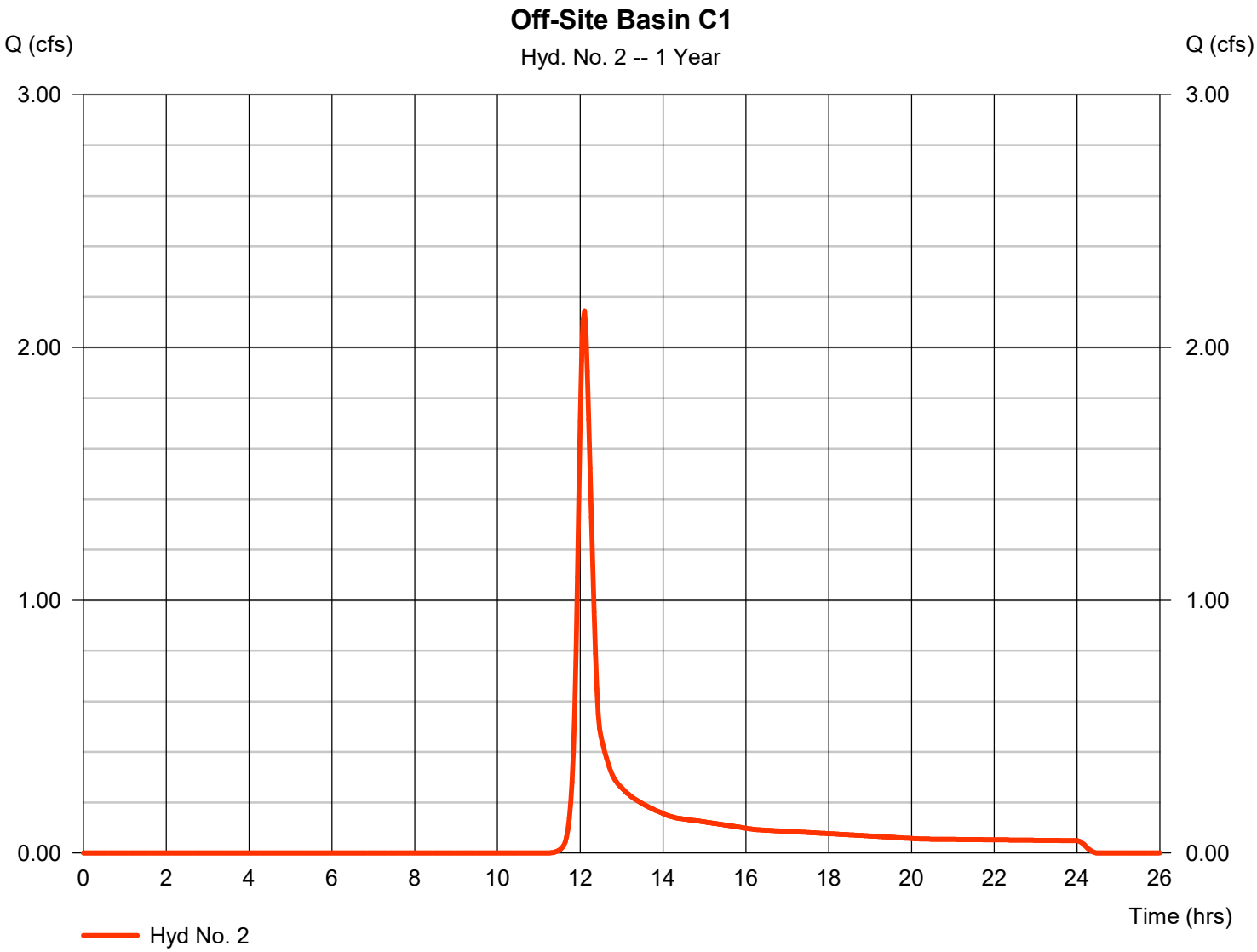
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 2

Off-Site Basin C1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.144 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,261 cuft
Drainage area	= 2.660 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 392 ft
Tc method	= LAG	Time of conc. (Tc)	= 20.10 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



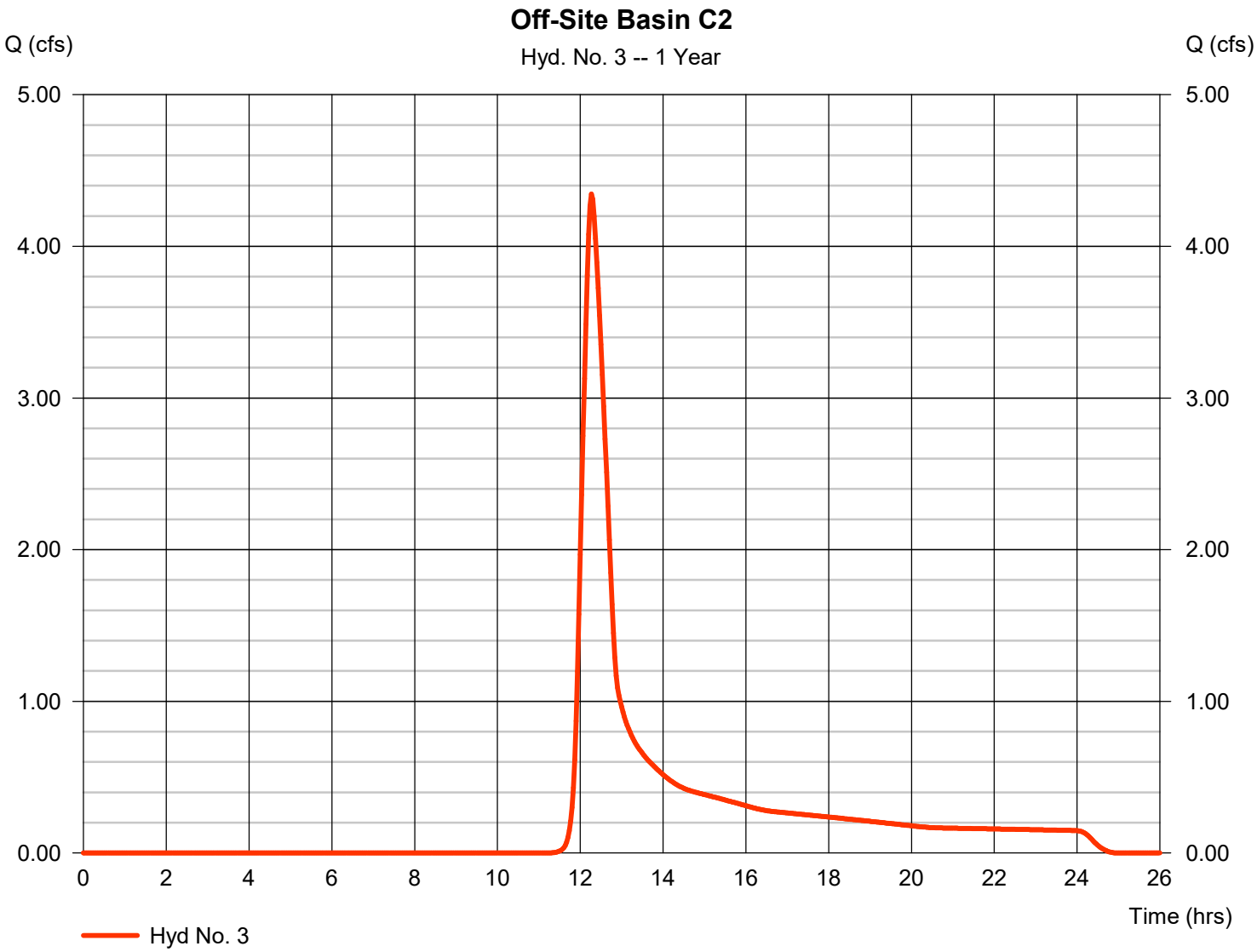
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 3

Off-Site Basin C2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.346 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 21,969 cuft
Drainage area	= 8.140 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 820 ft
Tc method	= LAG	Time of conc. (Tc)	= 36.40 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



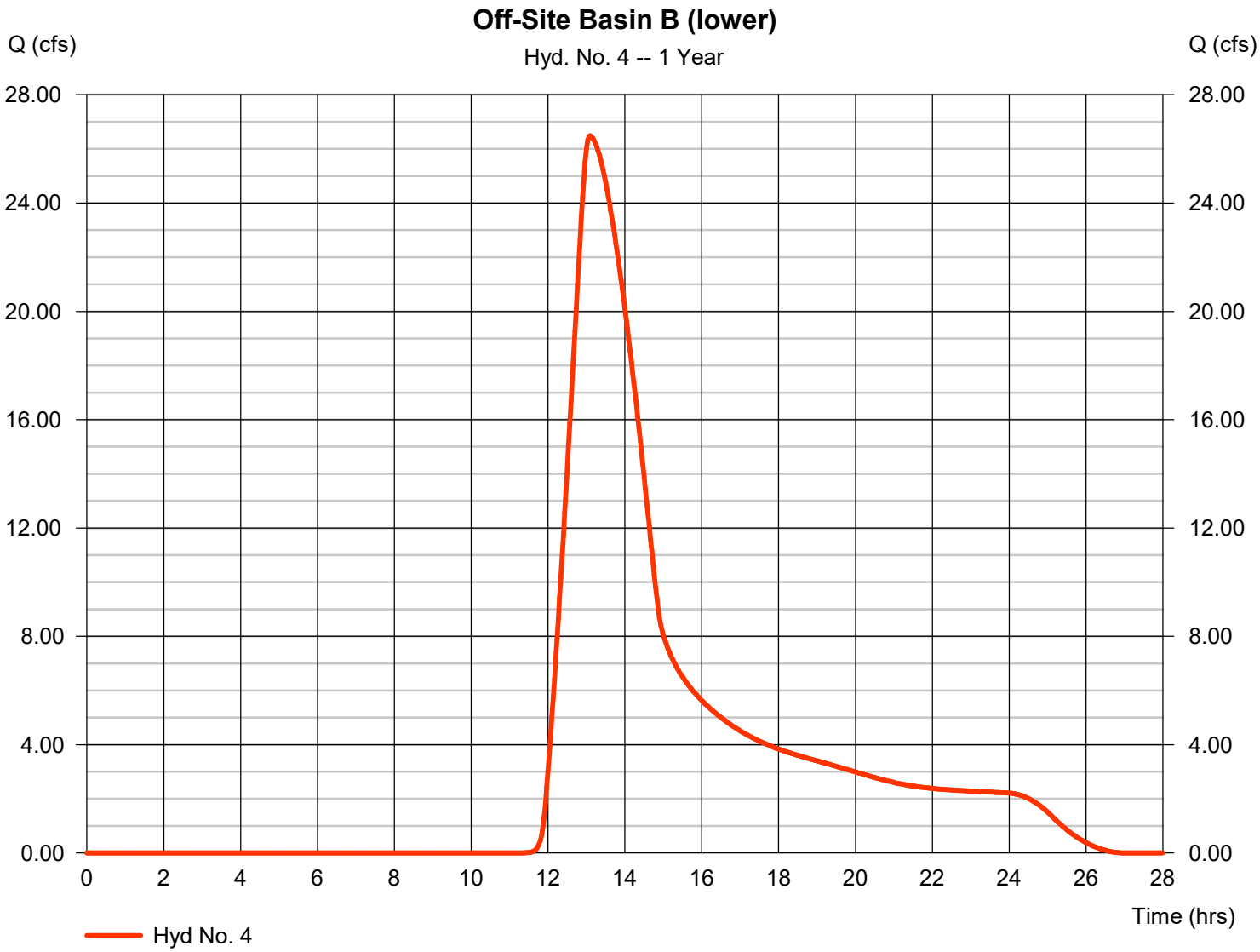
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 4

Off-Site Basin B (lower)

Hydrograph type	= SCS Runoff	Peak discharge	= 26.48 cfs
Storm frequency	= 1 yrs	Time to peak	= 13.10 hrs
Time interval	= 2 min	Hyd. volume	= 317,746 cuft
Drainage area	= 115.970 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 113.60 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

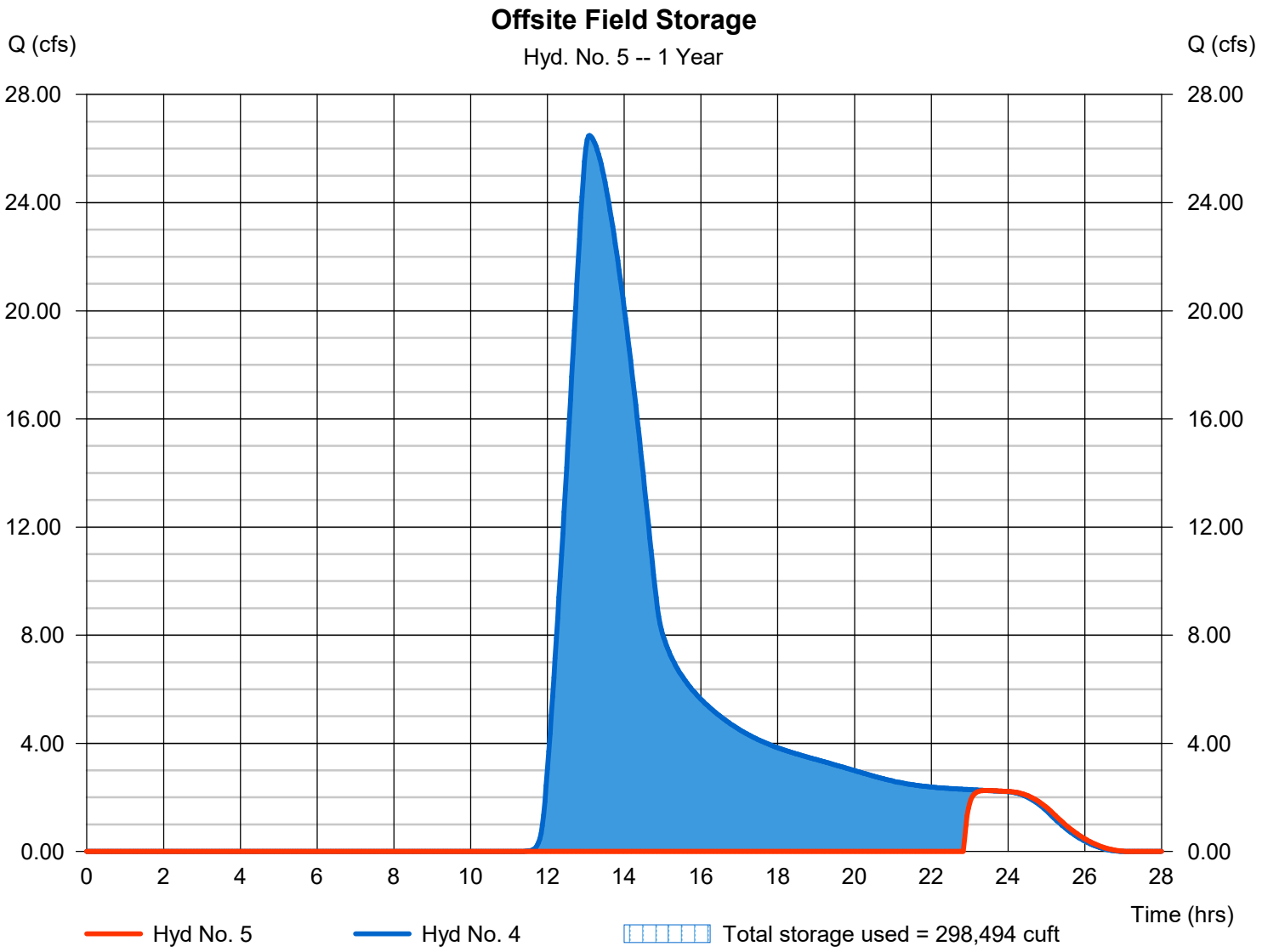
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 5

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 2.254 cfs
Storm frequency	= 1 yrs	Time to peak	= 23.43 hrs
Time interval	= 2 min	Hyd. volume	= 20,096 cuft
Inflow hyd. No.	= 4 - Off-Site Basin B (lower)	Max. Elevation	= 955.93 ft
Reservoir name	= Offsite Field Storage LOWER	Max. Storage	= 298,494 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 12 - Offsite Field Storage LOWER

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 955.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	955.00	196,750	0	0
1.00	957.00	486,220	330,722	330,722
2.00	958.00	1,109,149	776,500	1,107,222

Culvert / Orifice Structures

		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	0.00	0.00	0.00	0.00
Span (in)	=	0.00	0.00	0.00	0.00
No. Barrels	=	0	0	0	0
Invert El. (ft)	=	0.00	0.00	0.00	0.00
Length (ft)	=	0.00	0.00	0.00	0.00
Slope (%)	=	0.00	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	No	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	75.00	0.00	0.00	0.00
Crest El. (ft)	=	956.50	0.00	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	Ciplti	---	---	---
Multi-Stage	=	No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	955.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.00	330,722	957.00	---	---	---	---	88.30	---	---	---	---	---	88.30
2.00	1,107,222	958.00	---	---	---	---	458.82	---	---	---	---	---	458.82

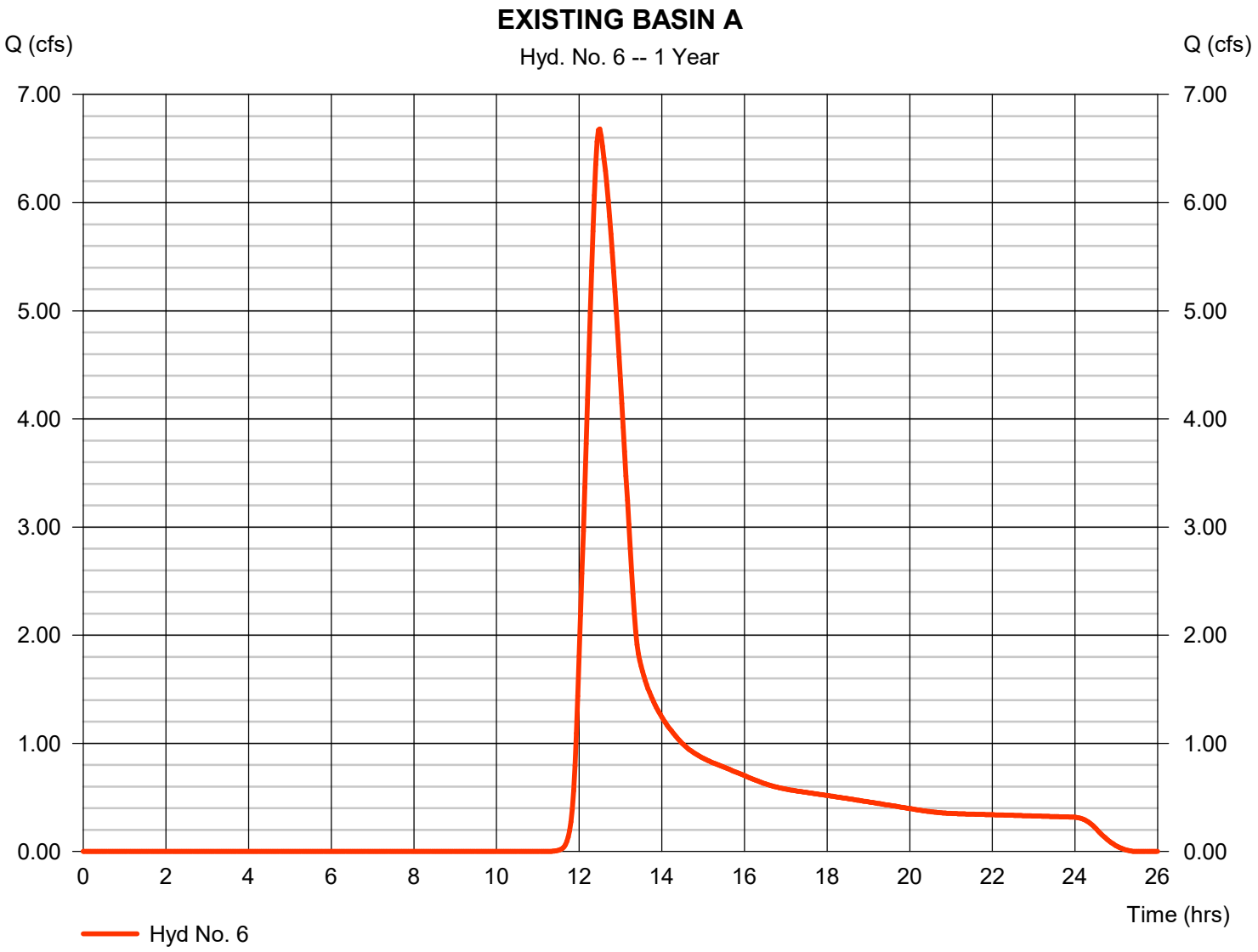
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 6

EXISTING BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 6.681 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.50 hrs
Time interval	= 2 min	Hyd. volume	= 46,690 cuft
Drainage area	= 17.230 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 57.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



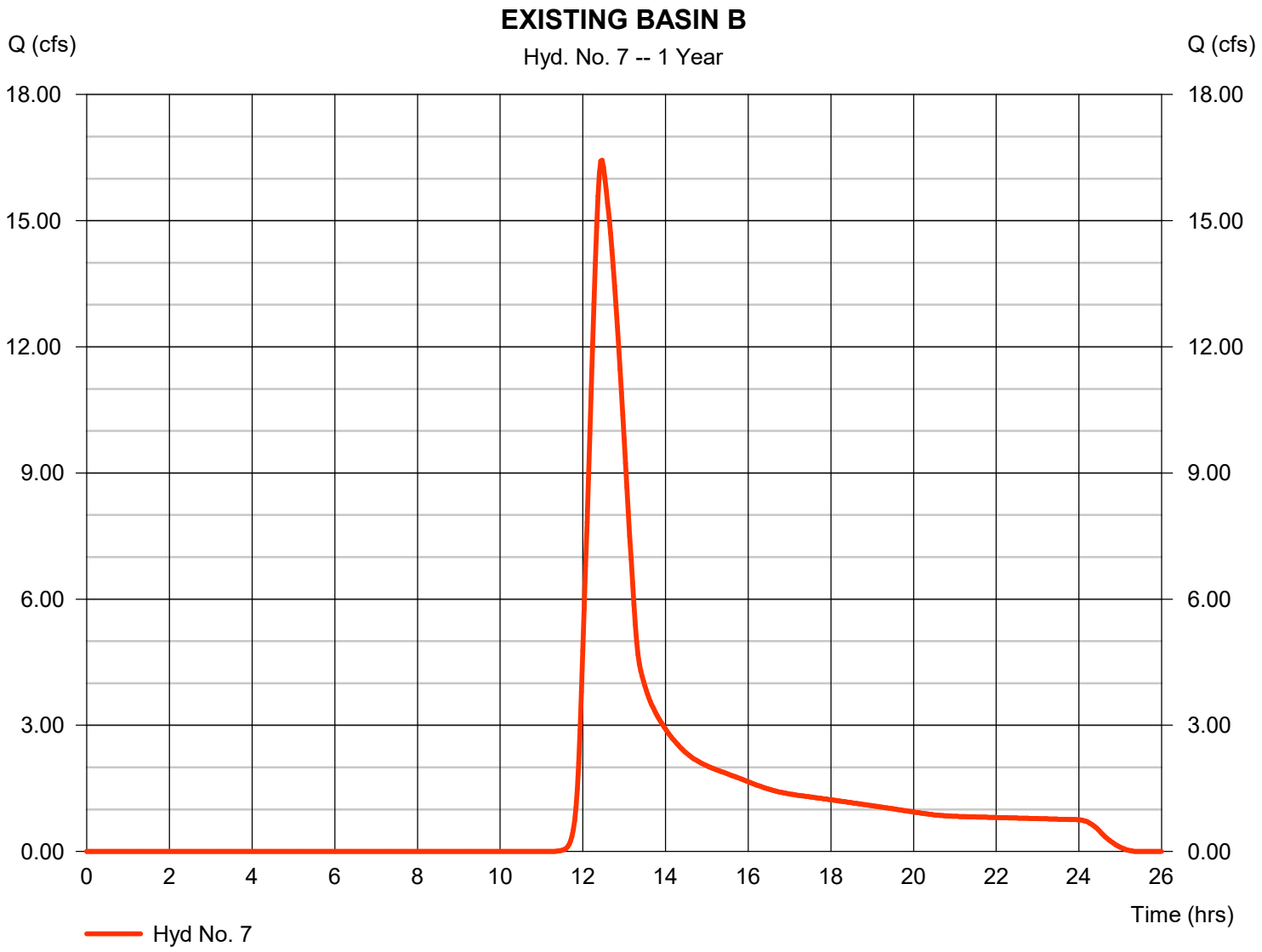
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 7

EXISTING BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 16.44 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 111,203 cuft
Drainage area	= 40.420 ac	Curve number	= 75
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 53.40 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



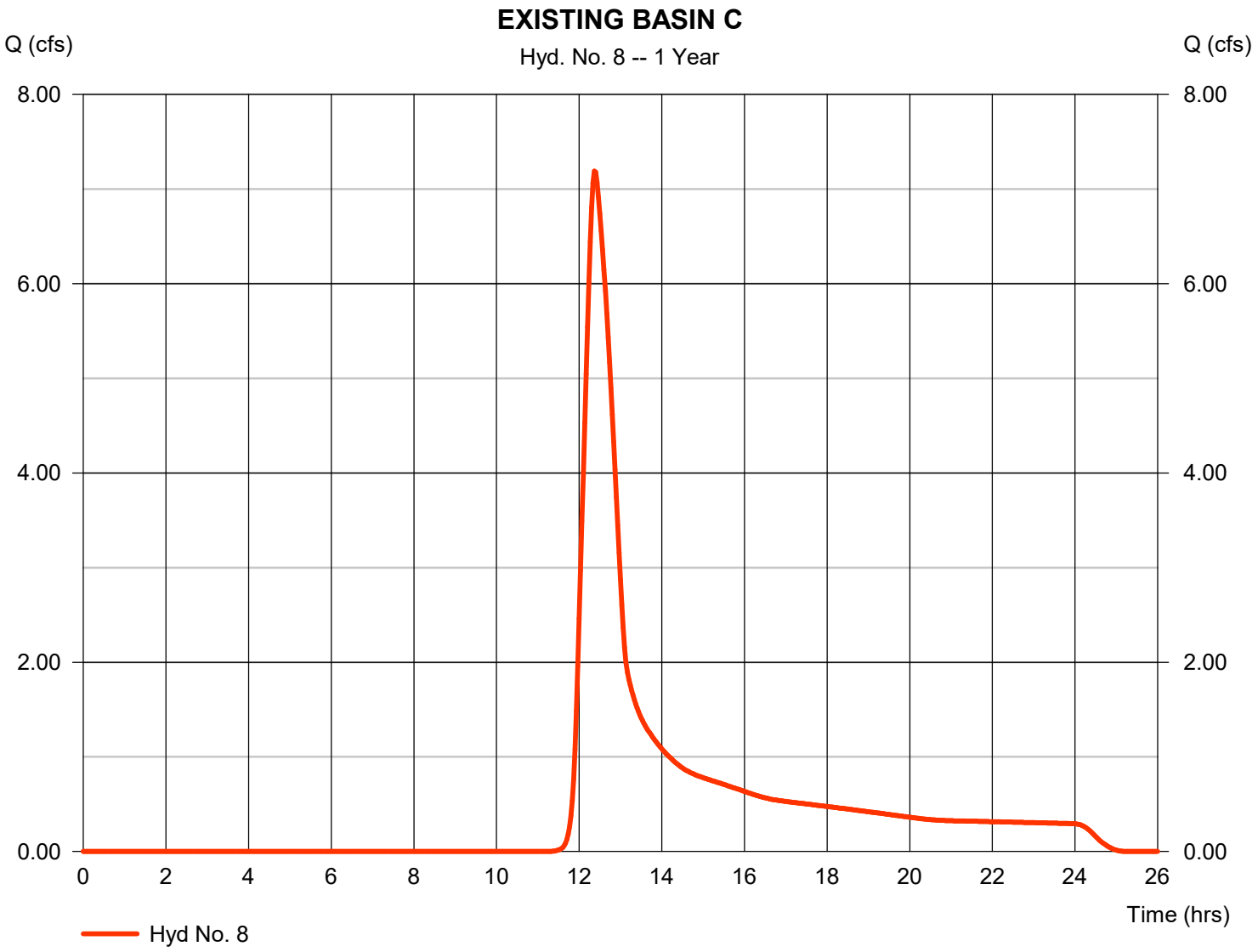
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 8

EXISTING BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 7.192 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 43,450 cuft
Drainage area	= 16.060 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 44.10 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



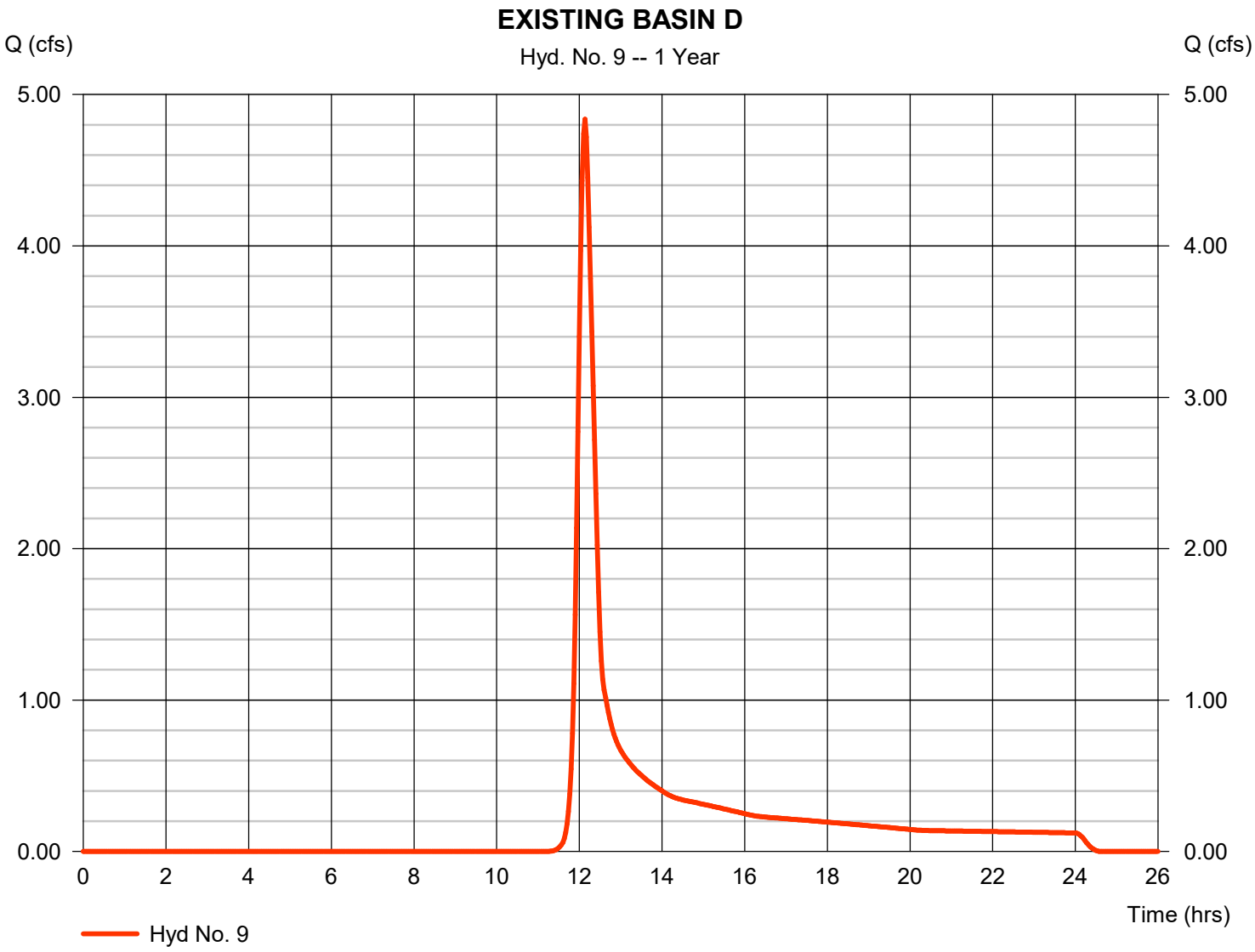
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 9

EXISTING BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 4.838 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 18,283 cuft
Drainage area	= 6.580 ac	Curve number	= 75
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.40 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



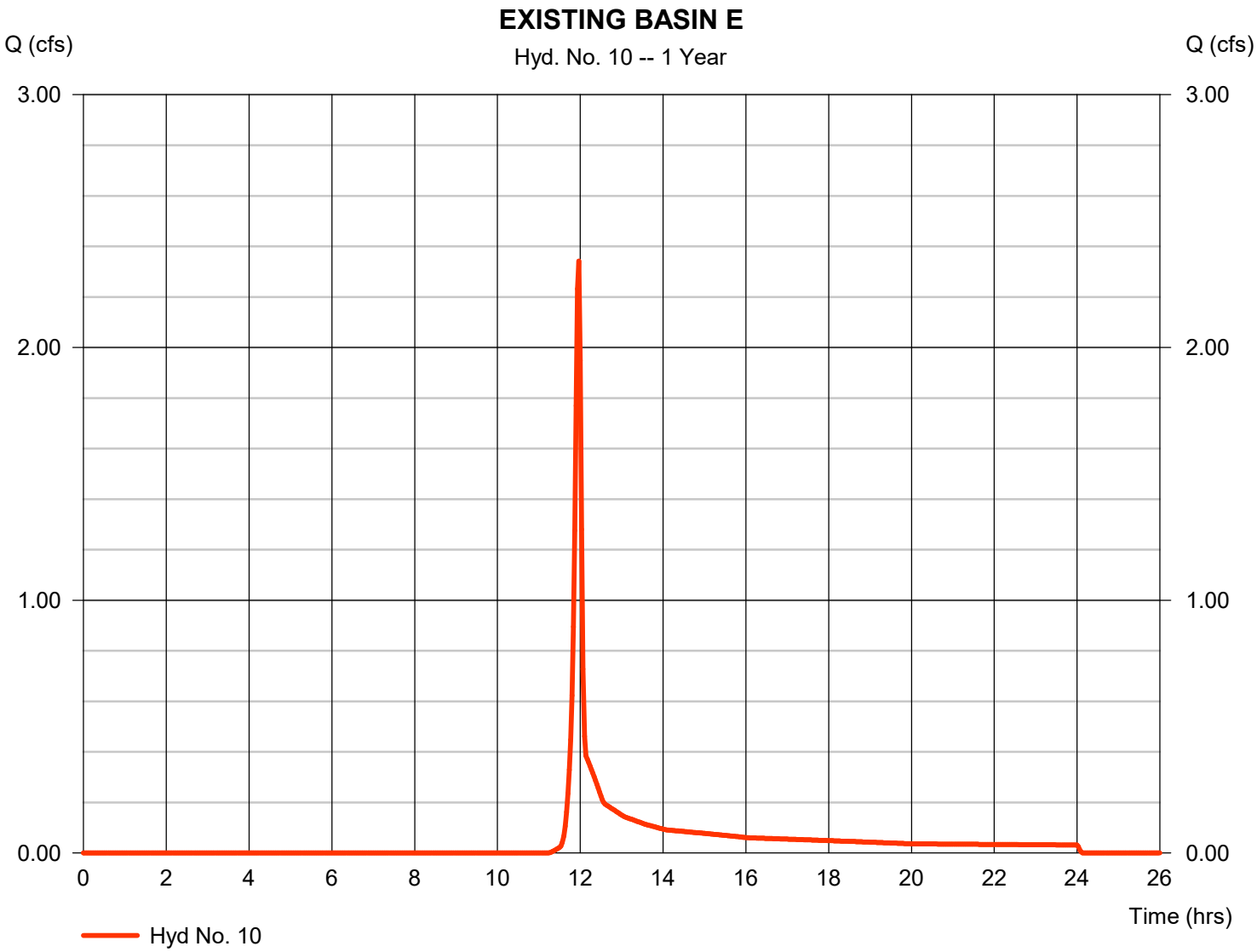
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 10

EXISTING BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 2.342 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 4,735 cuft
Drainage area	= 1.850 ac	Curve number	= 75
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 6.20 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



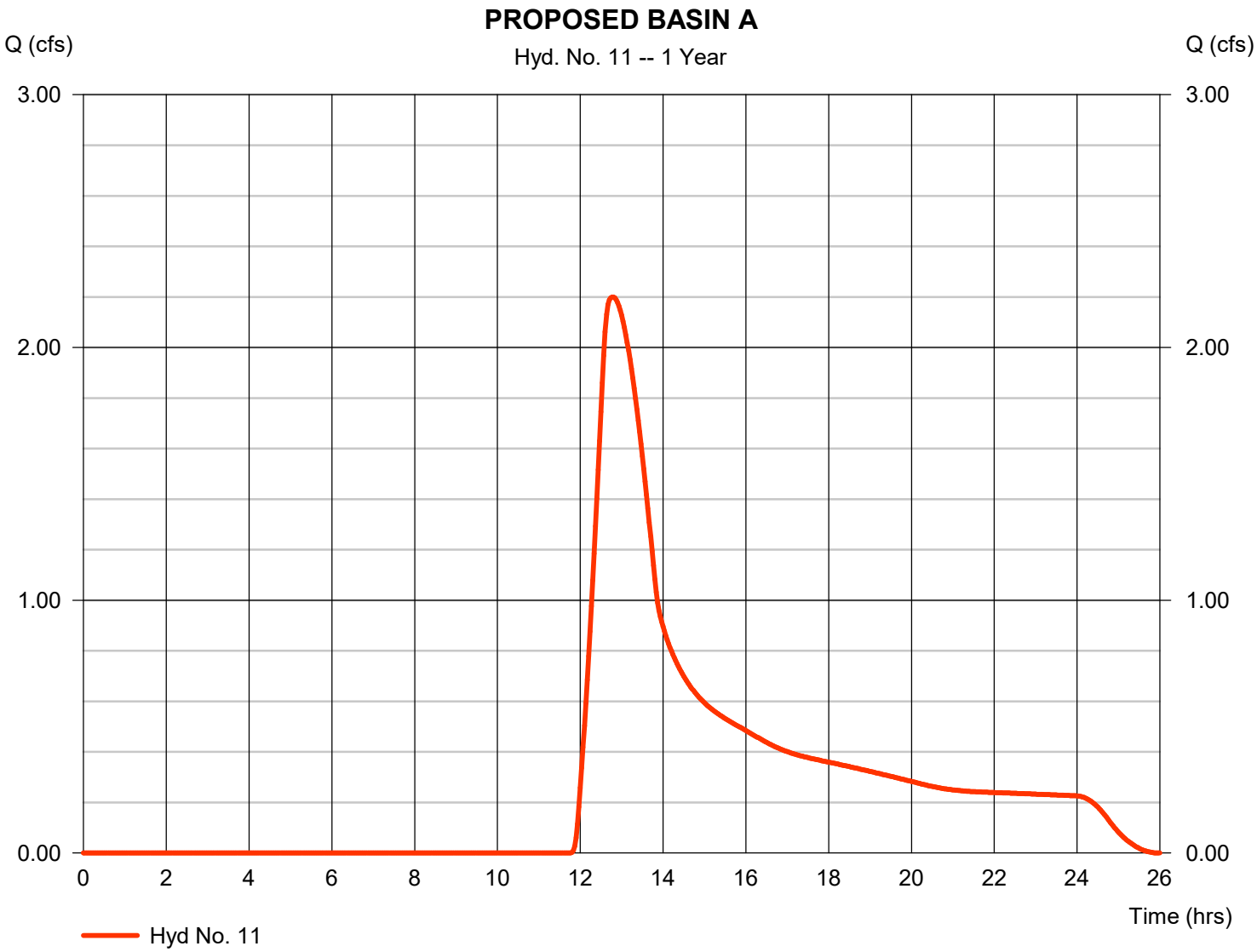
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 11

PROPOSED BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.200 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.77 hrs
Time interval	= 2 min	Hyd. volume	= 25,080 cuft
Drainage area	= 17.360 ac	Curve number	= 66
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 72.80 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



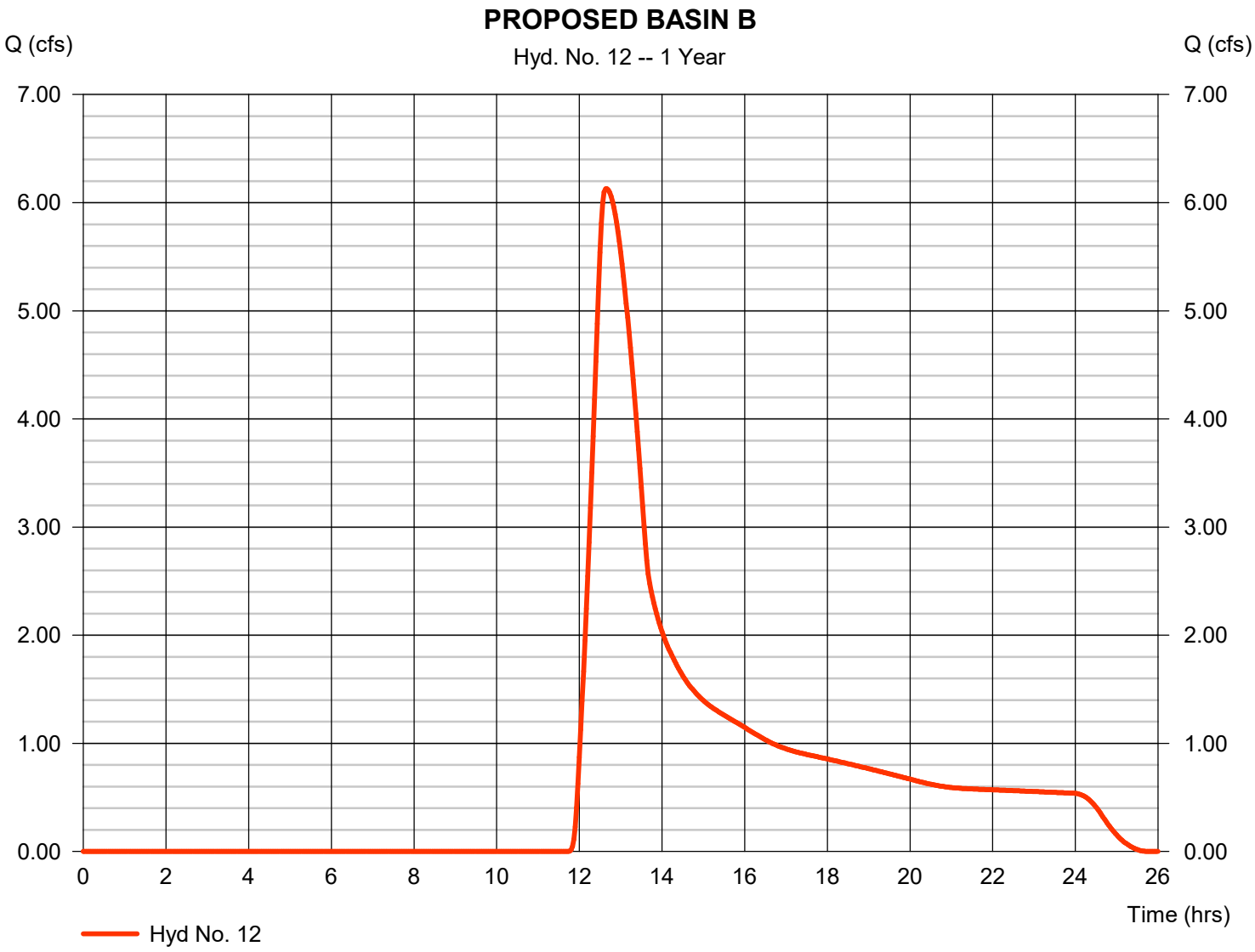
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 12

PROPOSED BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 6.129 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 61,946 cuft
Drainage area	= 39.990 ac	Curve number	= 67
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 66.50 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



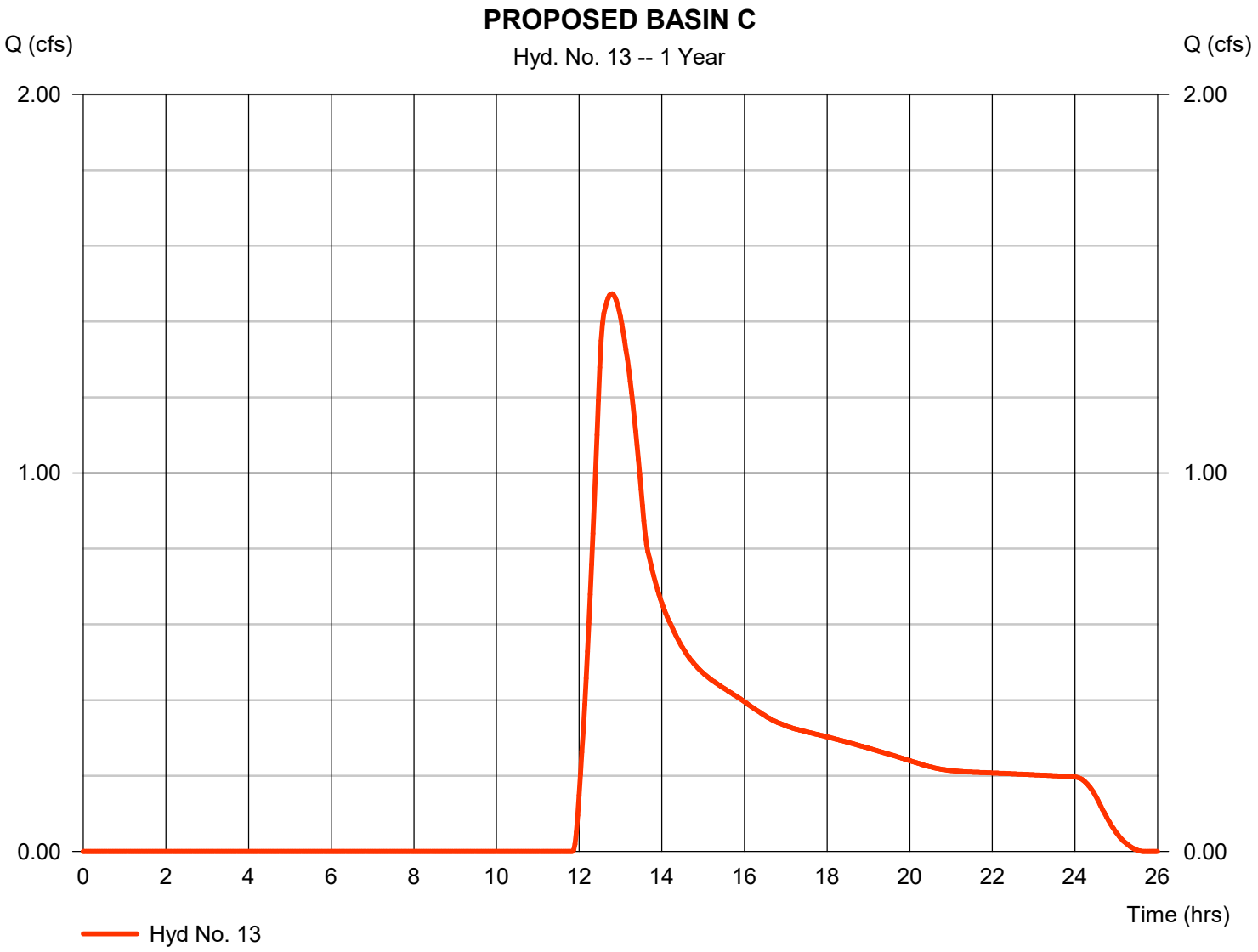
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 13

PROPOSED BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.473 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.80 hrs
Time interval	= 2 min	Hyd. volume	= 18,860 cuft
Drainage area	= 18.750 ac	Curve number	= 62
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.40 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



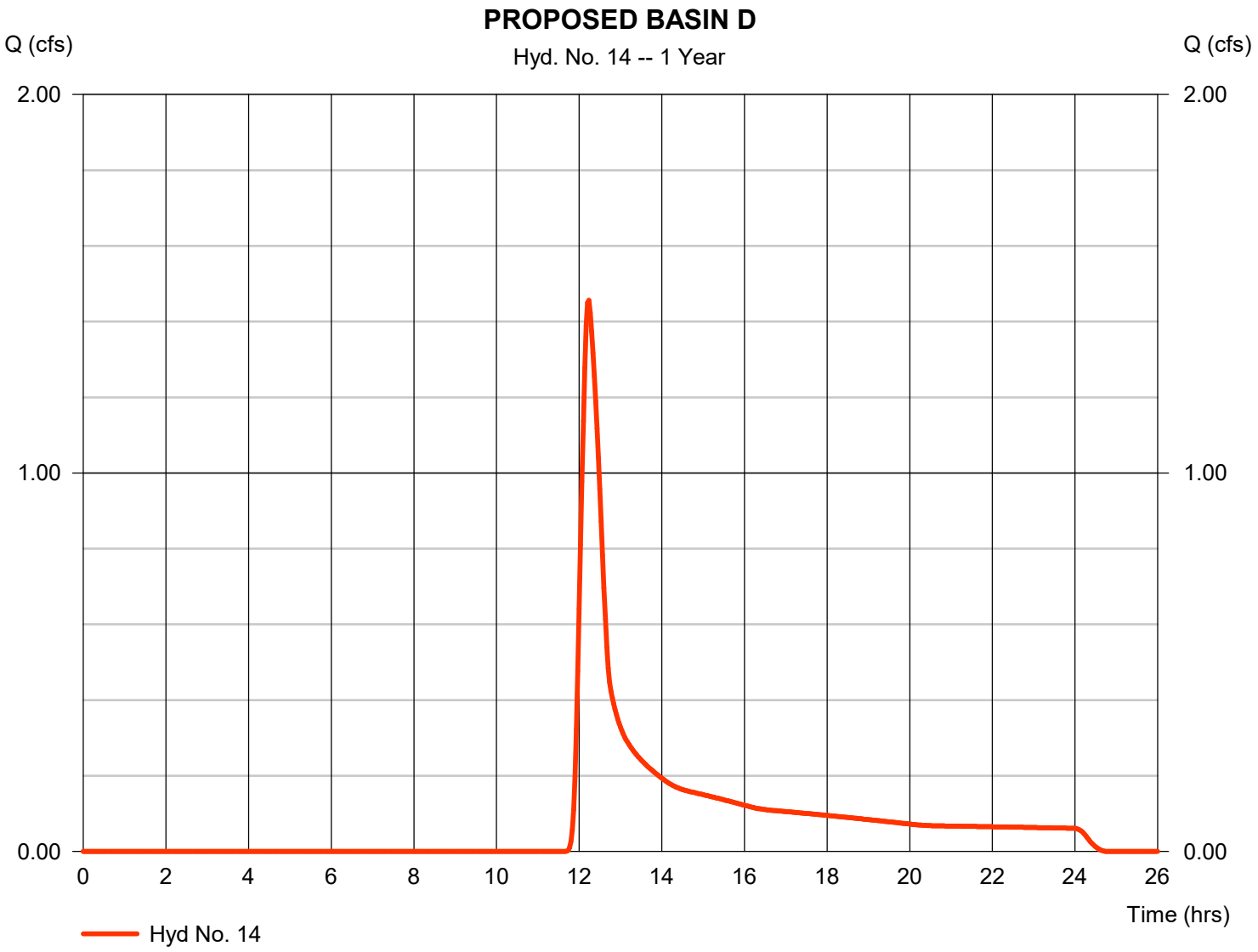
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 14

PROPOSED BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.456 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 7,637 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.60 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



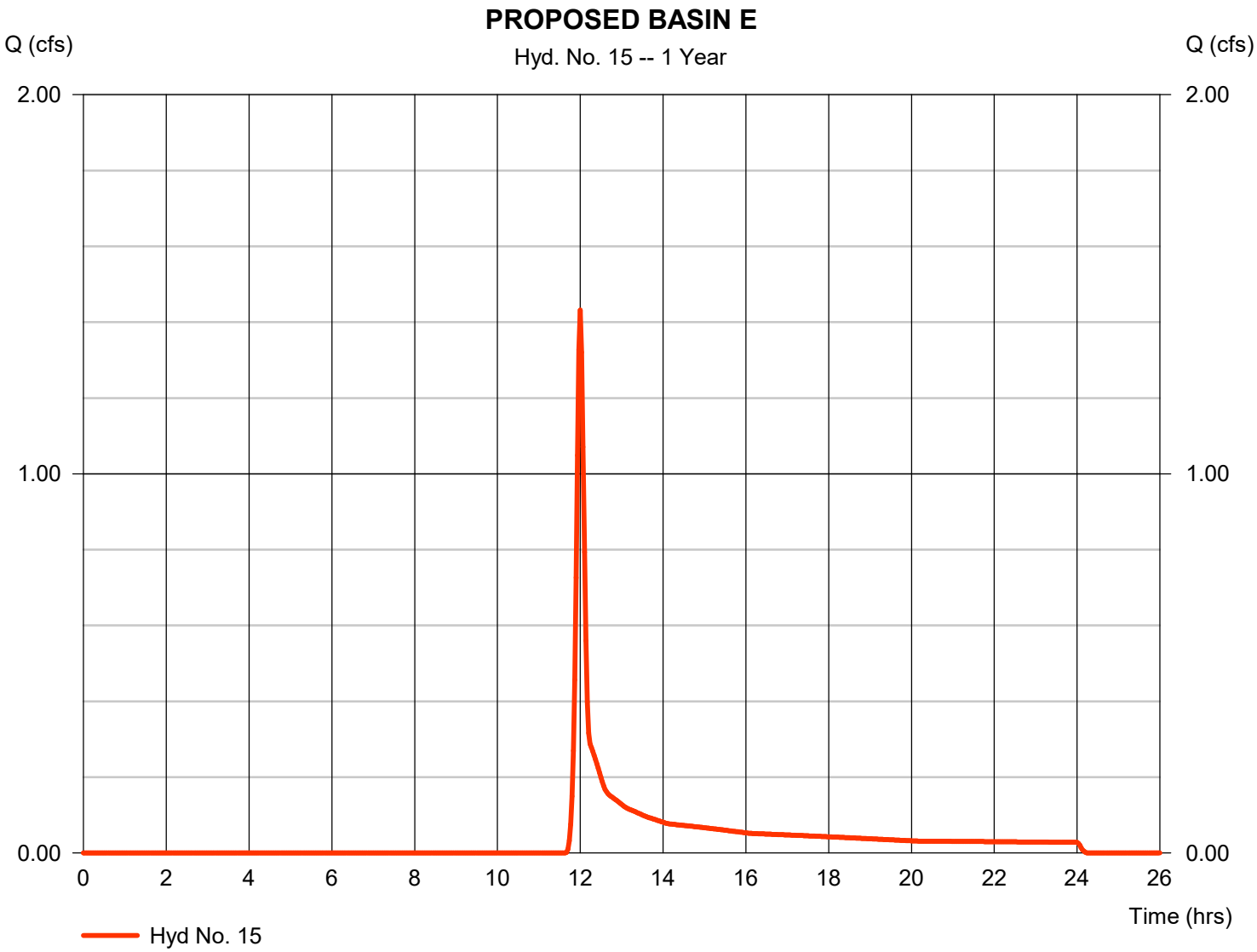
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 15

PROPOSED BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 1.432 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 3,619 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.20 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

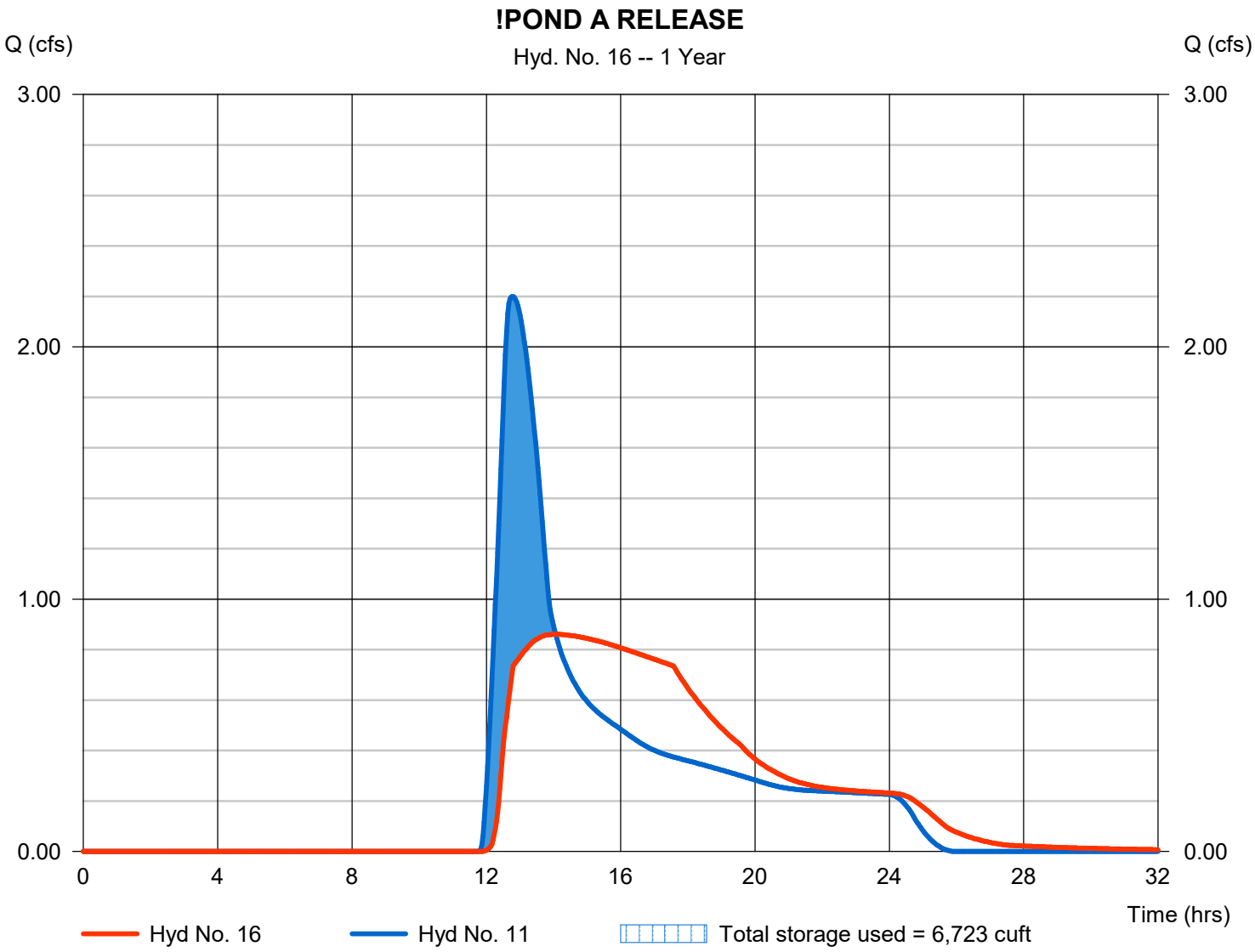
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 16

!POND A RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.861 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.07 hrs
Time interval	= 2 min	Hyd. volume	= 25,068 cuft
Inflow hyd. No.	= 11 - PROPOSED BASIN A	Max. Elevation	= 932.26 ft
Reservoir name	= POND A	Max. Storage	= 6,723 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 2 - POND A

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 931.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	931.00	530	0	0
1.00	932.00	7,030	3,163	3,163
2.00	933.00	21,210	13,482	16,645
3.00	934.00	37,060	28,766	45,411
4.00	935.00	54,030	45,275	90,686
5.00	936.00	69,960	61,818	152,504
6.00	937.00	82,700	76,234	228,737

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	8.00	0.00
Span (in)	= 15.00	6.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 931.00	931.00	934.00	0.00
Length (ft)	= 100.00	5.00	5.00	0.00
Slope (%)	= 1.00	1.00	1.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	0.00	0.00	0.00
Crest El. (ft)	= 936.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	931.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.00	3,163	932.00	0.74 ic	0.73 ic	0.00	---	0.00	---	---	---	---	---	0.735
2.00	16,645	933.00	1.16 ic	1.15 ic	0.00	---	0.00	---	---	---	---	---	1.155
3.00	45,411	934.00	1.47 ic	1.47 ic	0.00	---	0.00	---	---	---	---	---	1.469
4.00	90,686	935.00	3.04 ic	1.67 ic	1.37 ic	---	0.00	---	---	---	---	---	3.039
5.00	152,504	936.00	4.04 ic	1.87 ic	2.17 ic	---	0.00	---	---	---	---	---	4.039
6.00	228,737	937.00	11.97 oc	0.34 ic	0.61 ic	---	11.02 s	---	---	---	---	---	11.97

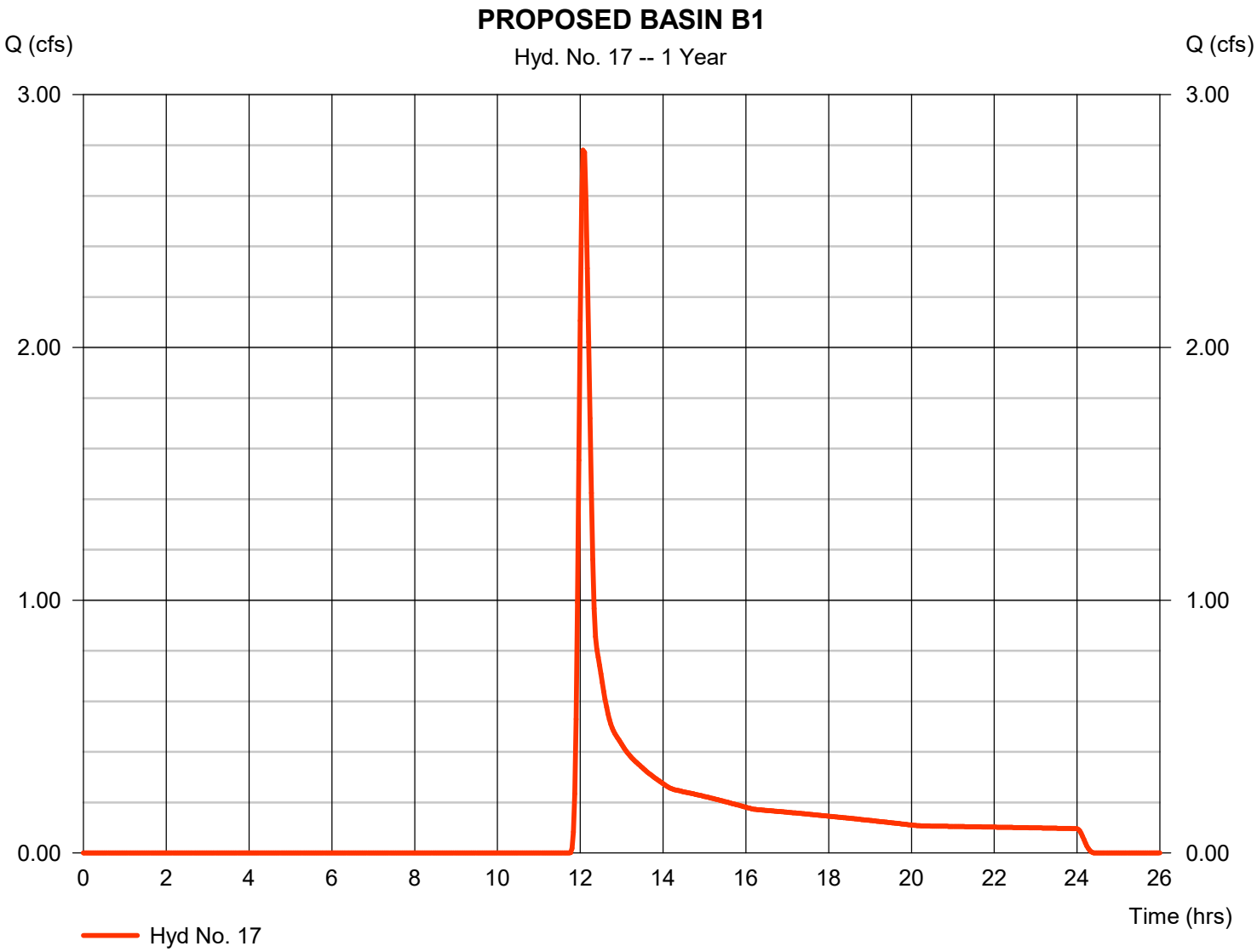
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 17

PROPOSED BASIN B1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.781 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 10,925 cuft
Drainage area	= 7.800 ac	Curve number	= 66
Basin Slope	= 6.5 %	Hydraulic length	= 760 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.80 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



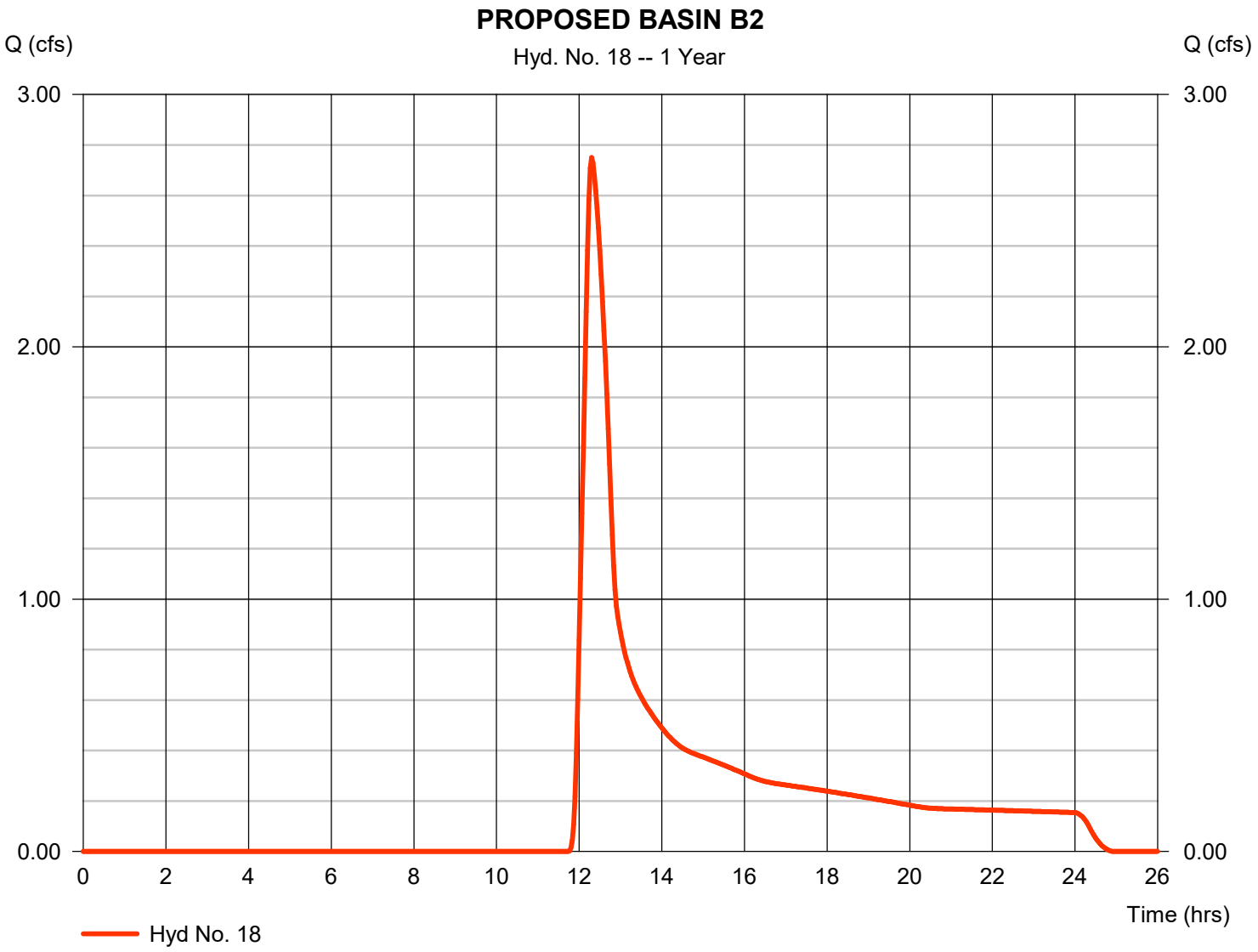
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 18

PROPOSED BASIN B2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.750 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 17,969 cuft
Drainage area	= 11.660 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 1500 ft
Tc method	= LAG	Time of conc. (Tc)	= 34.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



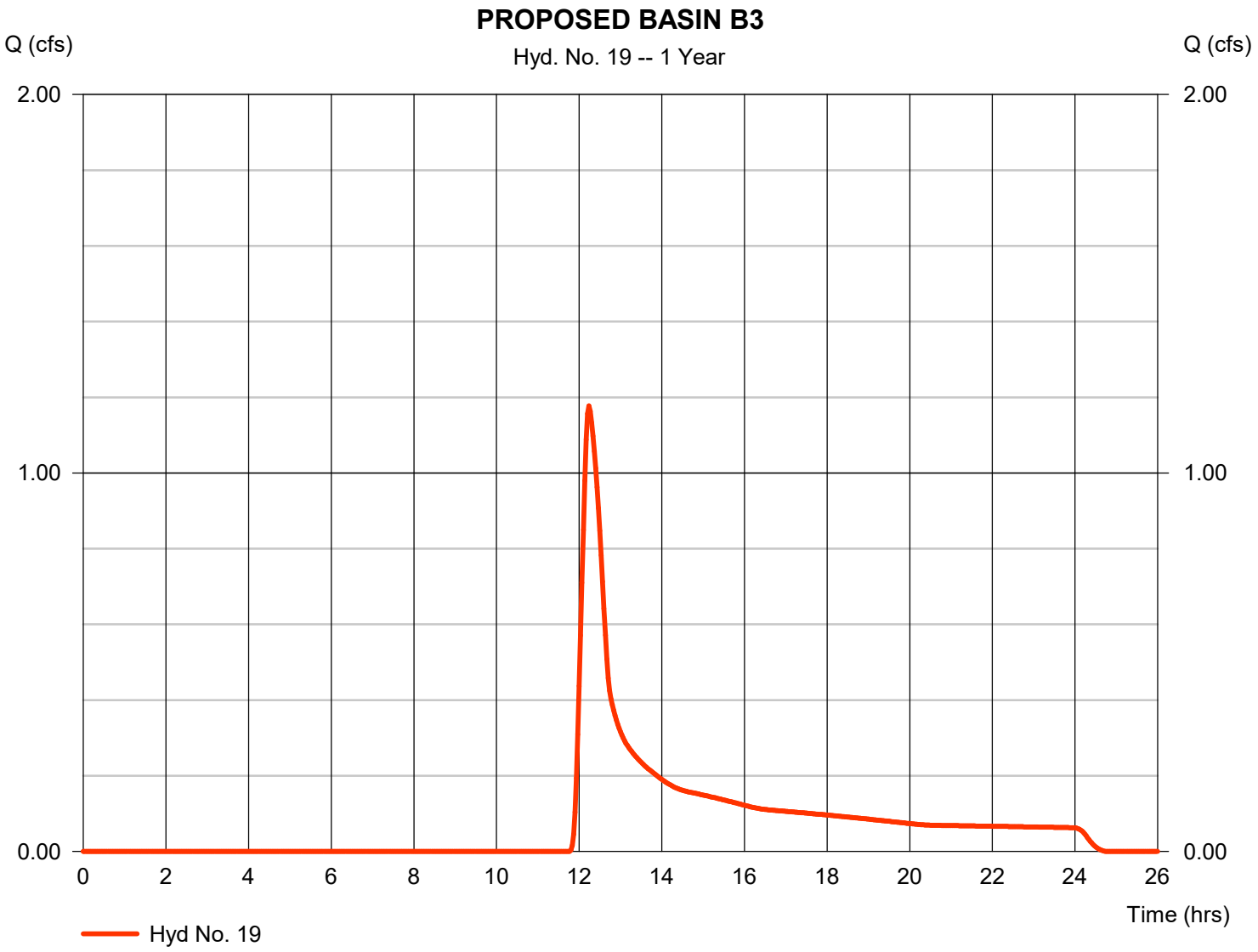
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 19

PROPOSED BASIN B3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.178 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 7,082 cuft
Drainage area	= 4.930 ac	Curve number	= 66
Basin Slope	= 2.7 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.30 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



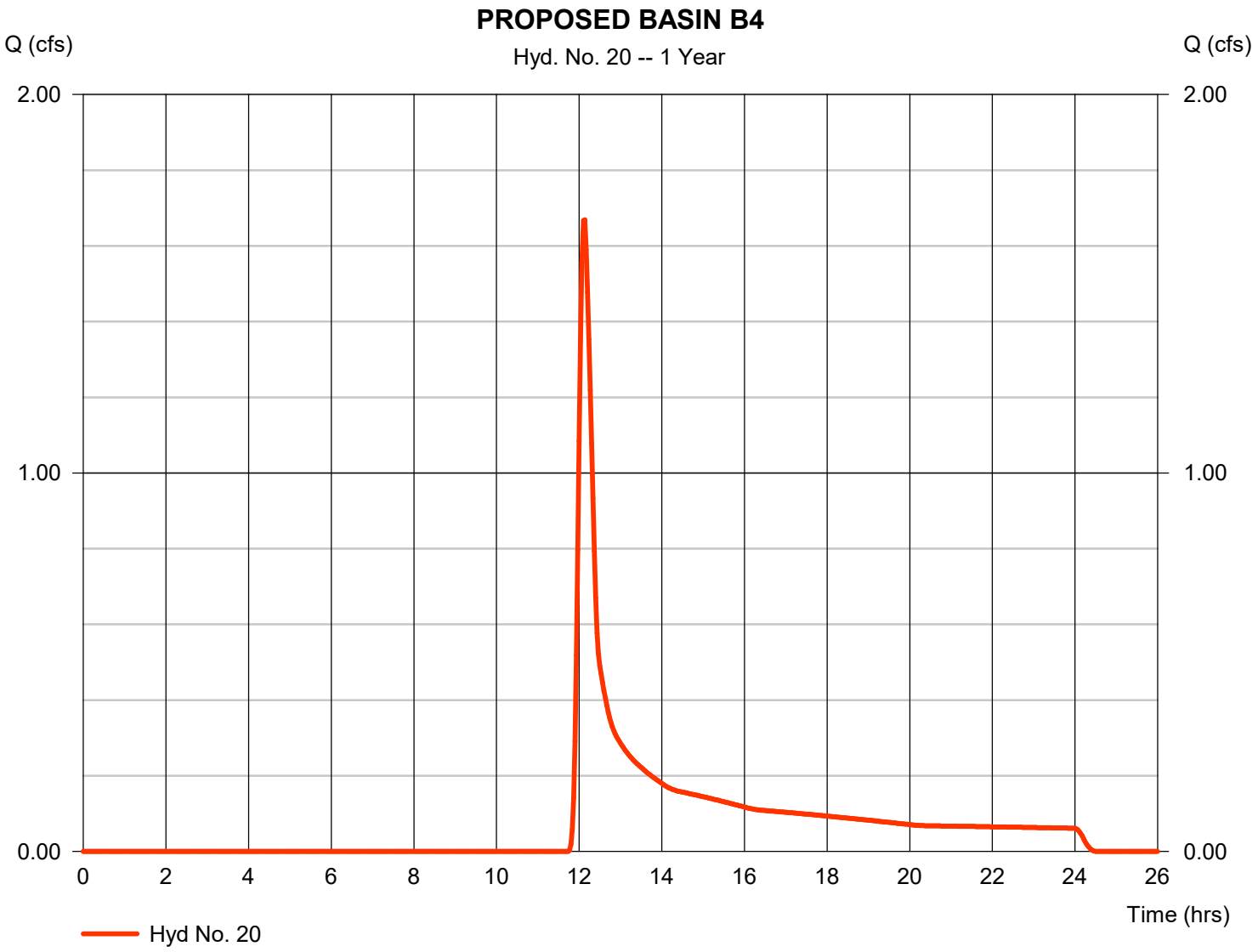
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 20

PROPOSED BASIN B4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.669 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 7,186 cuft
Drainage area	= 4.610 ac	Curve number	= 67
Basin Slope	= 4.1 %	Hydraulic length	= 780 ft
Tc method	= LAG	Time of conc. (Tc)	= 18.60 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



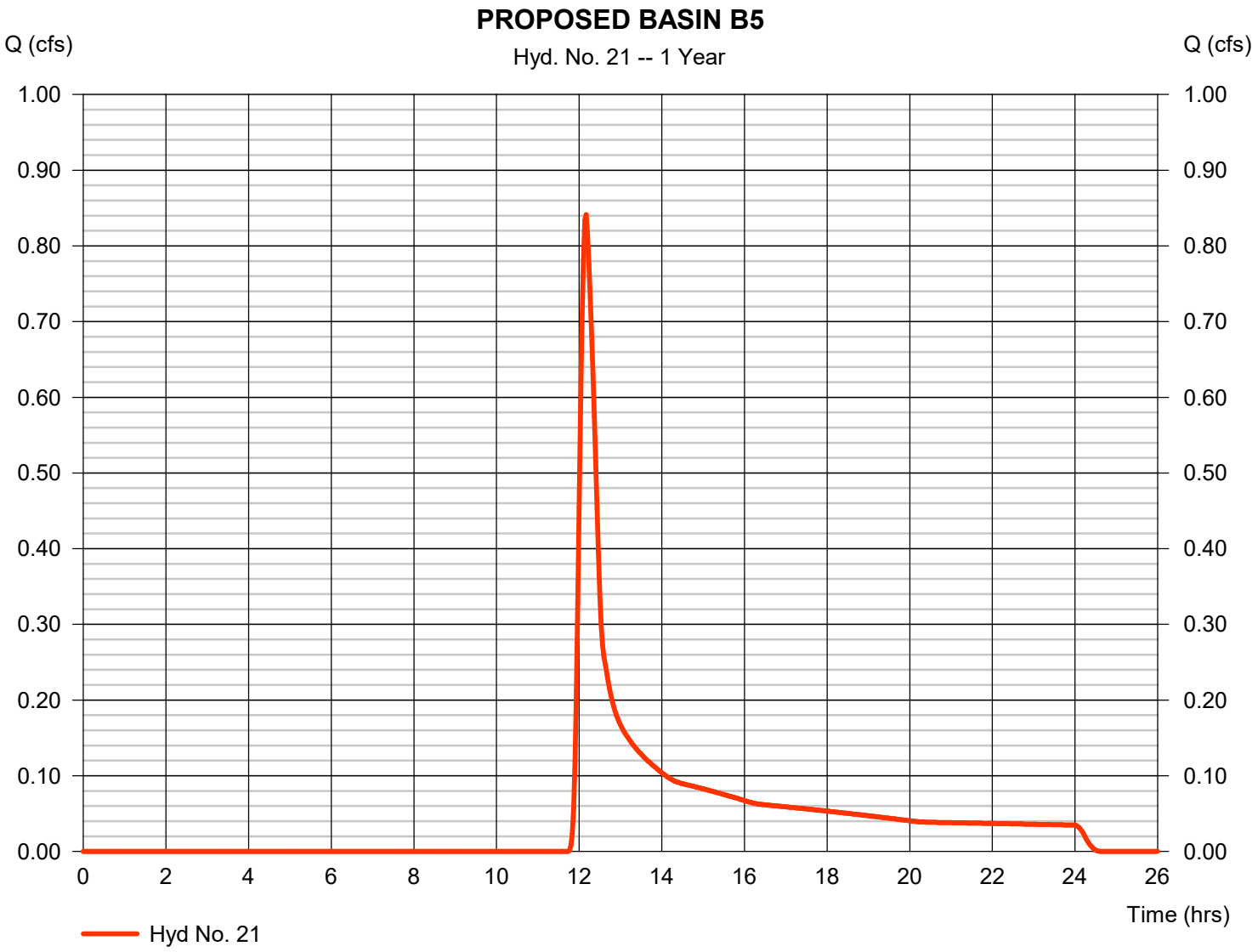
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 21

PROPOSED BASIN B5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.841 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 4,078 cuft
Drainage area	= 2.570 ac	Curve number	= 67
Basin Slope	= 2.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.10 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



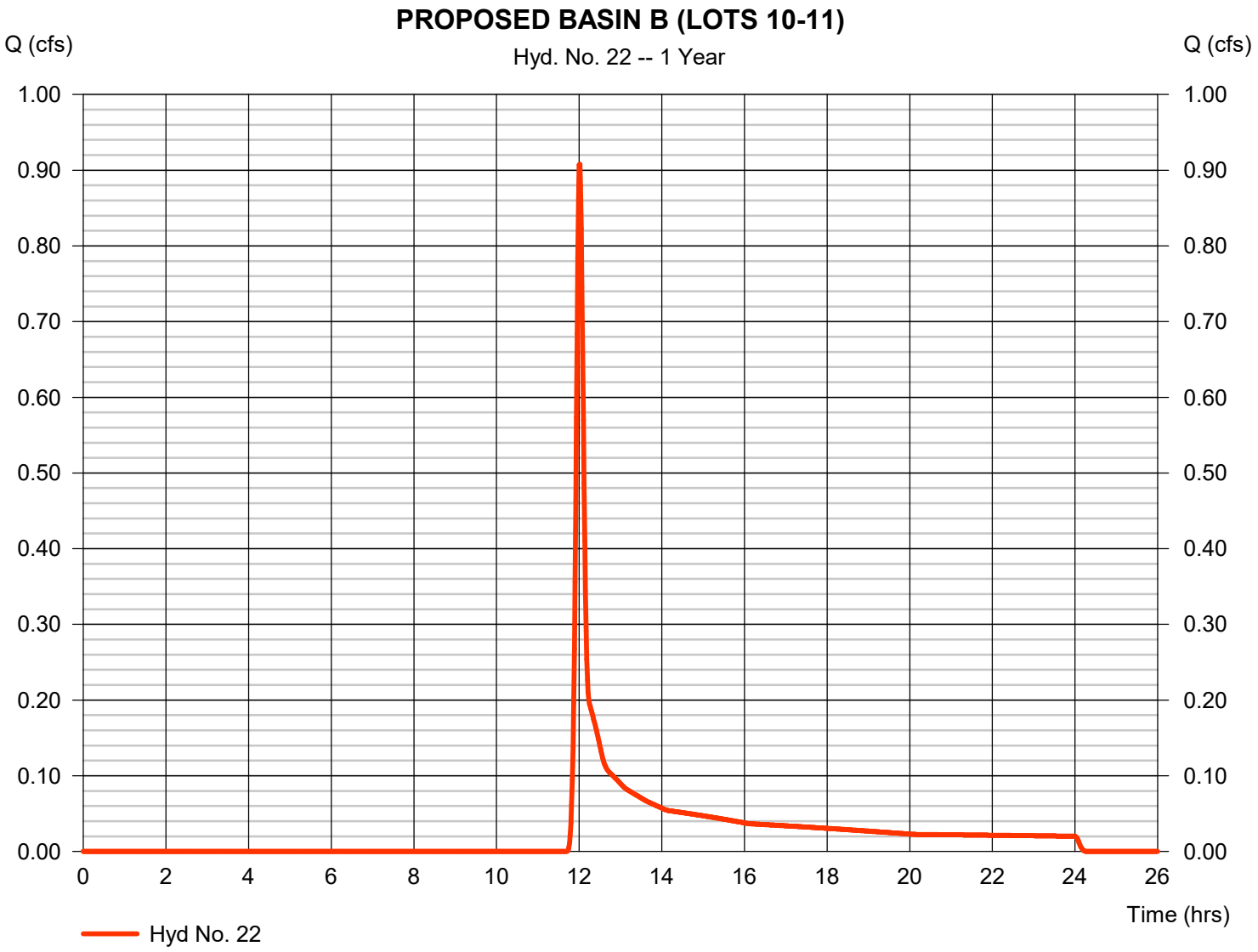
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 22

PROPOSED BASIN B (LOTS 10-11)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.908 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.02 hrs
Time interval	= 1 min	Hyd. volume	= 2,445 cuft
Drainage area	= 1.450 ac	Curve number	= 68
Basin Slope	= 2.0 %	Hydraulic length	= 100 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



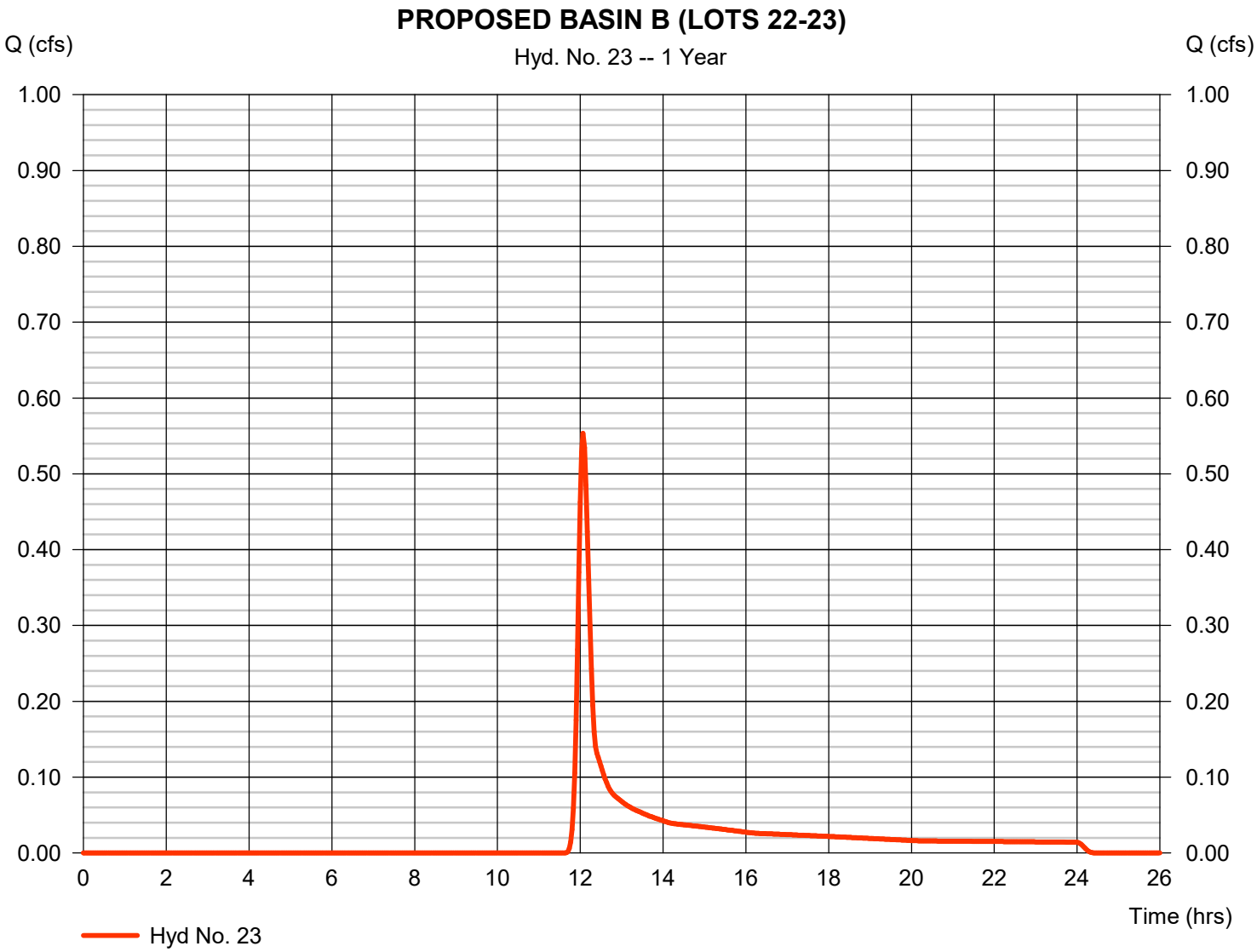
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 23

PROPOSED BASIN B (LOTS 22-23)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.553 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 1,831 cuft
Drainage area	= 0.960 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



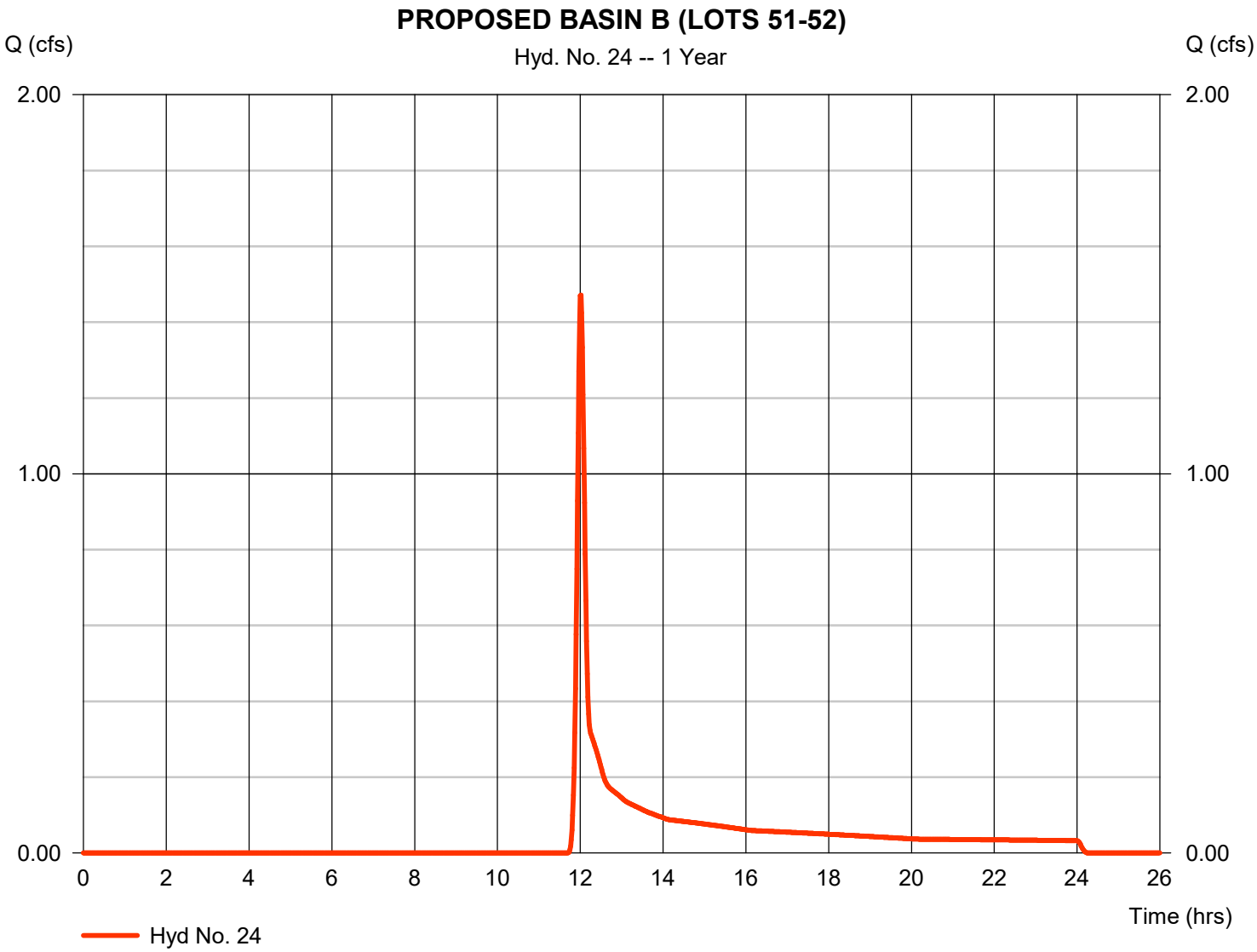
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 24

PROPOSED BASIN B (LOTS 51-52)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.471 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.02 hrs
Time interval	= 1 min	Hyd. volume	= 3,962 cuft
Drainage area	= 2.350 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 25

PROPOSED BASIN B (UND TO DAM)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.479 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 2,768 cuft
Drainage area	= 2.130 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Report

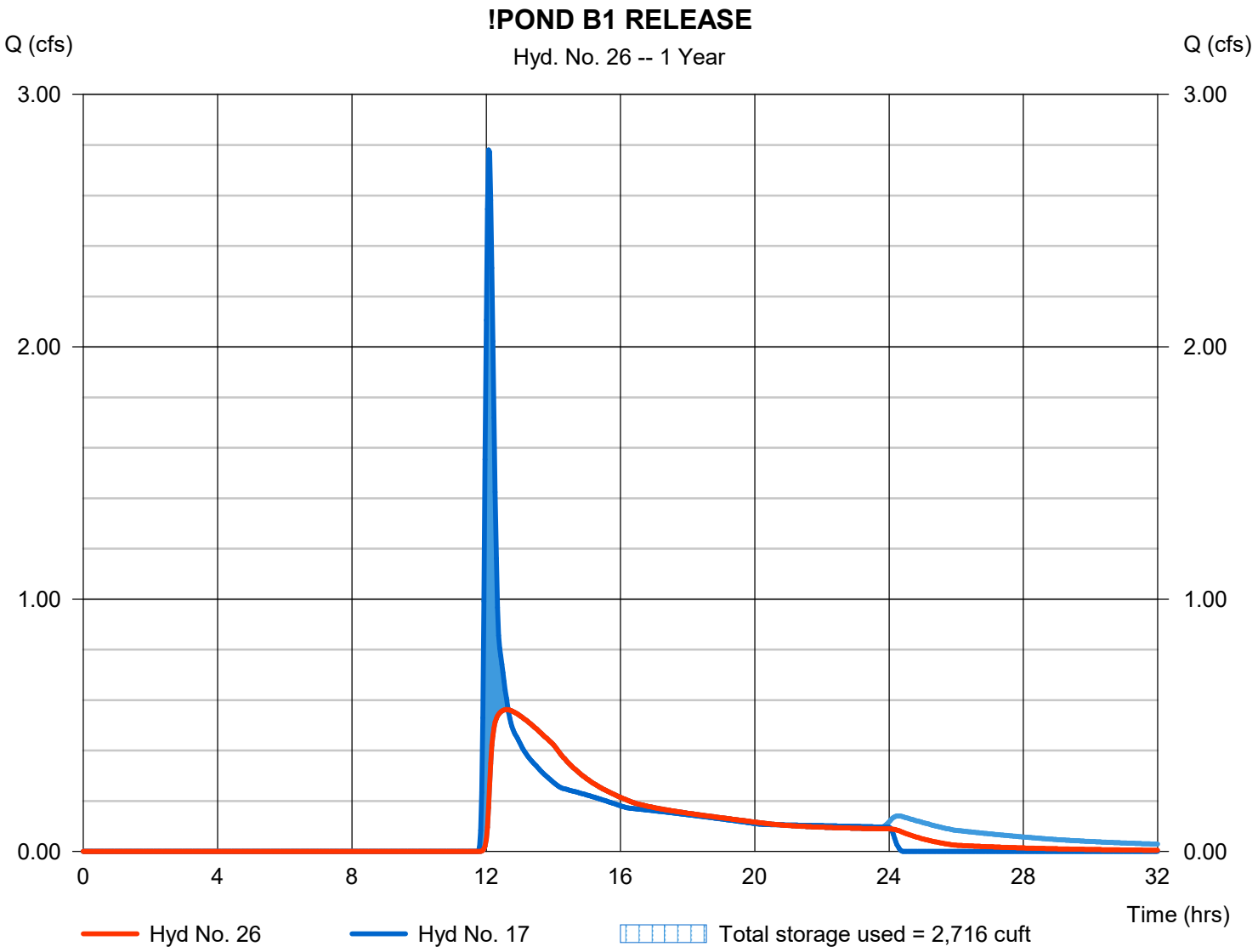
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 26

!POND B1 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.562 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.60 hrs
Time interval	= 2 min	Hyd. volume	= 9,984 cuft
Inflow hyd. No.	= 17 - PROPOSED BASIN B1	Max. Elevation	= 934.70 ft
Reservoir name	= POND B1	Max. Storage	= 2,716 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 3 - POND B1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 934.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	934.00	3,050	0	0
1.00	935.00	4,780	3,882	3,882
2.00	936.00	6,610	5,670	9,552
3.00	937.00	8,560	7,563	17,115
4.00	938.00	10,625	9,573	26,688
5.00	939.00	12,800	11,694	38,383
6.00	940.00	15,120	13,943	52,325
7.00	941.00	17,200	16,147	68,473

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	0.00	0.00
Span (in)	= 15.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 934.00	934.00	0.00	0.00
Length (ft)	= 100.00	20.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	25.00	0.00	0.00
Crest El. (ft)	= 938.00	939.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.520 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	934.00	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
1.00	3,882	935.00	0.74 ic	0.73 ic	---	---	0.00	0.00	---	---	0.058	---	0.793
2.00	9,552	936.00	1.16 ic	1.15 ic	---	---	0.00	0.00	---	---	0.080	---	1.234
3.00	17,115	937.00	1.47 ic	1.47 ic	---	---	0.00	0.00	---	---	0.103	---	1.572
4.00	26,688	938.00	1.73 ic	1.73 ic	---	---	0.00	0.00	---	---	0.128	---	1.861
5.00	38,383	939.00	10.87 oc	0.32 ic	---	---	10.55 s	0.00	---	---	0.154	---	11.02
6.00	52,325	940.00	12.09 oc	0.14 ic	---	---	11.94 s	83.25	---	---	0.182	---	95.51
7.00	68,473	941.00	13.11 oc	0.08 ic	---	---	12.97 s	235.47	---	---	0.207	---	248.73

Hydrograph Report

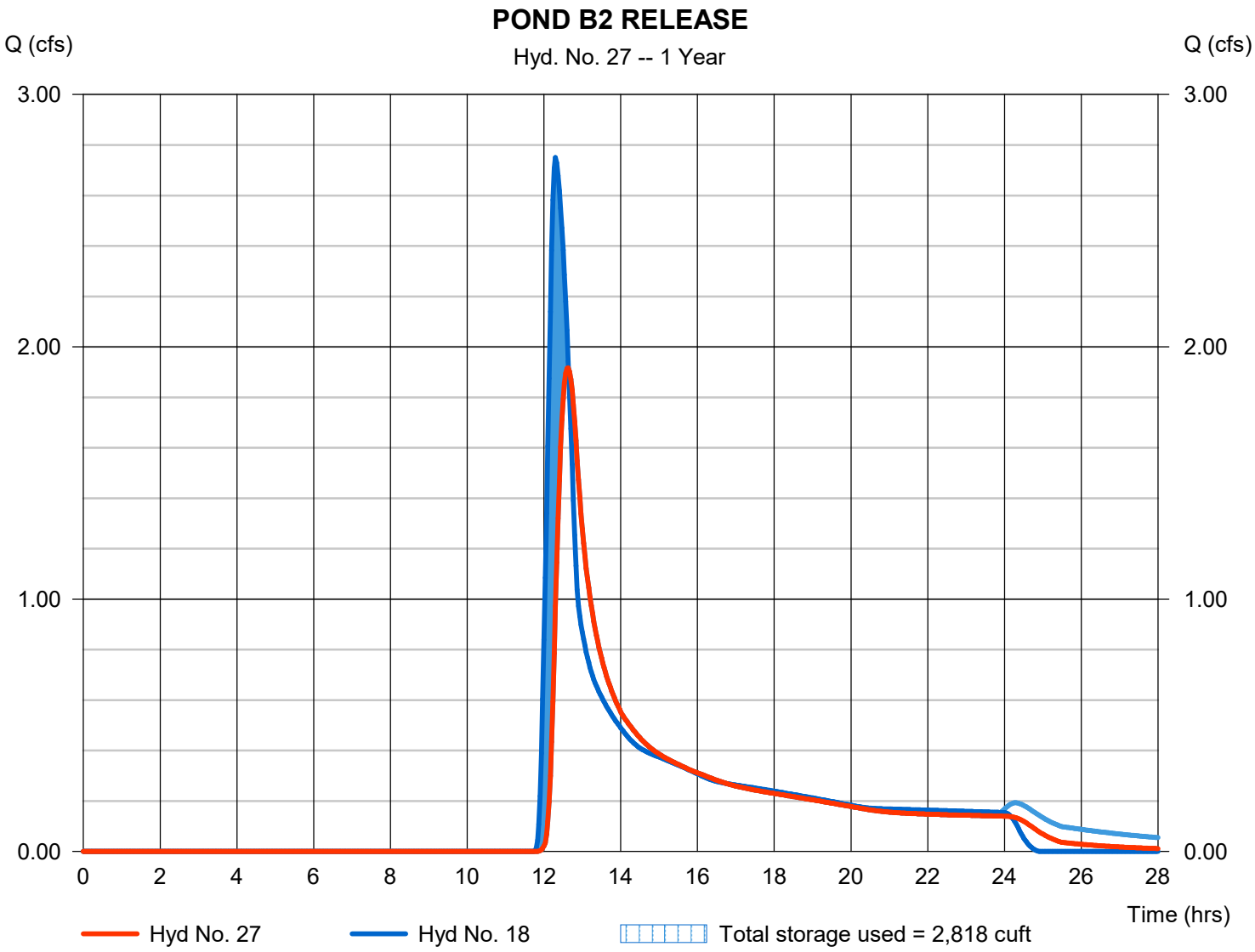
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 27

POND B2 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 1.917 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 16,605 cuft
Inflow hyd. No.	= 18 - PROPOSED BASIN B2	Max. Elevation	= 938.80 ft
Reservoir name	= POND B2	Max. Storage	= 2,818 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 4 - POND B2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 938.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	938.00	611	0	0
1.00	939.00	7,794	3,529	3,529
2.00	940.00	14,540	10,992	14,521
3.00	941.00	16,825	15,667	30,188
4.00	942.00	18,680	17,743	47,930
5.00	943.00	20,600	19,630	67,561

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	15.00	0.00	0.00
Span (in)	= 24.00	15.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 938.00	938.00	0.00	0.00
Length (ft)	= 100.00	10.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	25.00	0.00	0.00
Crest El. (ft)	= 941.50	942.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.520 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	938.00	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
1.00	3,529	939.00	2.81 ic	2.81 ic	---	---	0.00	0.00	---	---	0.094	---	2.903
2.00	14,521	940.00	5.78 ic	5.78 ic	---	---	0.00	0.00	---	---	0.175	---	5.960
3.00	30,188	941.00	7.83 ic	7.83 ic	---	---	0.00	0.00	---	---	0.203	---	8.034
4.00	47,930	942.00	15.61 ic	8.22 ic	---	---	7.39	0.00	---	---	0.225	---	15.84
5.00	67,561	943.00	23.62 ic	7.38 ic	---	---	16.23 ic	65.00	---	---	0.248	---	88.86

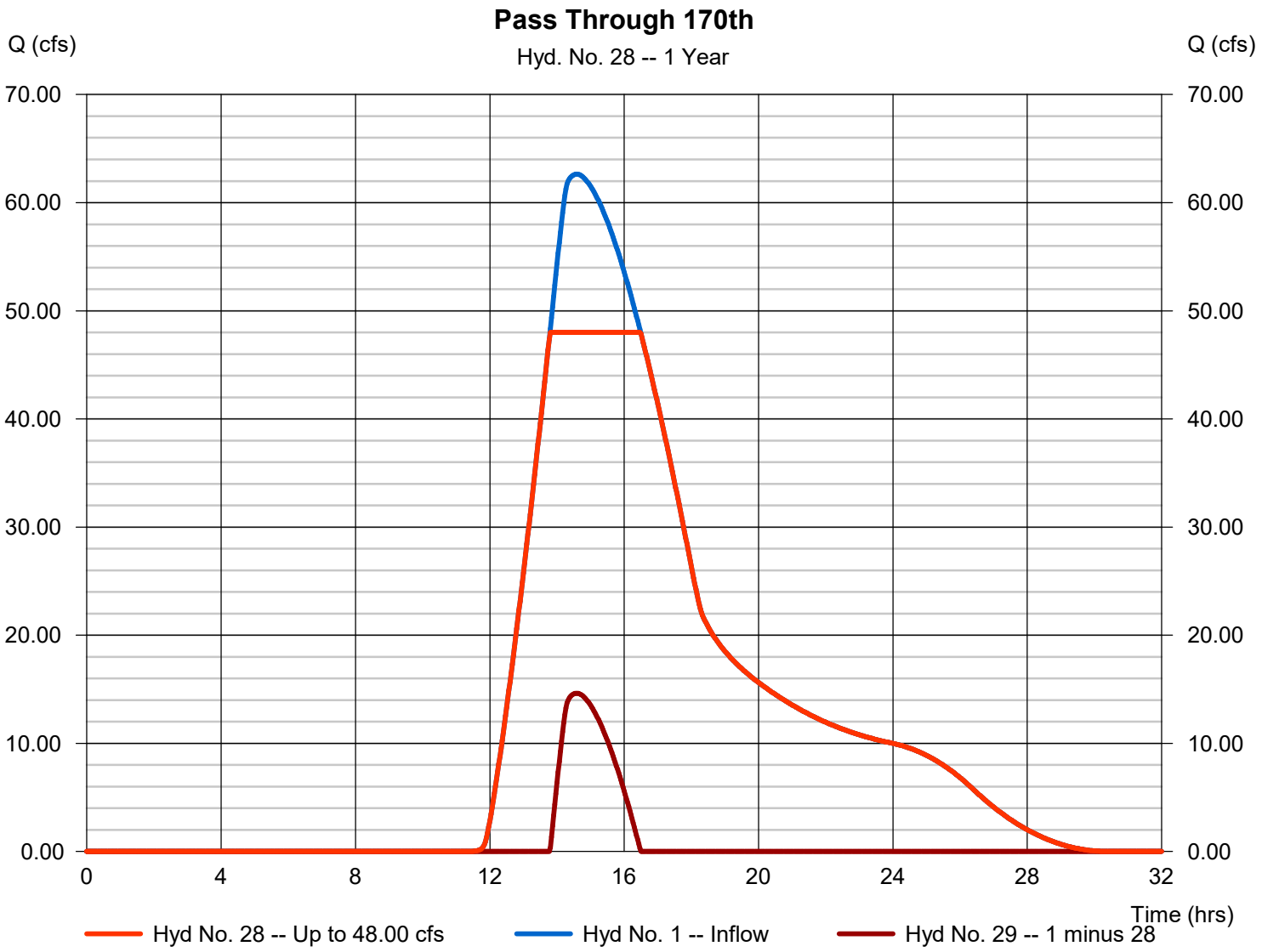
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 28

Pass Through 170th

Hydrograph type	= Diversion1	Peak discharge	= 48.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 13.80 hrs
Time interval	= 2 min	Hyd. volume	= 1,238,636 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 29
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



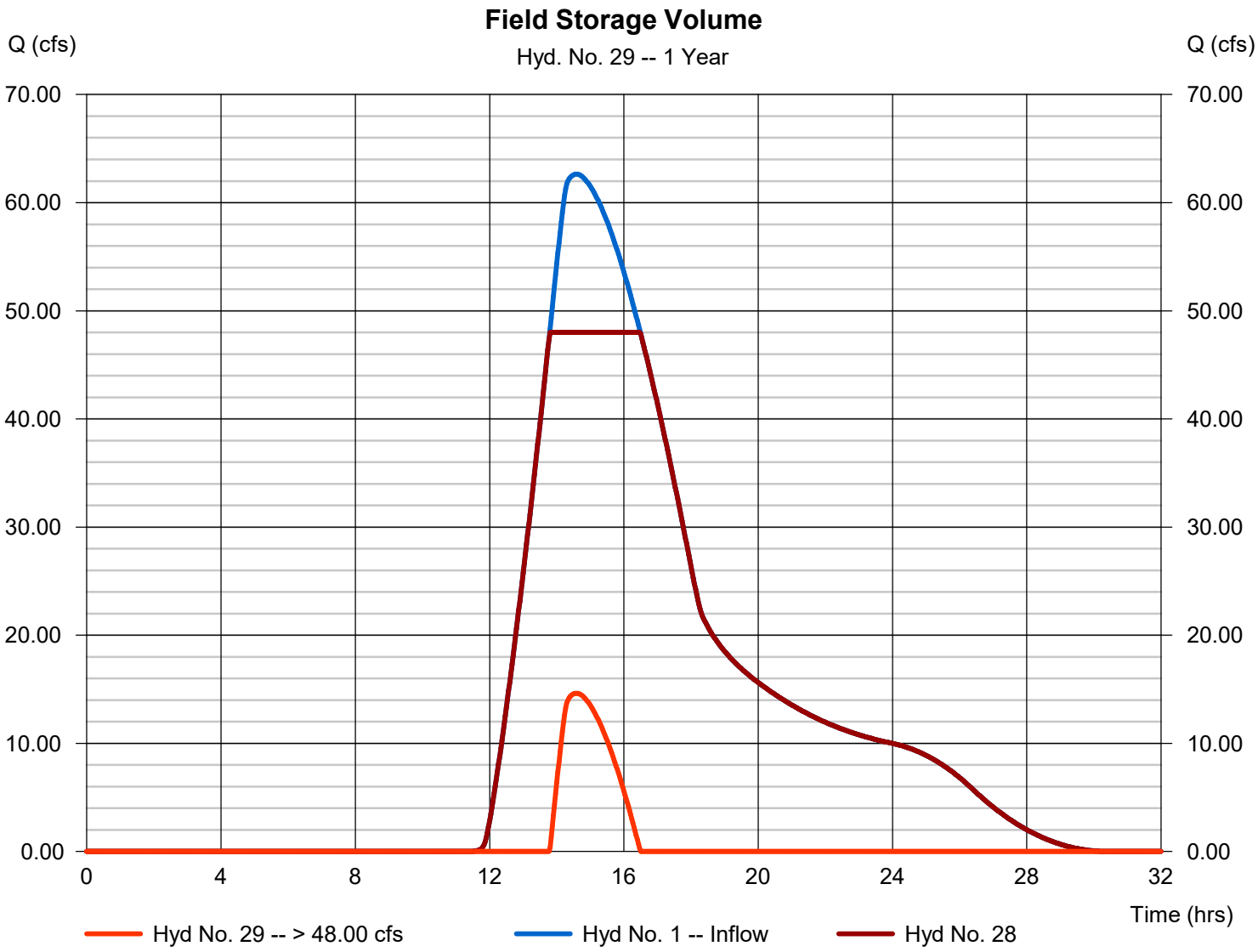
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 29

Field Storage Volume

Hydrograph type	= Diversion2	Peak discharge	= 14.63 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.60 hrs
Time interval	= 2 min	Hyd. volume	= 90,834 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 28
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



Hydrograph Report

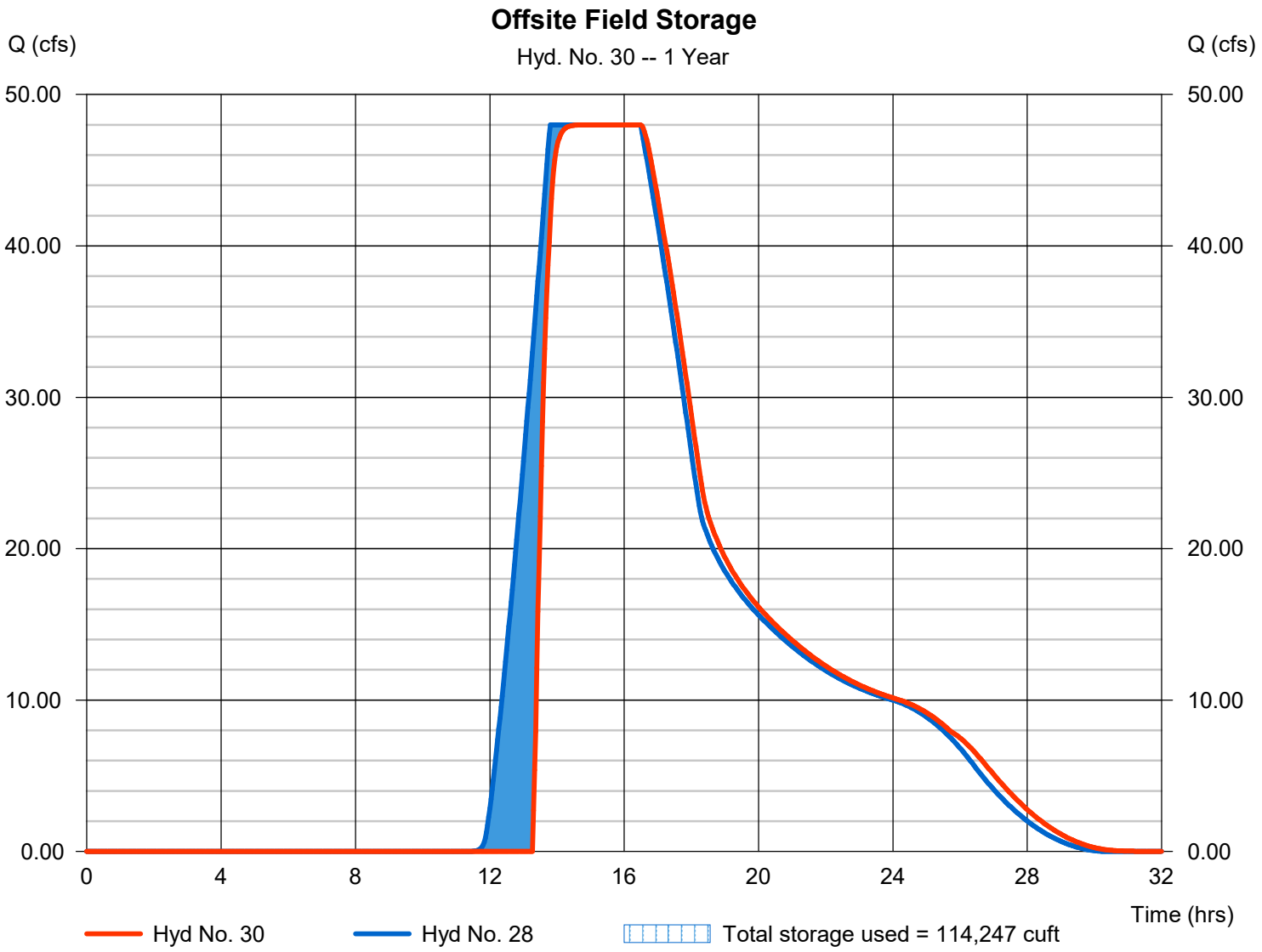
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 30

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 48.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.43 hrs
Time interval	= 2 min	Hyd. volume	= 1,160,110 cuft
Inflow hyd. No.	= 28 - Pass Through 170th	Max. Elevation	= 957.83 ft
Reservoir name	= Offsite Field Storage UPPER	Max. Storage	= 114,247 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 9 - Offsite Field Storage UPPER

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 956.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	956.00	500	0	0
1.00	957.00	67,693	24,668	24,668
2.00	958.00	153,535	107,714	132,382
3.00	959.00	299,214	222,339	354,722

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 75.00	0.00	0.00	0.00
Crest El. (ft)	= 957.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	956.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.00	24,668	957.00	---	---	---	---	0.00	---	---	---	---	---	0.000
2.00	132,382	958.00	---	---	---	---	88.30	---	---	---	---	---	88.30
3.00	354,722	959.00	---	---	---	---	458.82	---	---	---	---	---	458.82

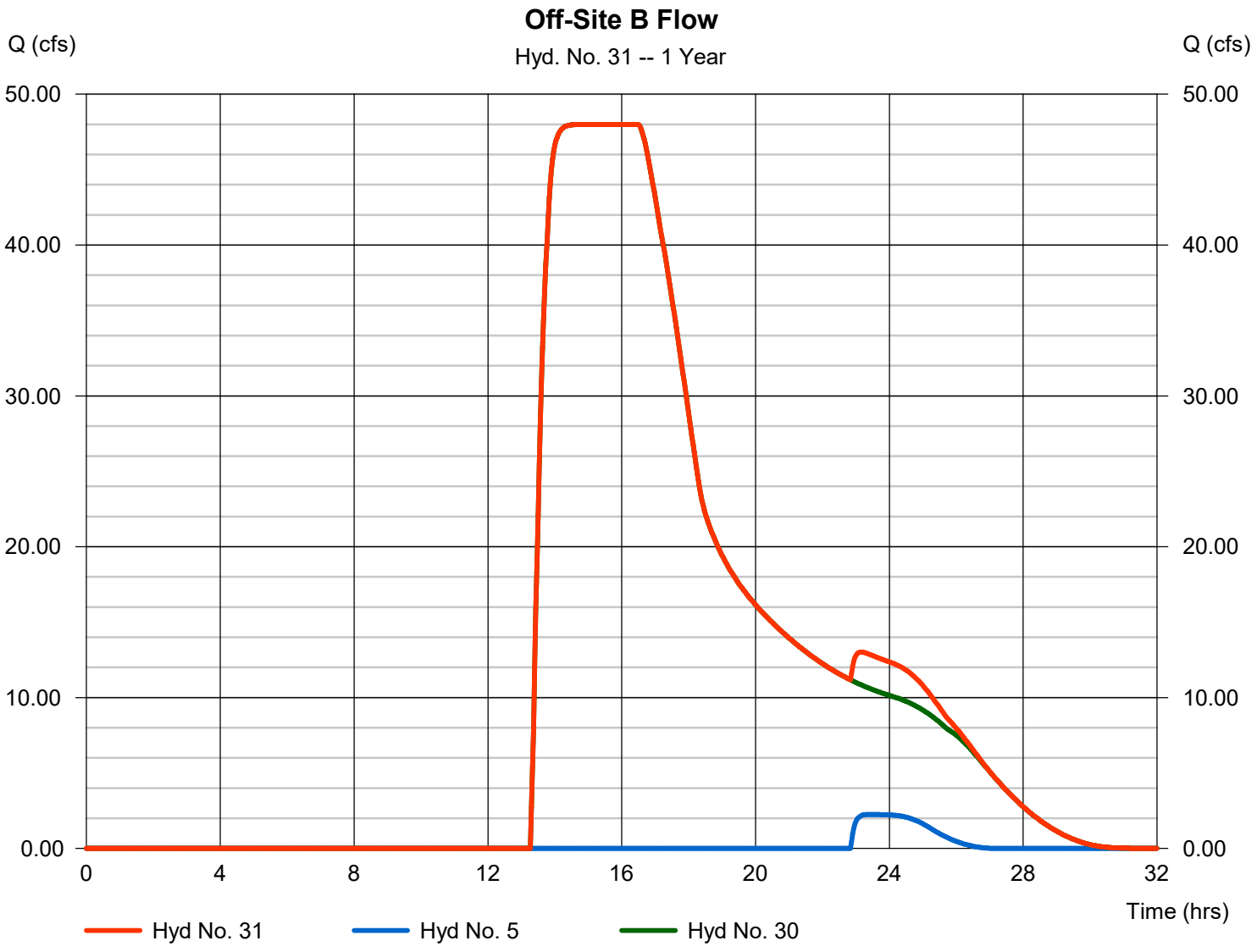
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 31

Off-Site B Flow

Hydrograph type	= Combine	Peak discharge	= 48.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.43 hrs
Time interval	= 2 min	Hyd. volume	= 1,180,206 cuft
Inflow hyds.	= 5, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

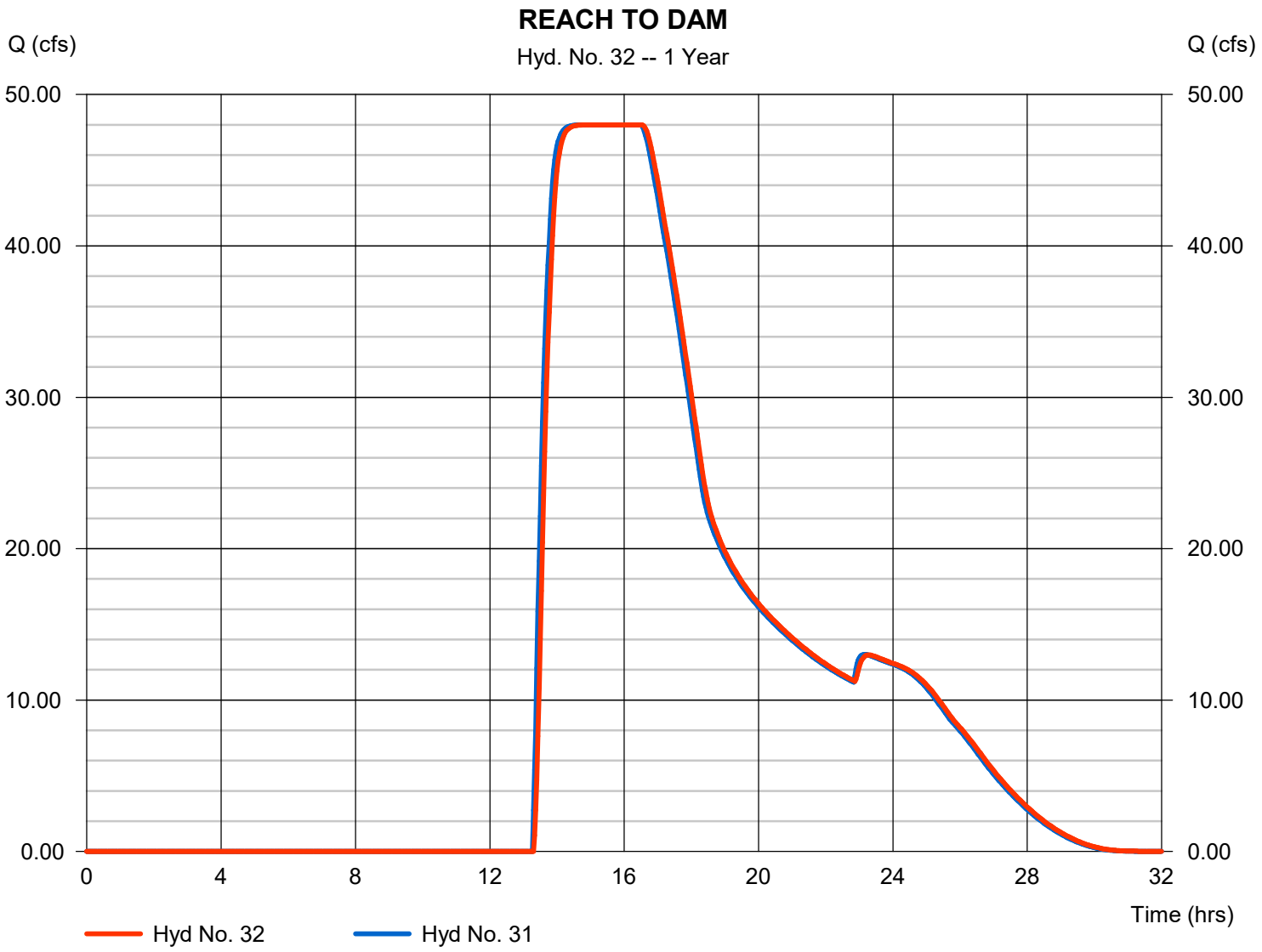
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 32

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 48.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.60 hrs
Time interval	= 2 min	Hyd. volume	= 1,180,194 cuft
Inflow hyd. No.	= 31 - Off-Site B Flow	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 2.80 ft/s	Routing coeff.	= 0.3893

Modified Att-Kin routing method used.



Hydrograph Report

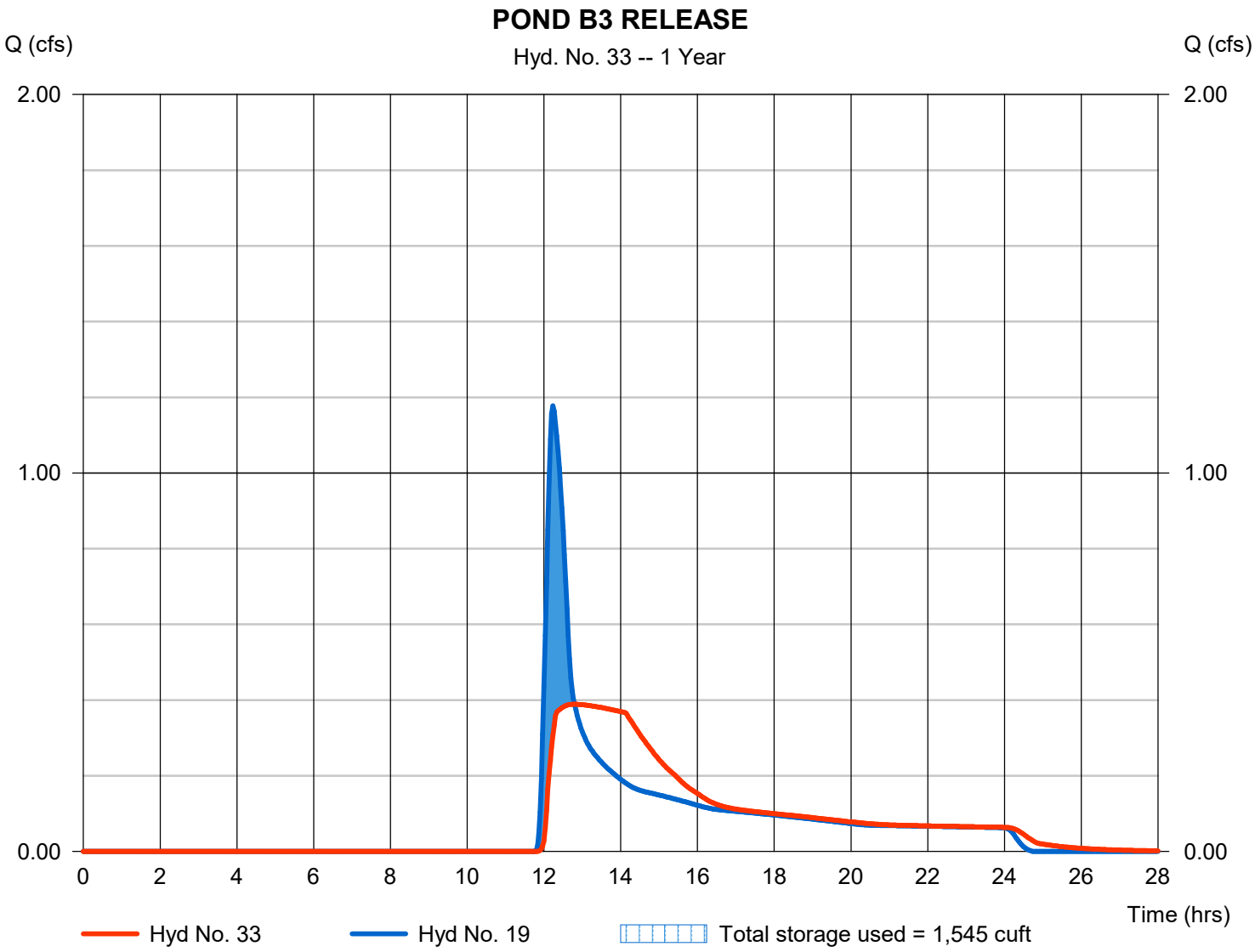
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 33

POND B3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.389 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.80 hrs
Time interval	= 2 min	Hyd. volume	= 7,078 cuft
Inflow hyd. No.	= 19 - PROPOSED BASIN B3	Max. Elevation	= 938.11 ft
Reservoir name	= POND B3	Max. Storage	= 1,545 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 5 - POND B3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 937.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	937.00	00	0	0
1.00	938.00	2,790	930	930
2.00	939.00	9,400	5,770	6,700
3.00	940.00	11,700	10,528	17,228
4.00	941.00	13,500	12,588	29,816
5.00	942.00	15,370	14,423	44,239
6.00	943.00	17,330	16,339	60,578
7.00	944.00	18,250	17,786	78,364

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	4.00	0.00	0.00
Span (in)	= 24.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 937.00	937.00	0.00	0.00
Length (ft)	= 100.00	25.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	25.00	0.00	0.00
Crest El. (ft)	= 942.00	943.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	937.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
1.00	930	938.00	0.38 ic	0.37 ic	---	---	0.00	0.00	---	---	---	---	0.366
2.00	6,700	939.00	0.56 ic	0.55 ic	---	---	0.00	0.00	---	---	---	---	0.549
3.00	17,228	940.00	0.69 ic	0.69 ic	---	---	0.00	0.00	---	---	---	---	0.687
4.00	29,816	941.00	0.84 ic	0.80 ic	---	---	0.00	0.00	---	---	---	---	0.801
5.00	44,239	942.00	0.90 ic	0.90 ic	---	---	0.00	0.00	---	---	---	---	0.902
6.00	60,578	943.00	15.60 ic	0.83 ic	---	---	13.25 ic	0.00	---	---	---	---	14.09
7.00	78,364	944.00	19.62 ic	0.87 ic	---	---	18.74 ic	83.25	---	---	---	---	102.87

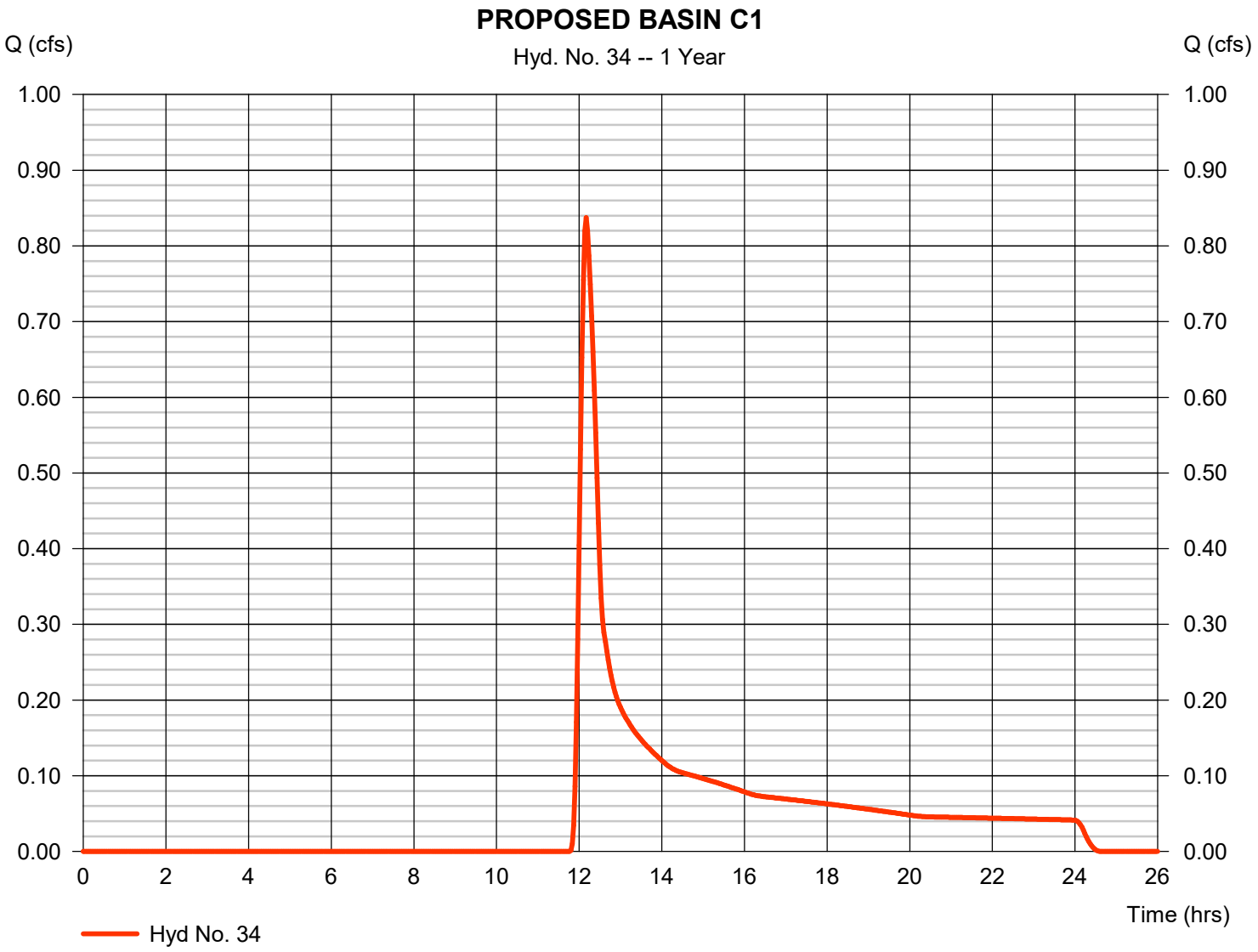
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 34

PROPOSED BASIN C1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.838 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 4,529 cuft
Drainage area	= 3.370 ac	Curve number	= 65
Basin Slope	= 2.3 %	Hydraulic length	= 630 ft
Tc method	= LAG	Time of conc. (Tc)	= 22.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



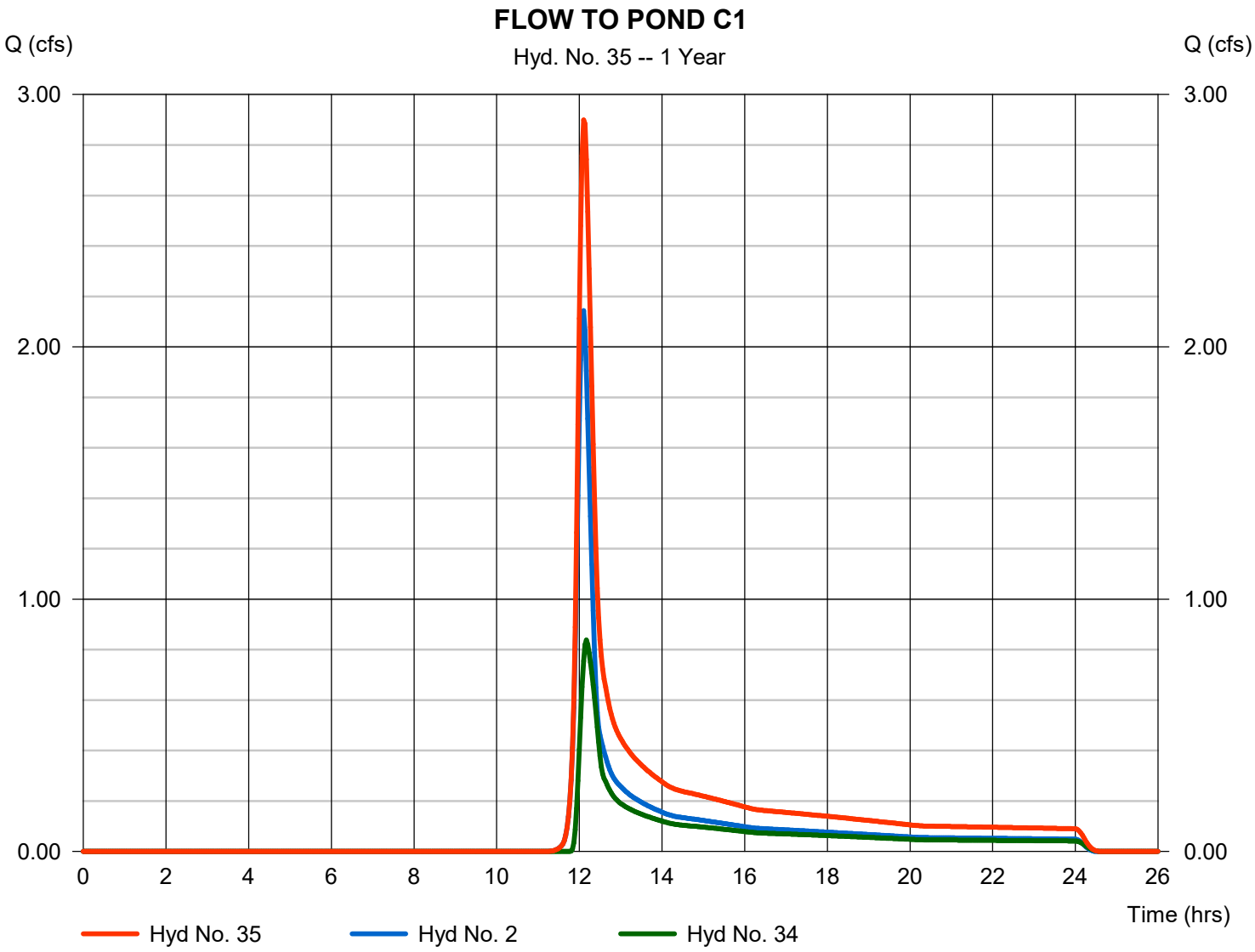
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 35

FLOW TO POND C1

Hydrograph type	= Combine	Peak discharge	= 2.899 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 11,790 cuft
Inflow hyds.	= 2, 34	Contrib. drain. area	= 6.030 ac



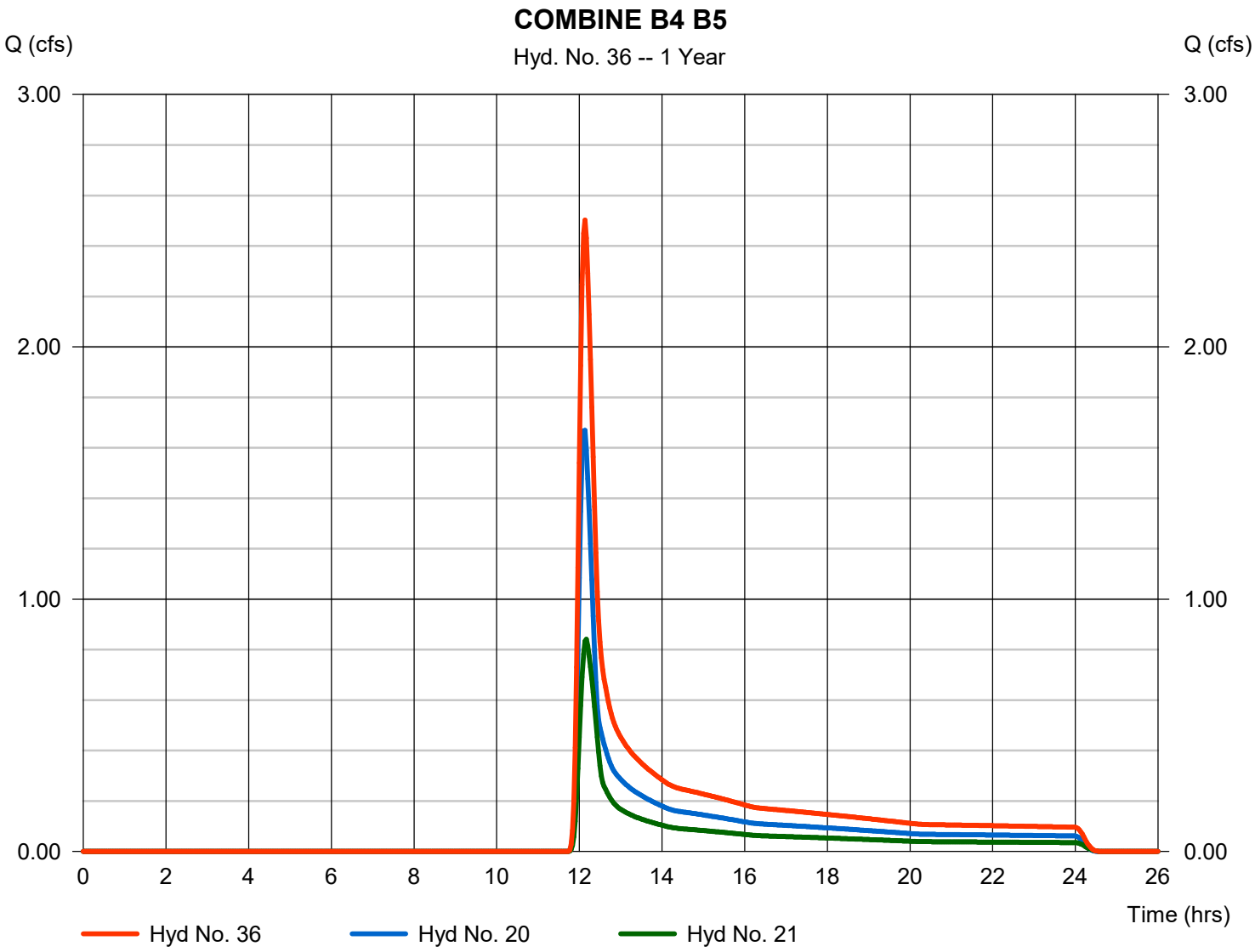
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 36

COMBINE B4 B5

Hydrograph type	= Combine	Peak discharge	= 2.503 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 11,264 cuft
Inflow hyds.	= 20, 21	Contrib. drain. area	= 7.180 ac



Hydrograph Report

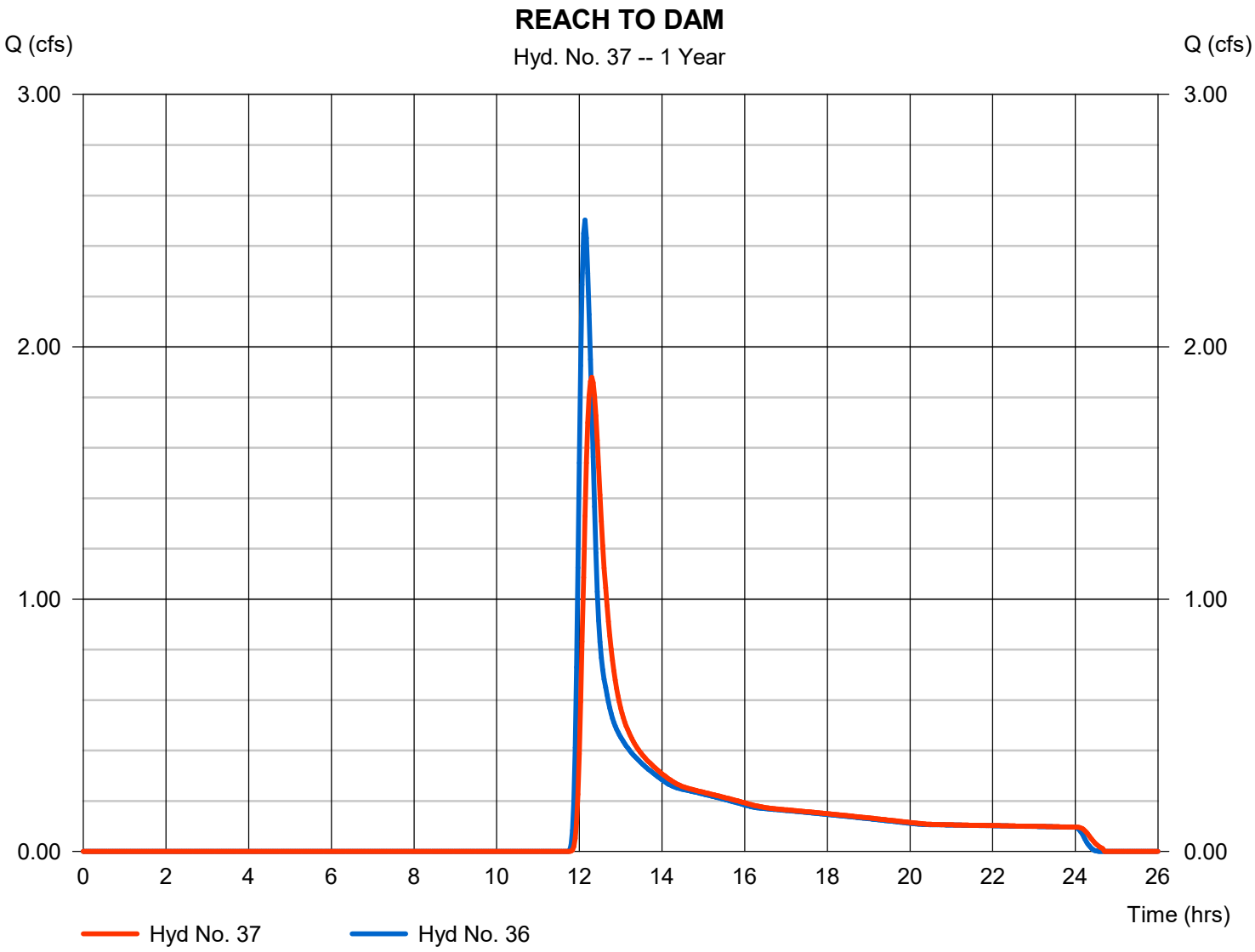
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 37

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 1.879 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 11,257 cuft
Inflow hyd. No.	= 36 - COMBINE B4 B5	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 1.14 ft/s	Routing coeff.	= 0.1791

Modified Att-Kin routing method used.



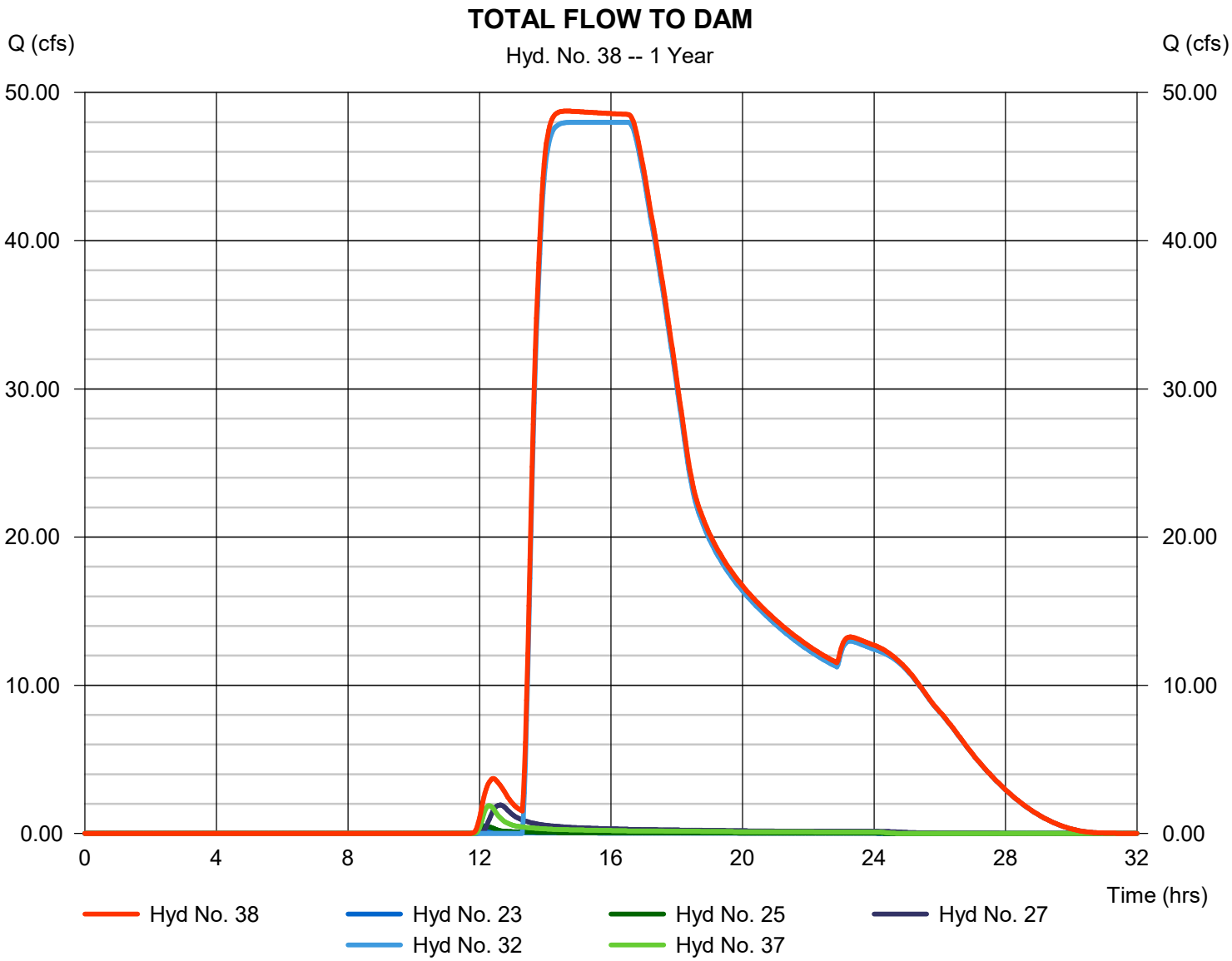
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 38

TOTAL FLOW TO DAM

Hydrograph type	= Combine	Peak discharge	= 48.75 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.63 hrs
Time interval	= 2 min	Hyd. volume	= 1,212,655 cuft
Inflow hyds.	= 23, 25, 27, 32, 37	Contrib. drain. area	= 3.090 ac



Hydrograph Report

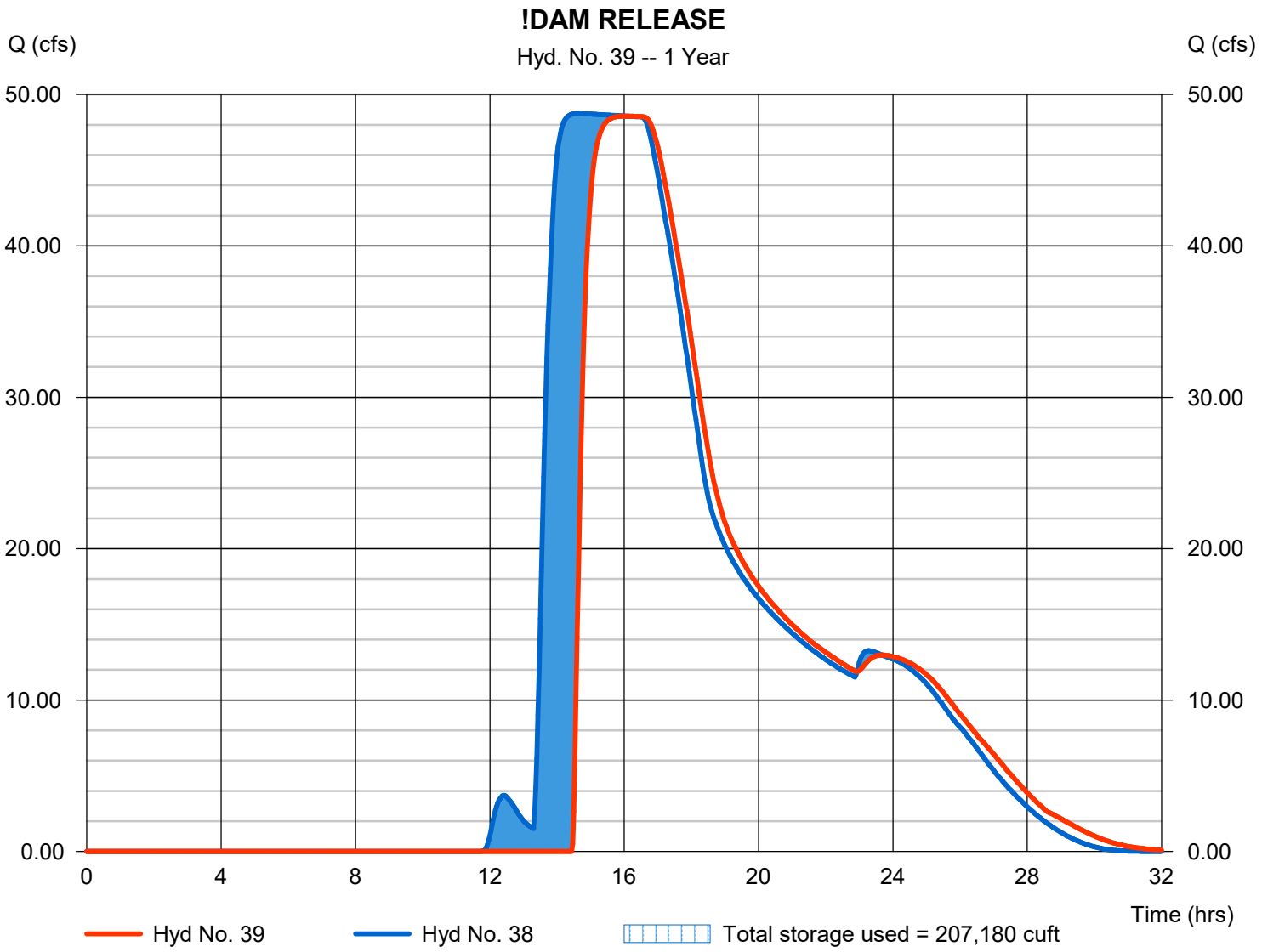
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 39

!DAM RELEASE

Hydrograph type	=	Reservoir	Peak discharge	=	48.57 cfs
Storm frequency	=	1 yrs	Time to peak	=	16.03 hrs
Time interval	=	2 min	Hyd. volume	=	1,054,492 cuft
Inflow hyd. No.	=	38 - TOTAL FLOW TO DAM	Max. Elevation	=	942.70 ft
Reservoir name	=	EXISTING DAM	Max. Storage	=	207,180 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 1 - EXISTING DAM

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 933.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	933.00	10	0	0
1.00	934.00	50	27	27
2.00	935.00	75	62	90
3.00	936.00	3,439	1,340	1,430
4.00	937.00	7,836	5,488	6,918
5.00	938.00	14,583	11,035	17,952
6.00	939.00	23,387	18,810	36,763
7.00	940.00	35,992	29,461	66,224
8.00	941.00	44,215	40,029	106,253
9.00	942.00	60,012	51,908	158,161
10.00	943.00	80,901	70,190	228,351
11.00	944.00	98,000	89,305	317,656
11.50	944.50	106,226	51,038	368,693
12.00	945.00	110,000	54,048	422,742

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	1.25
Span (in)	= 24.00	0.00	0.00	1.25
No. Barrels	= 1	0	0	72
Invert El. (ft)	= 976.80	0.00	0.00	933.00
Length (ft)	= 105.00	0.00	0.00	6.00
Slope (%)	= 0.45	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	25.00	0.00	0.00
Crest El. (ft)	= 933.00	942.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	933.00	0.00	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.00	27	934.00	0.00	---	---	0.00	0.25 s	0.00	---	---	---	---	0.000
2.00	90	935.00	0.00	---	---	0.00	0.70 s	0.00	---	---	---	---	0.000
3.00	1,430	936.00	0.00	---	---	0.00	0.74 s	0.00	---	---	---	---	0.000
4.00	6,918	937.00	0.00	---	---	0.00	1.43 s	0.00	---	---	---	---	0.000
5.00	17,952	938.00	0.00	---	---	0.00	1.48 s	0.00	---	---	---	---	0.000
6.00	36,763	939.00	0.00	---	---	0.00	2.37 s	0.00	---	---	---	---	0.000
7.00	66,224	940.00	0.00	---	---	0.00	1.91 s	0.00	---	---	---	---	0.000
8.00	106,253	941.00	0.00	---	---	0.00	3.09 s	0.00	---	---	---	---	0.000
9.00	158,161	942.00	0.00	---	---	0.00	2.84 s	0.00	---	---	---	---	0.000
10.00	228,351	943.00	0.00	---	---	0.00	4.19 s	83.25	---	---	---	---	83.25
11.00	317,656	944.00	0.00	---	---	0.00	3.15 s	235.47	---	---	---	---	235.47
11.50	368,693	944.50	0.00	---	---	0.00	4.05 s	329.07	---	---	---	---	329.07
12.00	422,742	945.00	0.00	---	---	0.00	4.85 s	432.58	---	---	---	---	432.58

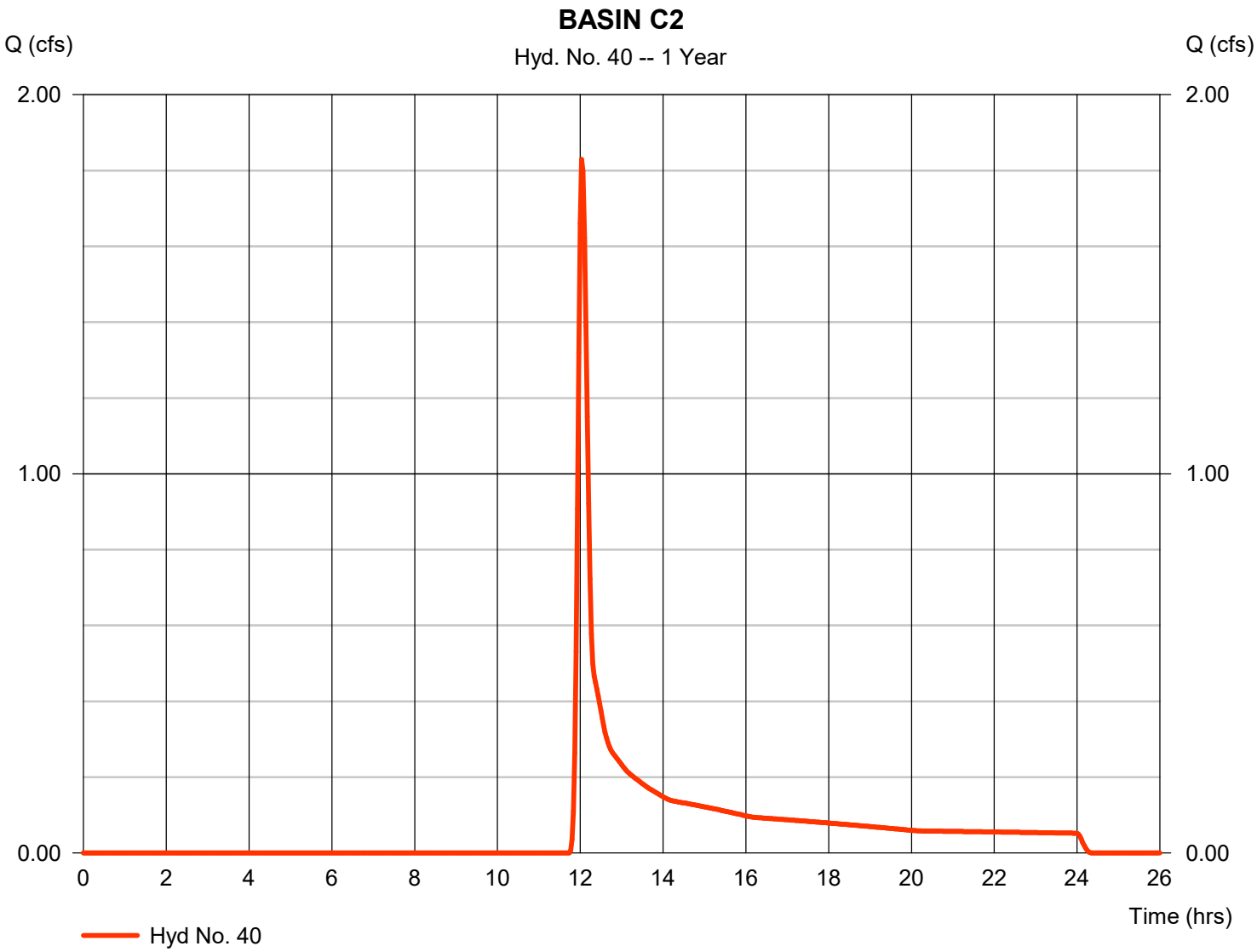
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 40

BASIN C2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.830 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6,125 cuft
Drainage area	= 3.810 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 457 ft
Tc method	= LAG	Time of conc. (Tc)	= 13.10 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



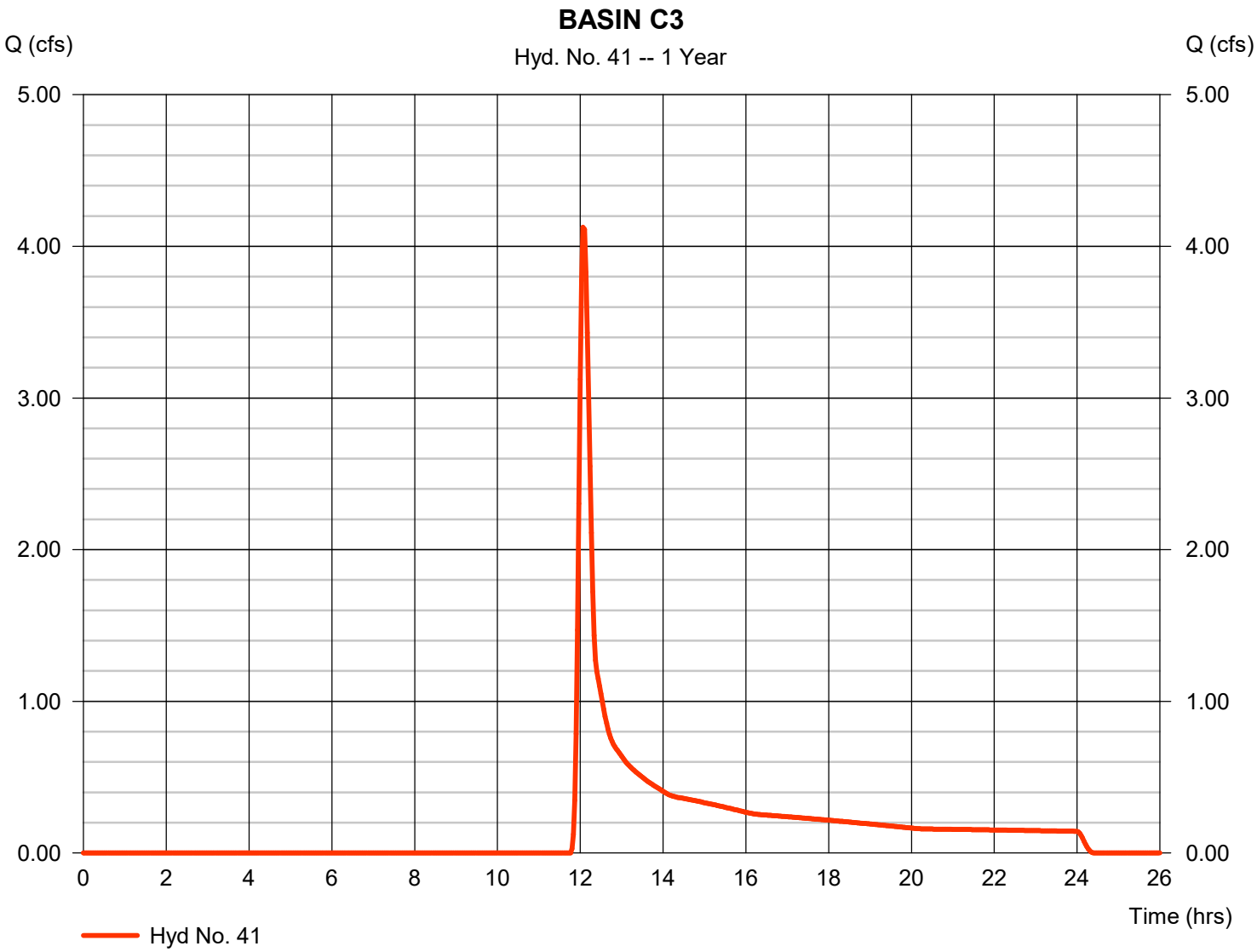
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 41

BASIN C3

Hydrograph type	= SCS Runoff	Peak discharge	= 4.125 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 16,205 cuft
Drainage area	= 11.570 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



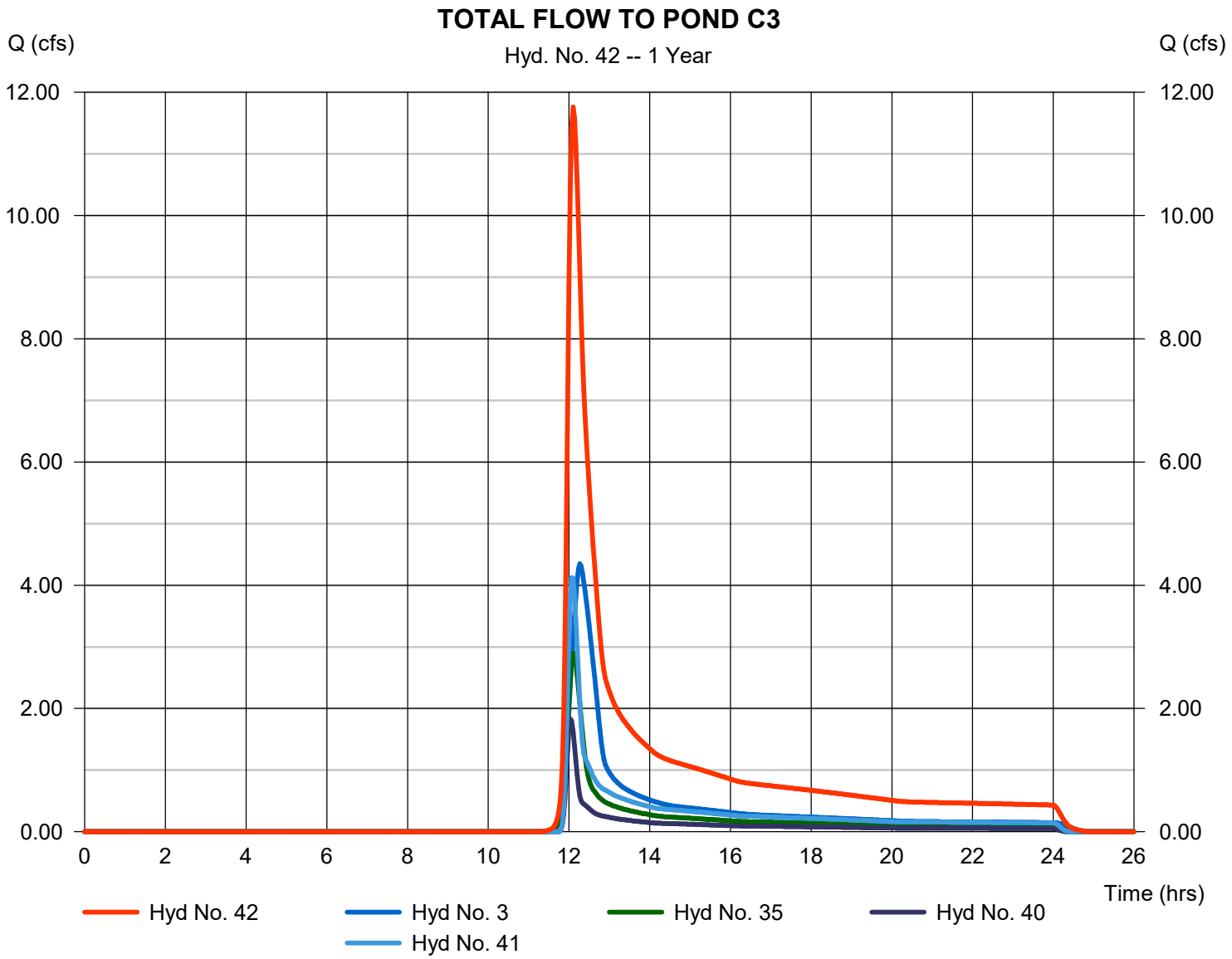
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 42

TOTAL FLOW TO POND C3

Hydrograph type	= Combine	Peak discharge	= 11.76 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 56,089 cuft
Inflow hyds.	= 3, 35, 40, 41	Contrib. drain. area	= 23.520 ac



Hydrograph Report

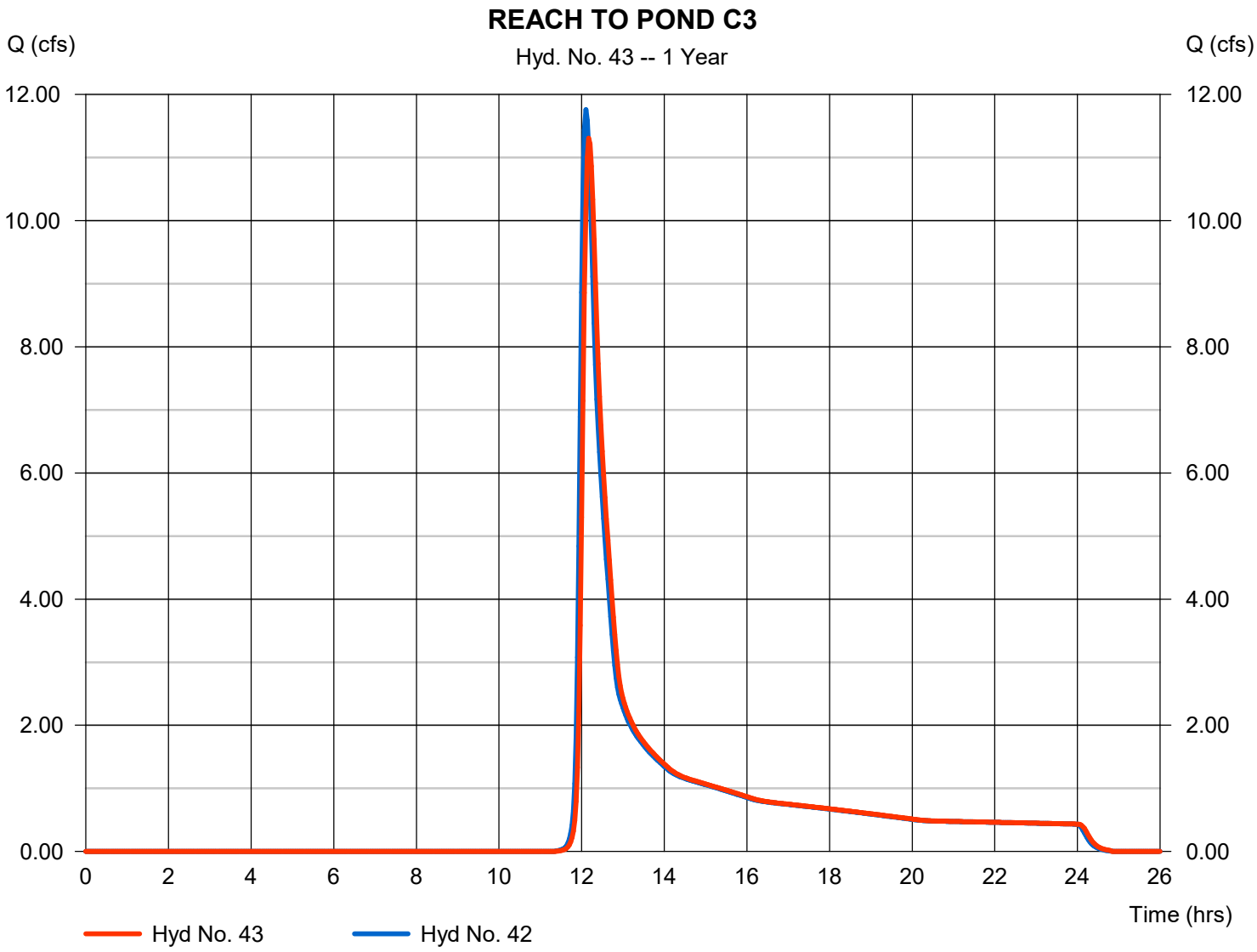
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 43

REACH TO POND C3

Hydrograph type	= Reach	Peak discharge	= 11.31 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 56,086 cuft
Inflow hyd. No.	= 42 - TOTAL FLOW TO POND C3	Section type	= Trapezoidal
Reach length	= 450.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 1.83 ft/s	Routing coeff.	= 0.5185

Modified Att-Kin routing method used.



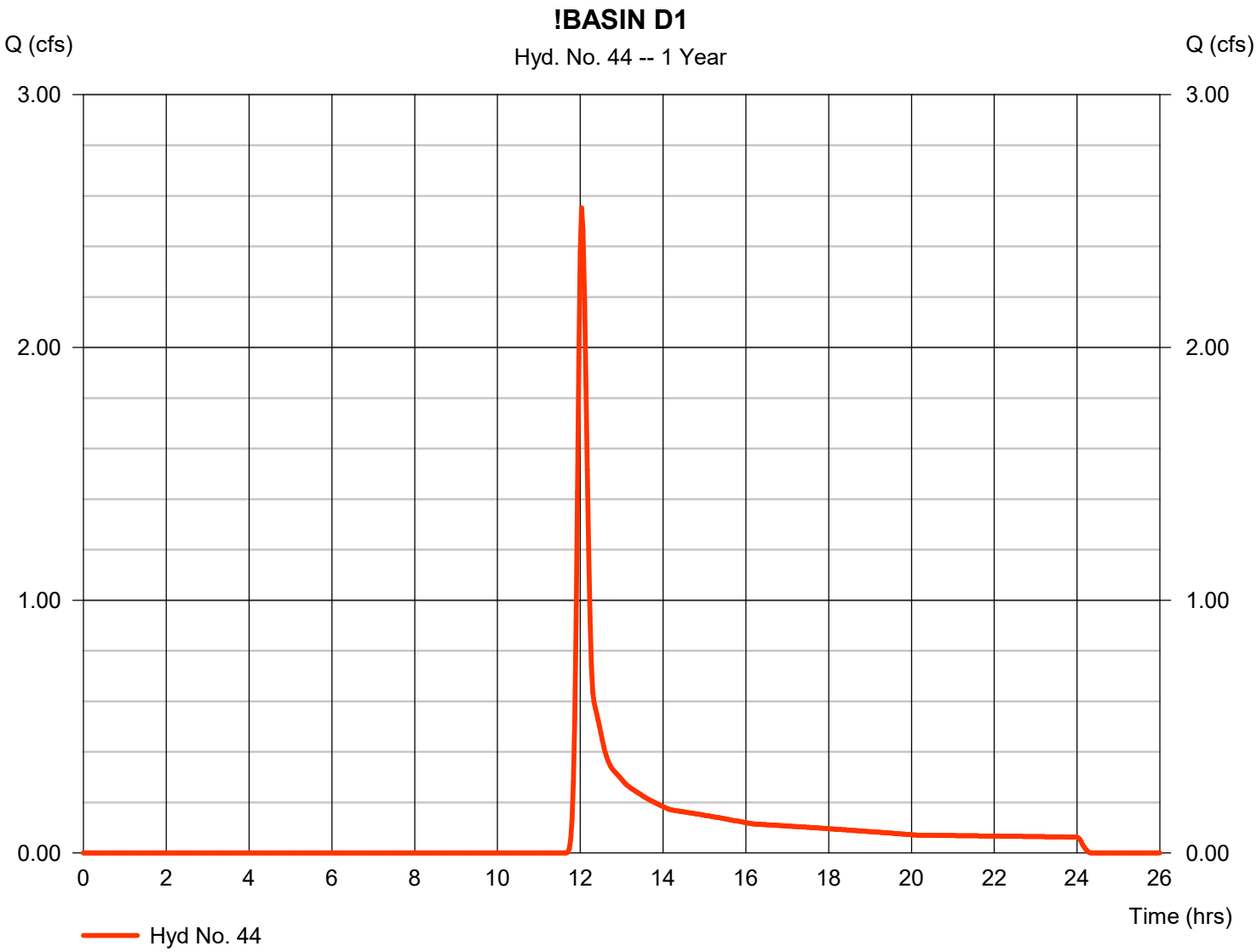
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 44

!BASIN D1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.552 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 7,876 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



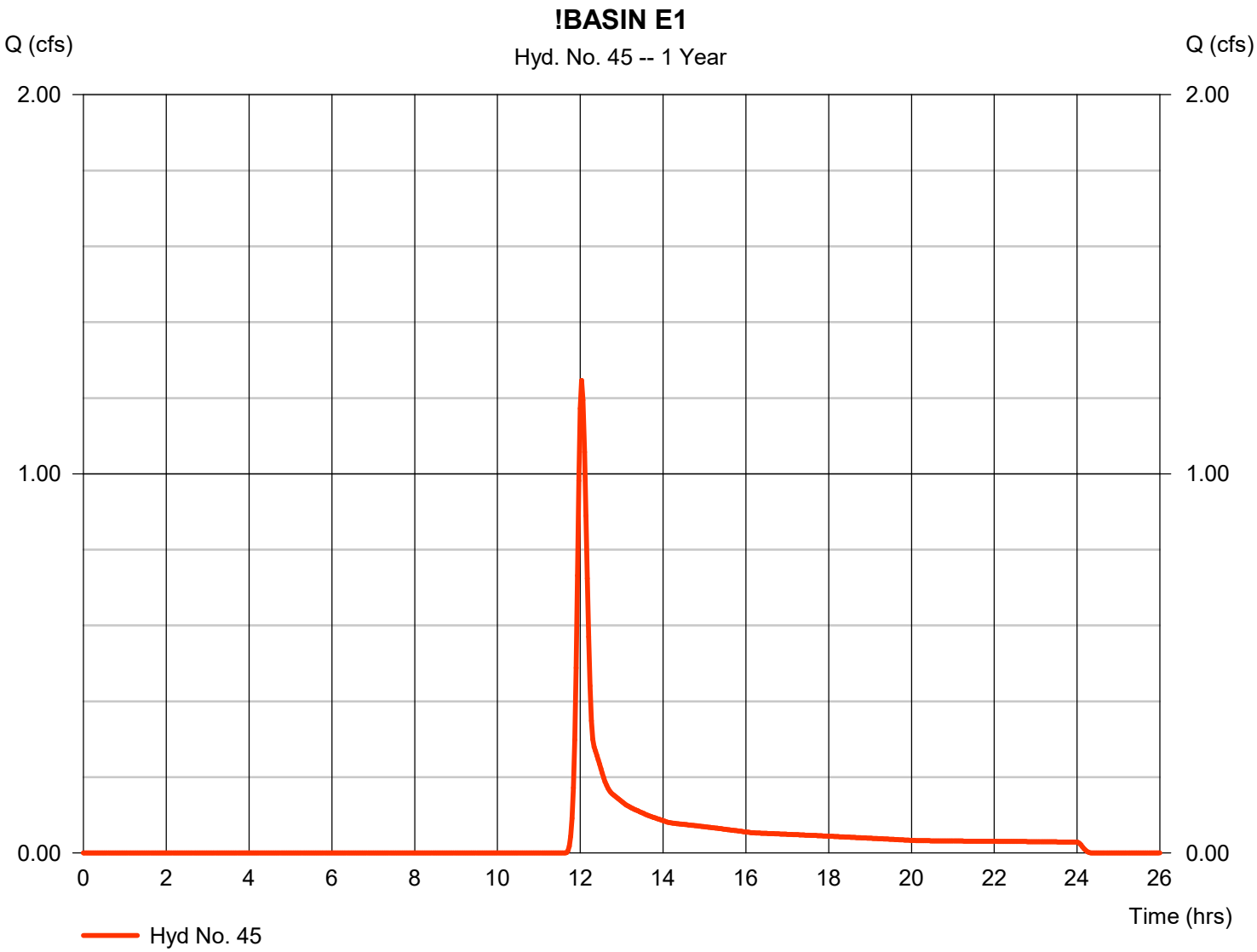
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 45

!BASIN E1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.247 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 3,732 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

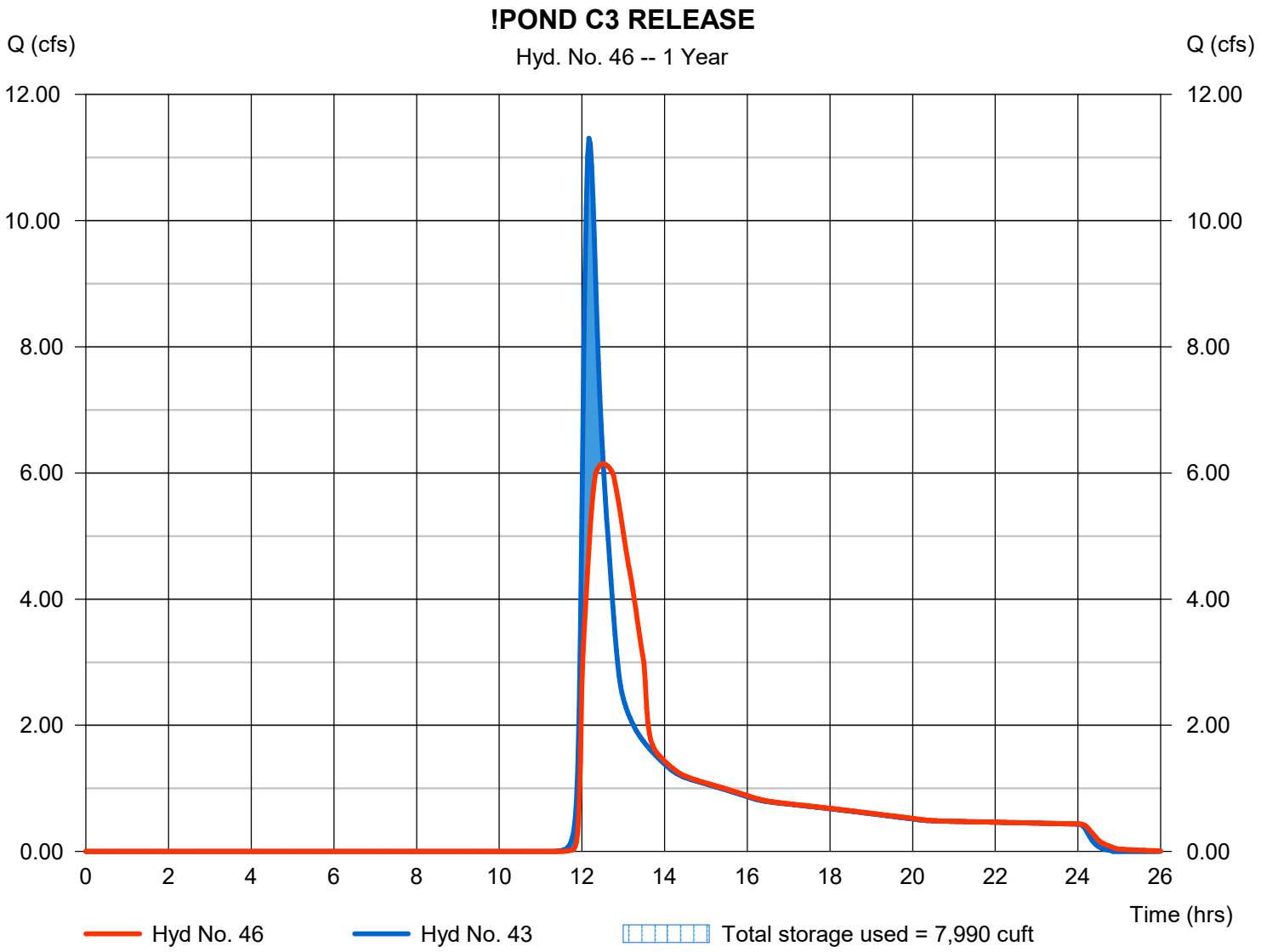
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 46

!POND C3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 6.144 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 56,083 cuft
Inflow hyd. No.	= 43 - REACH TO POND C3	Max. Elevation	= 938.07 ft
Reservoir name	= POND C3	Max. Storage	= 7,990 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 11 - POND C3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 936.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	936.00	00	0	0
1.00	937.00	3,100	1,033	1,033
2.00	938.00	9,400	5,965	6,999
3.00	939.00	18,500	13,694	20,693
4.00	940.00	28,780	23,449	44,142
5.00	941.00	40,300	34,375	78,518
6.00	942.00	51,500	45,781	124,299

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	15.00	0.00	0.00
Span (in)	= 30.00	15.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 936.00	936.00	0.00	0.00
Length (ft)	= 50.00	10.00	0.00	0.00
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 7.85	25.00	0.00	0.00
Crest El. (ft)	= 939.25	941.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	936.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
1.00	1,033	937.00	3.02 ic	2.93 ic	---	---	0.00	0.00	---	---	---	---	2.933
2.00	6,999	938.00	5.98 ic	5.98 ic	---	---	0.00	0.00	---	---	---	---	5.980
3.00	20,693	939.00	8.05 ic	8.05 ic	---	---	0.00	0.00	---	---	---	---	8.048
4.00	44,142	940.00	23.69 oc	6.71 ic	---	---	16.98	0.00	---	---	---	---	23.69
5.00	78,518	941.00	43.20 ic	3.77 ic	---	---	39.43 s	0.00	---	---	---	---	43.20
6.00	124,299	942.00	50.54 ic	2.48 ic	---	---	48.06 s	29.43	---	---	---	---	79.97

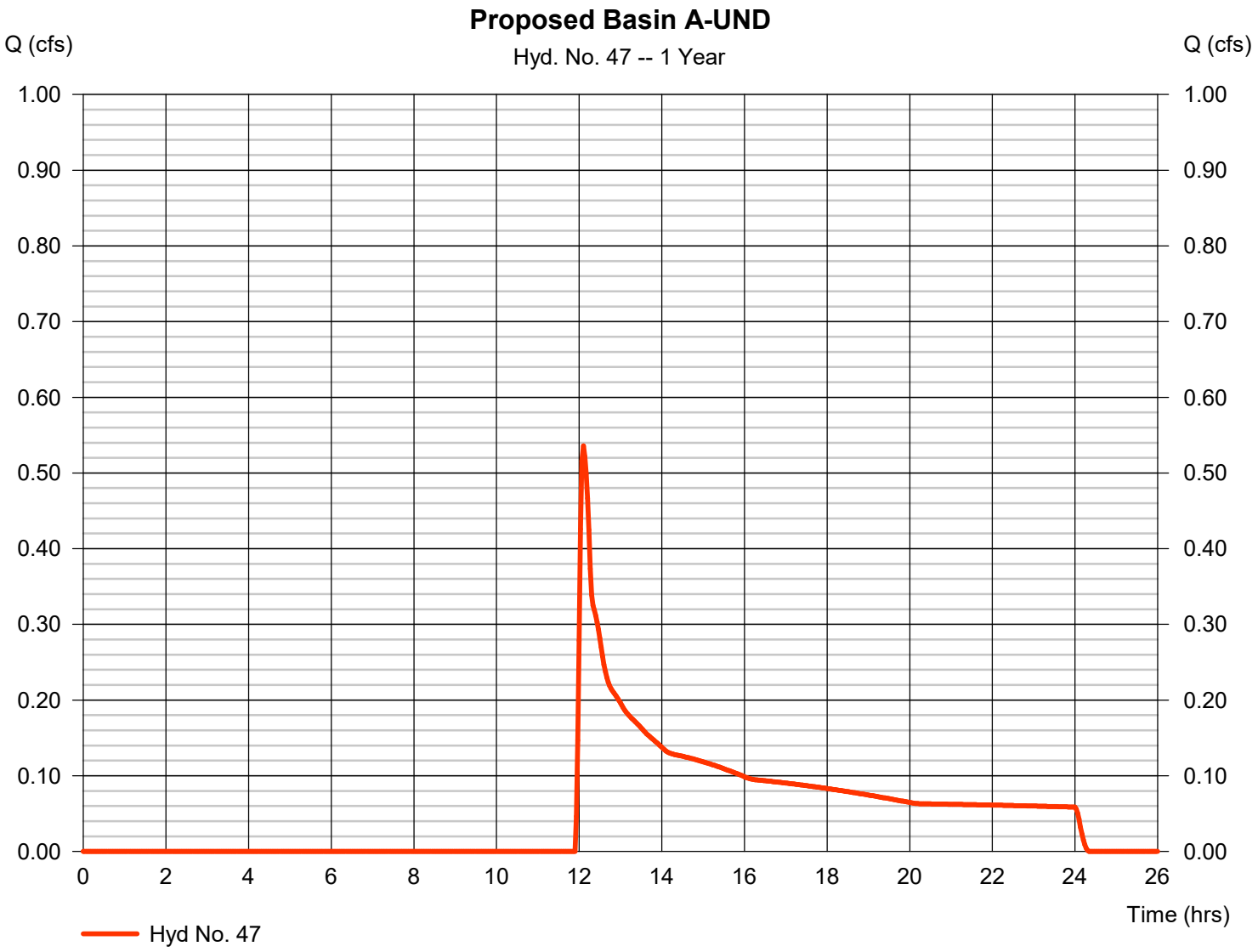
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 47

Proposed Basin A-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.536 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 4,691 cuft
Drainage area	= 7.130 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



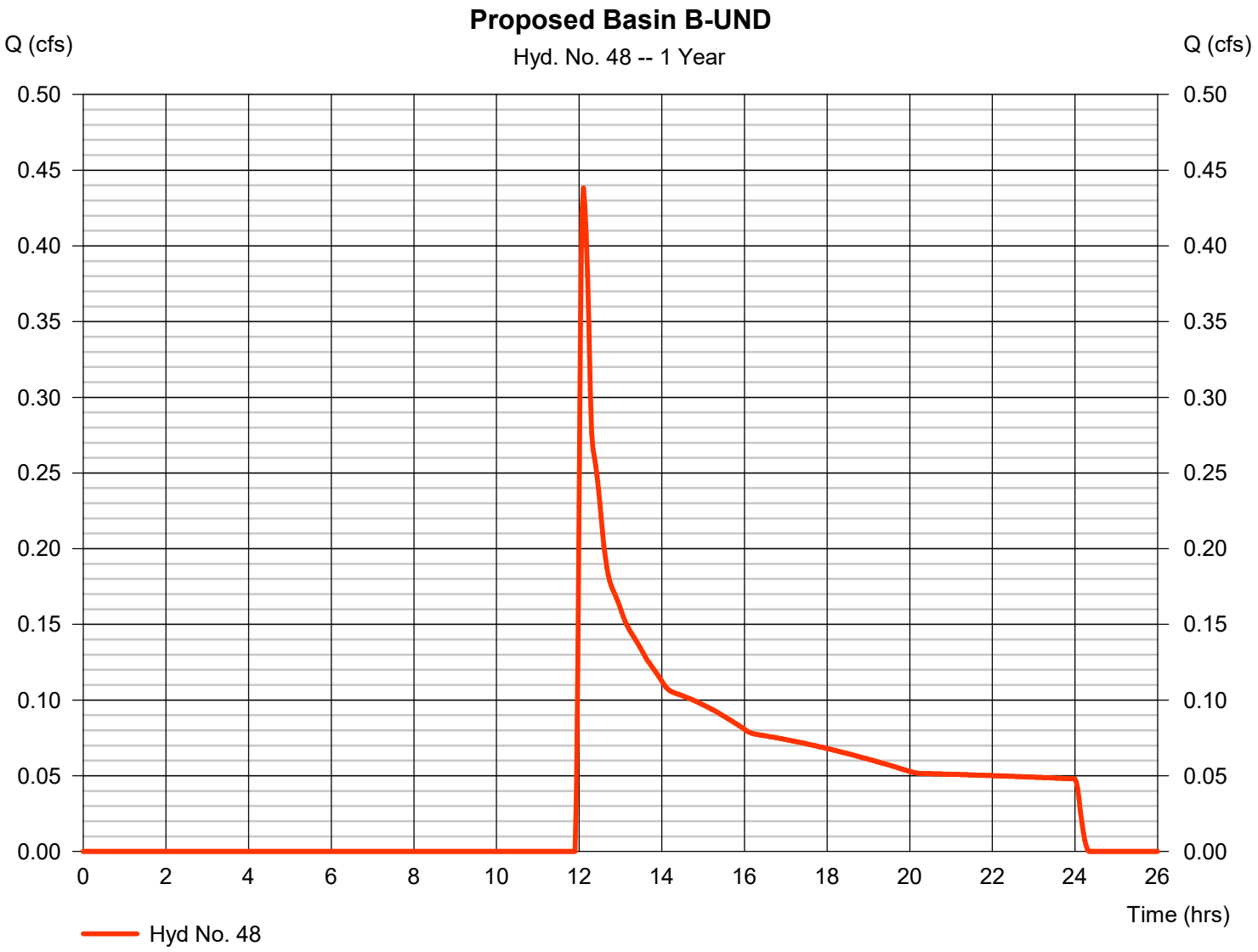
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 48

Proposed Basin B-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.438 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,835 cuft
Drainage area	= 5.830 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



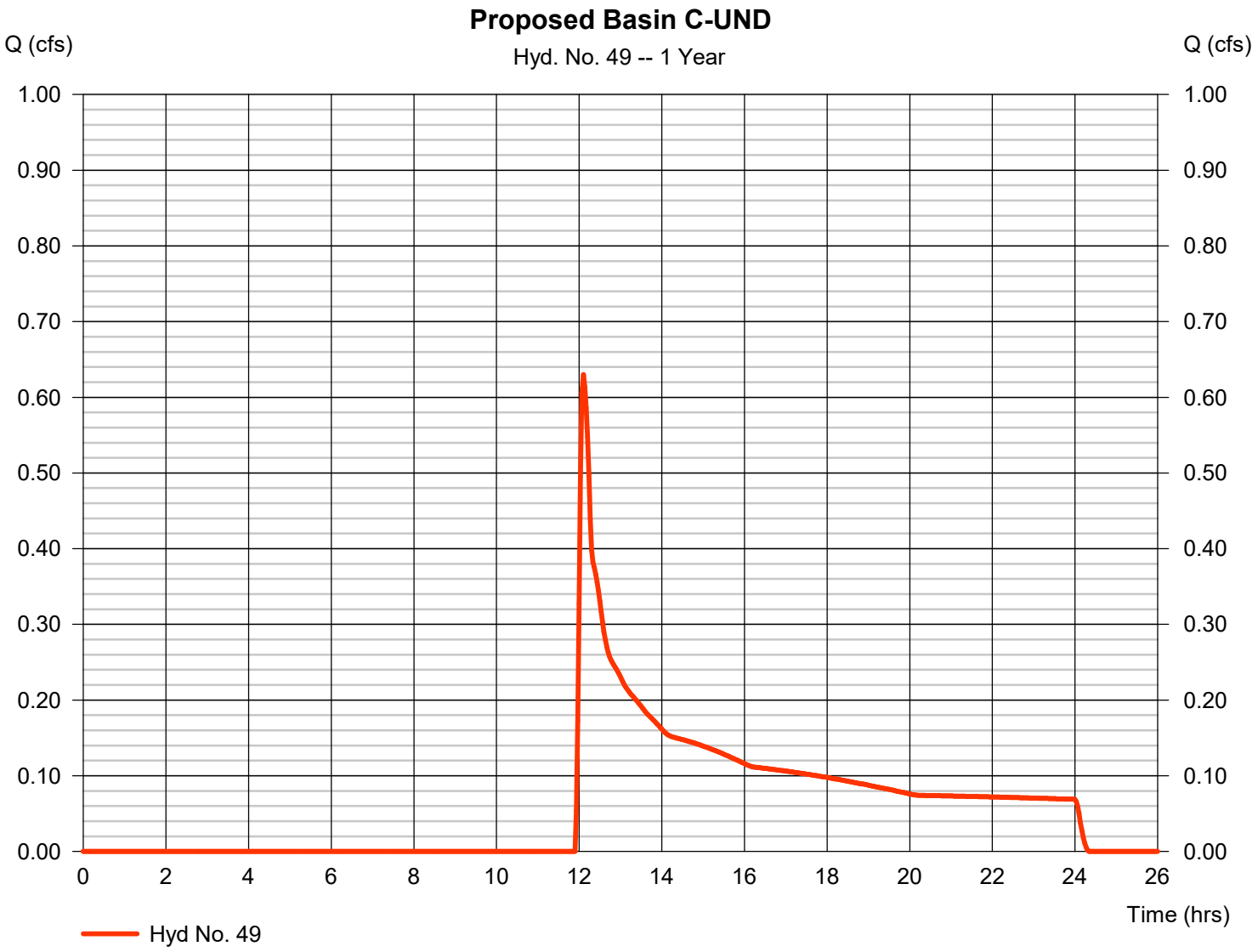
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 49

Proposed Basin C-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 0.630 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 5,513 cuft
Drainage area	= 8.380 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

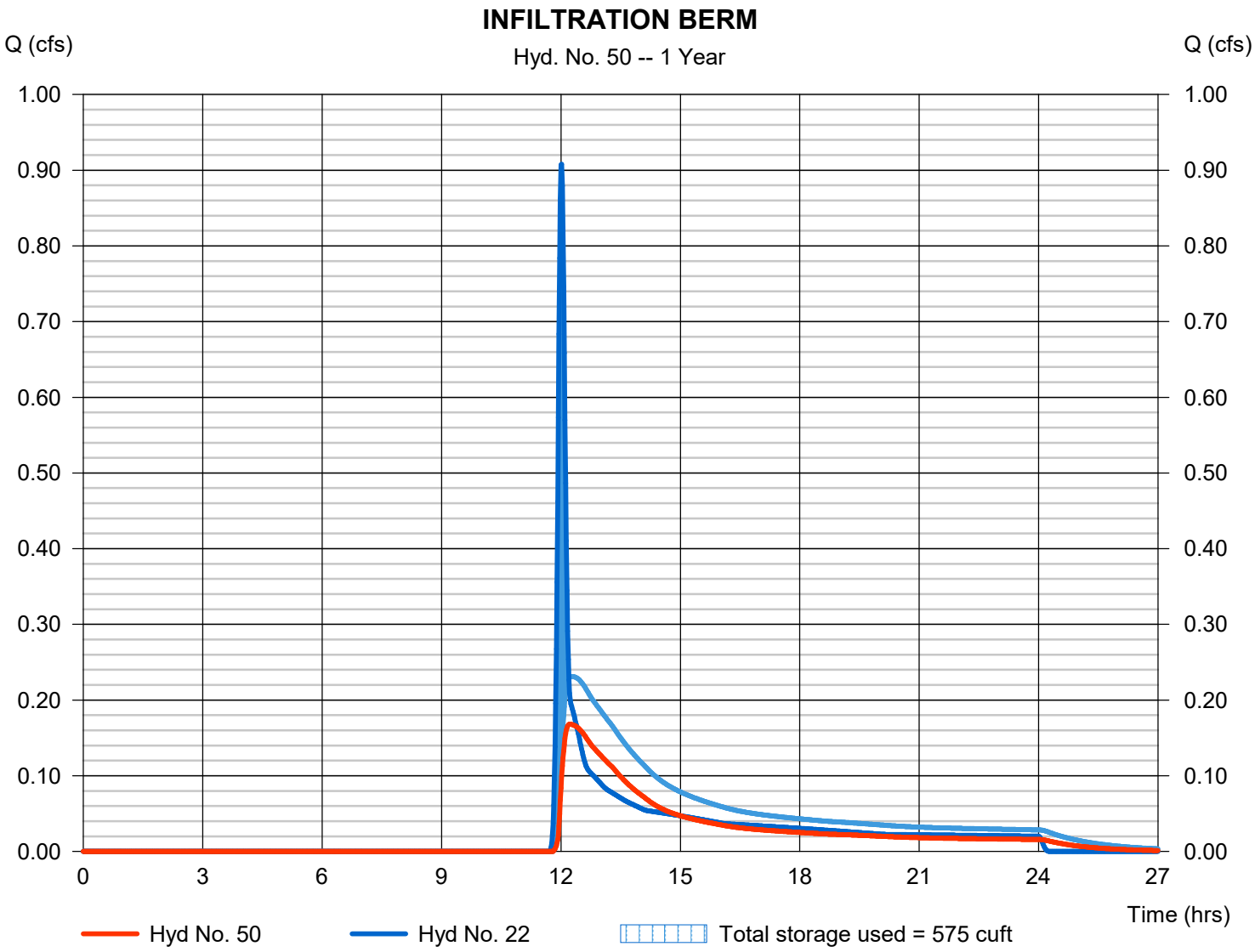
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 50

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 0.168 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.23 hrs
Time interval	= 1 min	Hyd. volume	= 1,957 cuft
Inflow hyd. No.	= 22 - PROPOSED BASIN B (LOTS 10-11)	Max. Elevation	= 945.48 ft
Reservoir name	= LOT 10 11	Max. Storage	= 575 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 14 - LOT 10 11

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 945.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	945.00	1,100	0	0
1.00	946.00	1,320	1,208	1,208
1.50	946.50	1,430	687	1,895
2.00	947.00	1,600	757	2,652

Culvert / Orifice Structures

		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	4.00	0.00	0.00	0.00
Span (in)	=	4.00	0.00	0.00	0.00
No. Barrels	=	1	0	0	0
Invert El. (ft)	=	945.00	0.00	0.00	0.00
Length (ft)	=	20.00	0.00	0.00	0.00
Slope (%)	=	0.50	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	No	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	200.00	0.00	0.00	0.00
Crest El. (ft)	=	946.50	0.00	0.00	0.00
Weir Coeff.	=	2.60	3.33	3.33	3.33
Weir Type	=	Broad	---	---	---
Multi-Stage	=	No	No	No	No

Exfil.(in/hr) = 2.410 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	945.00	0.00	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	1,208	946.00	0.30 oc	---	---	---	0.00	---	---	---	0.074	---	0.374
1.50	1,895	946.50	0.39 oc	---	---	---	0.00	---	---	---	0.080	---	0.466
2.00	2,652	947.00	0.46 oc	---	---	---	183.85	---	---	---	0.089	---	184.39

Hydrograph Report

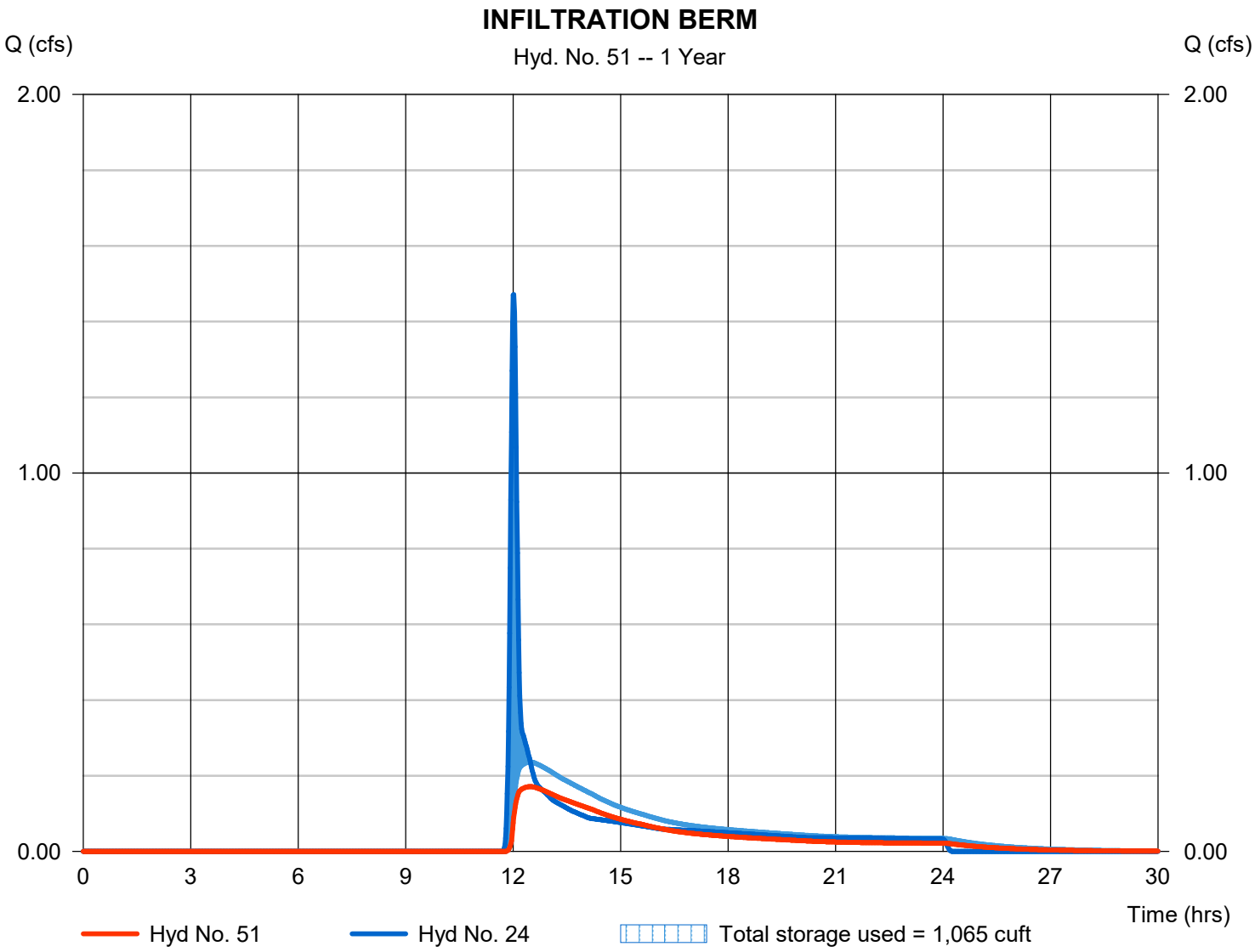
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 51

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 0.171 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.48 hrs
Time interval	= 1 min	Hyd. volume	= 2,775 cuft
Inflow hyd. No.	= 24 - PROPOSED BASIN B (LOTS 51-52)	Max. Elevation	= 940.48 ft
Reservoir name	= LOT 51 52	Max. Storage	= 1,065 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Pond No. 15 - LOT 51 52

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 940.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	940.00	2,000	0	0
1.00	941.00	2,400	2,197	2,197
1.50	941.50	2,600	1,250	3,446
2.00	942.00	2,800	1,350	4,796

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 4.00	0.00	0.00	0.00
Span (in)	= 4.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 940.00	0.00	0.00	0.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 400.00	0.00	0.00	0.00
Crest El. (ft)	= 941.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 2.410 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	940.00	0.00	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	2,197	941.00	0.30 oc	---	---	---	0.00	---	---	---	0.134	---	0.434
1.50	3,446	941.50	0.39 oc	---	---	---	0.00	---	---	---	0.145	---	0.531
2.00	4,796	942.00	0.46 oc	---	---	---	367.70	---	---	---	0.156	---	368.31

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	137.32	2	864	2,696,955	------	------	------	Off-Site Basin B (upper)
2	SCS Runoff	4.601	2	726	14,730	------	------	------	Off-Site Basin C1
3	SCS Runoff	9.540	2	736	44,565	------	------	------	Off-Site Basin C2
4	SCS Runoff	59.04	2	784	644,578	------	------	------	Off-Site Basin B (lower)
5	Reservoir	37.57	2	848	346,928	4	956.37	311,722	Offsite Field Storage
6	SCS Runoff	14.82	2	748	94,714	------	------	------	EXISTING BASIN A
7	SCS Runoff	36.45	2	746	225,586	------	------	------	EXISTING BASIN B
8	SCS Runoff	15.90	2	742	88,143	------	------	------	EXISTING BASIN C
9	SCS Runoff	10.47	2	728	37,089	------	------	------	EXISTING BASIN D
10	SCS Runoff	4.798	2	718	9,605	------	------	------	EXISTING BASIN E
11	SCS Runoff	6.942	2	760	61,741	------	------	------	PROPOSED BASIN A
12	SCS Runoff	18.52	2	756	148,535	------	------	------	PROPOSED BASIN B
13	SCS Runoff	5.958	2	754	52,508	------	------	------	PROPOSED BASIN C
14	SCS Runoff	4.016	2	732	17,454	------	------	------	PROPOSED BASIN D
15	SCS Runoff	3.487	2	720	8,089	------	------	------	PROPOSED BASIN E
16	Reservoir	1.276	2	896	61,728	11	933.36	27,031	!POND A RELEASE
17	SCS Runoff	8.777	2	724	26,894	------	------	------	PROPOSED BASIN B1
18	SCS Runoff	8.407	2	736	43,086	------	------	------	PROPOSED BASIN B2
19	SCS Runoff	3.817	2	732	17,434	------	------	------	PROPOSED BASIN B3
20	SCS Runoff	5.035	2	726	17,231	------	------	------	PROPOSED BASIN B4
21	SCS Runoff	2.557	2	728	9,777	------	------	------	PROPOSED BASIN B5
22	SCS Runoff	2.448	1	720	5,719	------	------	------	PROPOSED BASIN B (LOTS 10-11)
23	SCS Runoff	1.393	2	724	4,093	------	------	------	PROPOSED BASIN B (LOTS 22-23)
24	SCS Runoff	3.967	1	720	9,269	------	------	------	PROPOSED BASIN B (LOTS 51-52)
25	SCS Runoff	1.651	2	730	7,004	------	------	------	PROPOSED BASIN B (UND TO DAM
26	Reservoir	1.153	2	760	24,953	17	935.99	9,523	!POND B1 RELEASE
27	Reservoir	4.517	2	760	40,934	18	939.49	8,878	POND B2 RELEASE
28	Diversion1	48.00	2	766	1,715,593	1	------	------	Pass Through 170th
29	Diversion2	89.32	2	864	981,361	1	------	------	Field Storage Volume
30	Reservoir	48.00	2	884	1,637,068	28	957.83	114,247	Offsite Field Storage
31	Combine	85.57	2	848	1,983,995	5, 30	------	------	Off-Site B Flow
32	Reach	84.97	2	854	1,983,983	31	------	------	REACH TO DAM
33	Reservoir	0.549	2	802	17,430	19	939.00	6,697	POND B3 RELEASE
34	SCS Runoff	2.888	2	728	11,458	------	------	------	PROPOSED BASIN C1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
35	Combine	7.403	2	726	26,188	2, 34	------	------	FLOW TO POND C1
36	Combine	7.535	2	726	27,008	20, 21,	------	------	COMBINE B4 B5
37	Reach	6.271	2	734	27,004	36	------	------	REACH TO DAM
38	Combine	86.83	2	854	2,063,017	23, 25, 27, 32, 37	------	------	TOTAL FLOW TO DAM
39	Reservoir	81.93	2	870	1,904,853	38	942.99	227,590	!DAM RELEASE
40	SCS Runoff	5.334	2	722	14,686	------	------	------	BASIN C2
41	SCS Runoff	13.02	2	724	39,893	------	------	------	BASIN C3
42	Combine	31.88	2	724	125,332	3, 35, 40, 41	------	------	TOTAL FLOW TO POND C3
43	Reach	31.24	2	728	125,330	42	------	------	REACH TO POND C3
44	SCS Runoff	6.662	2	722	17,999	------	------	------	!BASIN D1
45	SCS Runoff	3.111	2	722	8,342	------	------	------	!BASIN E1
46	Reservoir	11.63	2	754	125,327	43	939.49	32,224	!POND C3 RELEASE
47	SCS Runoff	4.474	2	722	15,502	------	------	------	Proposed Basin A-UND
48	SCS Runoff	3.658	2	722	12,675	------	------	------	Proposed Basin B-UND
49	SCS Runoff	5.258	2	722	18,219	------	------	------	Proposed Basin C-UND
50	Reservoir	0.375	1	734	4,657	22	946.43	1,802	INFILTRATION BERM
51	Reservoir	0.375	1	748	6,601	24	941.43	3,265	INFILTRATION BERM

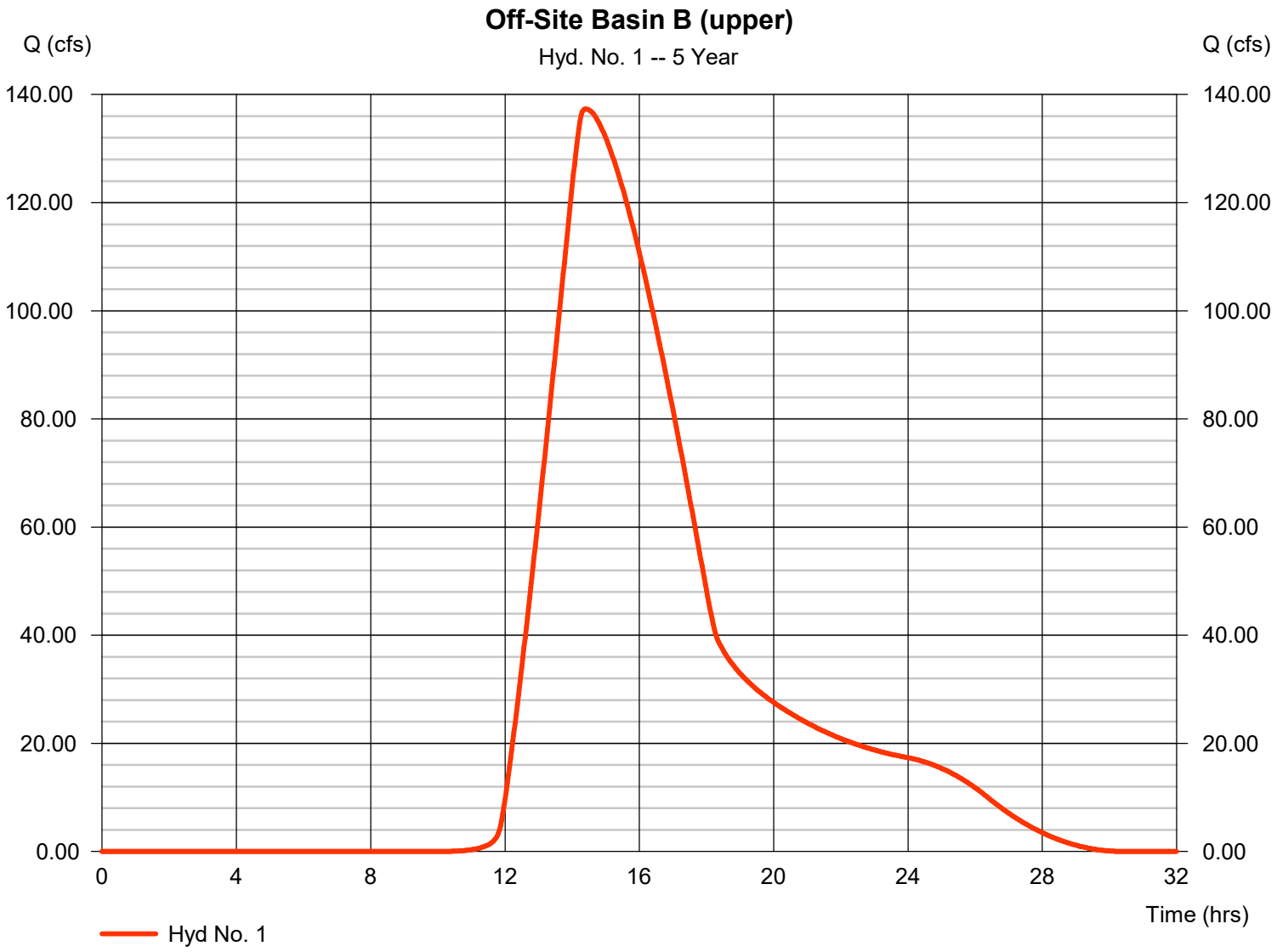
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 1

Off-Site Basin B (upper)

Hydrograph type	= SCS Runoff	Peak discharge	= 137.32 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.40 hrs
Time interval	= 2 min	Hyd. volume	= 2,696,955 cuft
Drainage area	= 487.010 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 8797 ft
Tc method	= LAG	Time of conc. (Tc)	= 243.10 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



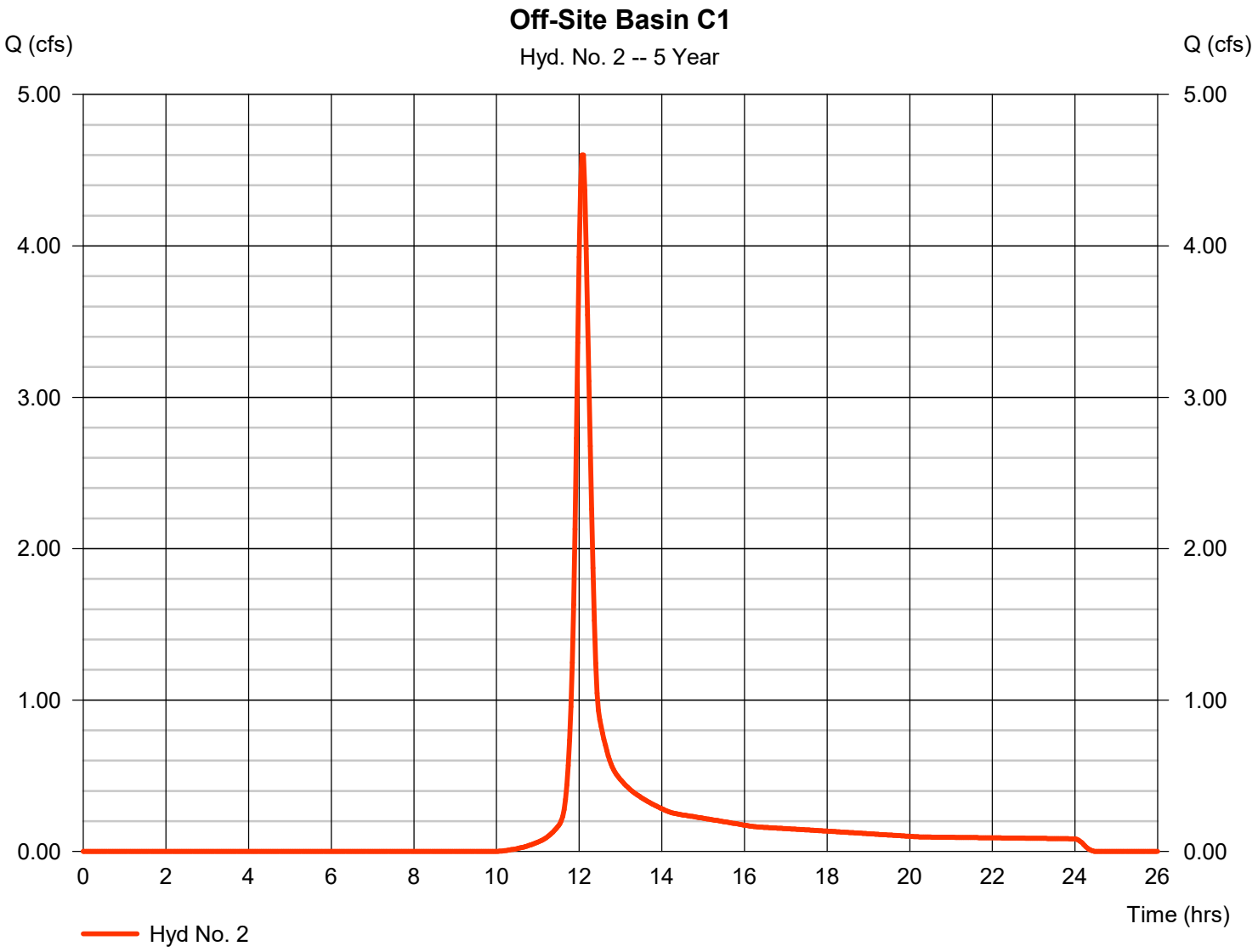
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 2

Off-Site Basin C1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.601 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 14,730 cuft
Drainage area	= 2.660 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 392 ft
Tc method	= LAG	Time of conc. (Tc)	= 20.10 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



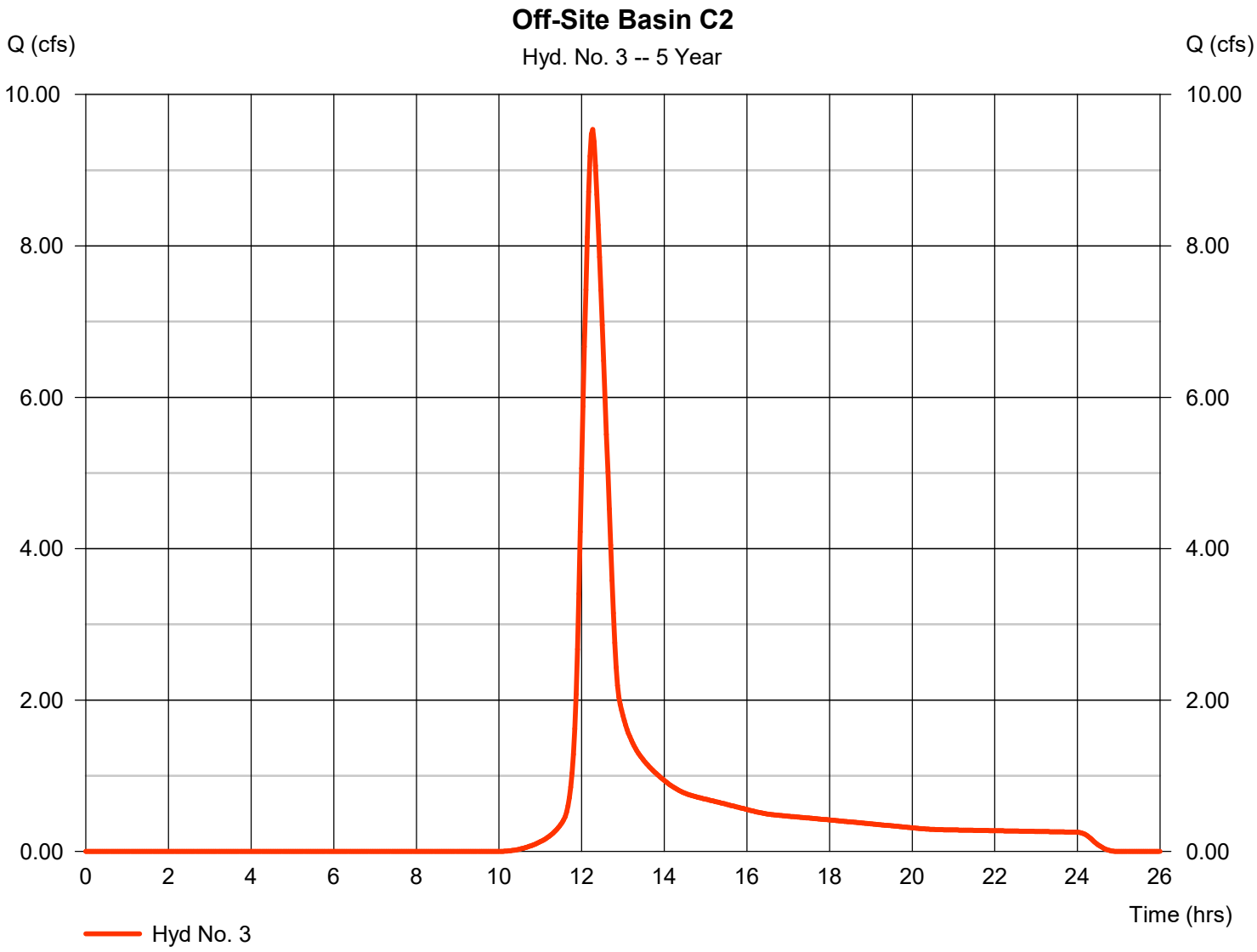
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 3

Off-Site Basin C2

Hydrograph type	= SCS Runoff	Peak discharge	= 9.540 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 44,565 cuft
Drainage area	= 8.140 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 820 ft
Tc method	= LAG	Time of conc. (Tc)	= 36.40 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



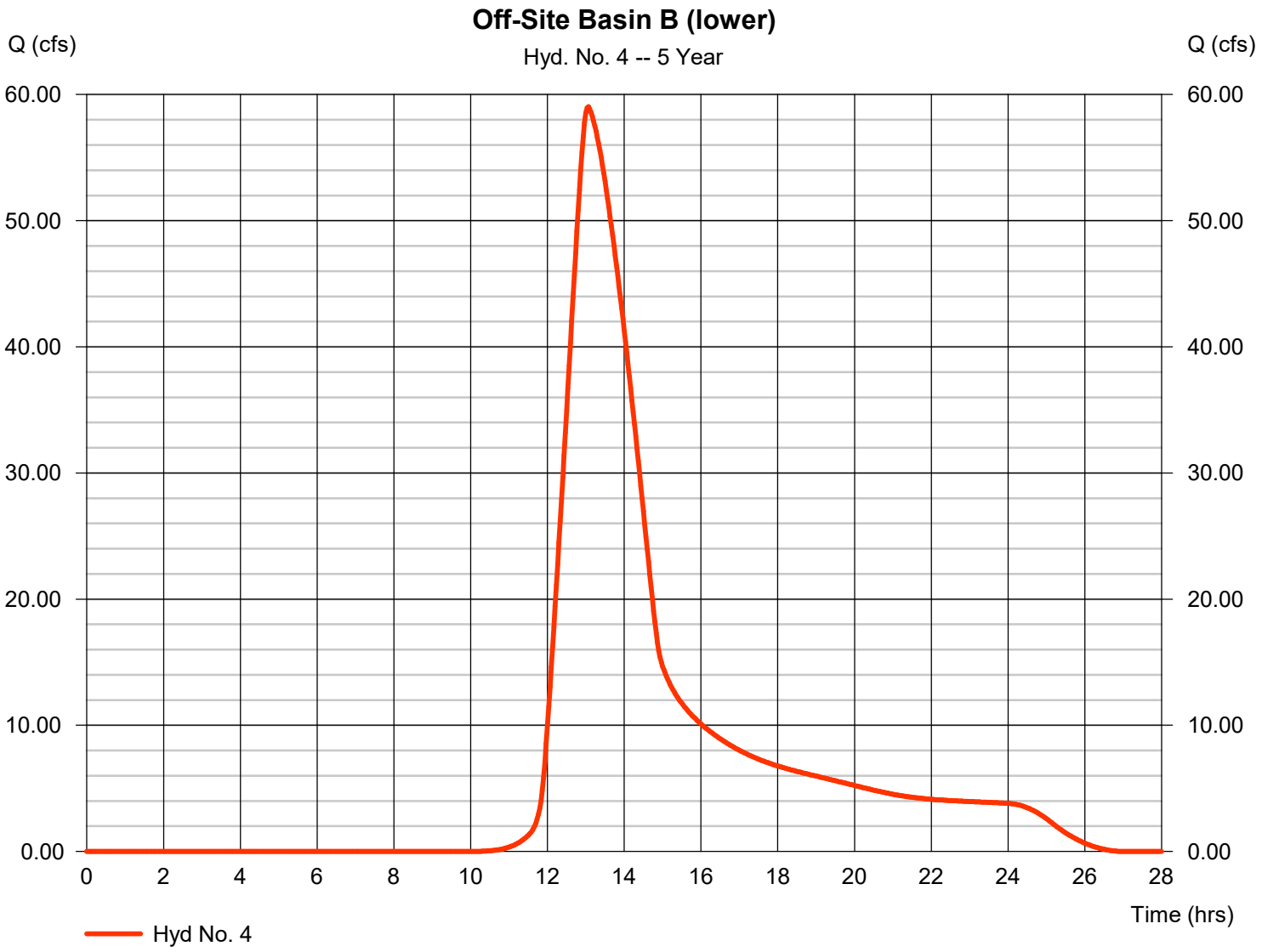
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 4

Off-Site Basin B (lower)

Hydrograph type	= SCS Runoff	Peak discharge	= 59.04 cfs
Storm frequency	= 5 yrs	Time to peak	= 13.07 hrs
Time interval	= 2 min	Hyd. volume	= 644,578 cuft
Drainage area	= 115.970 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 113.60 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

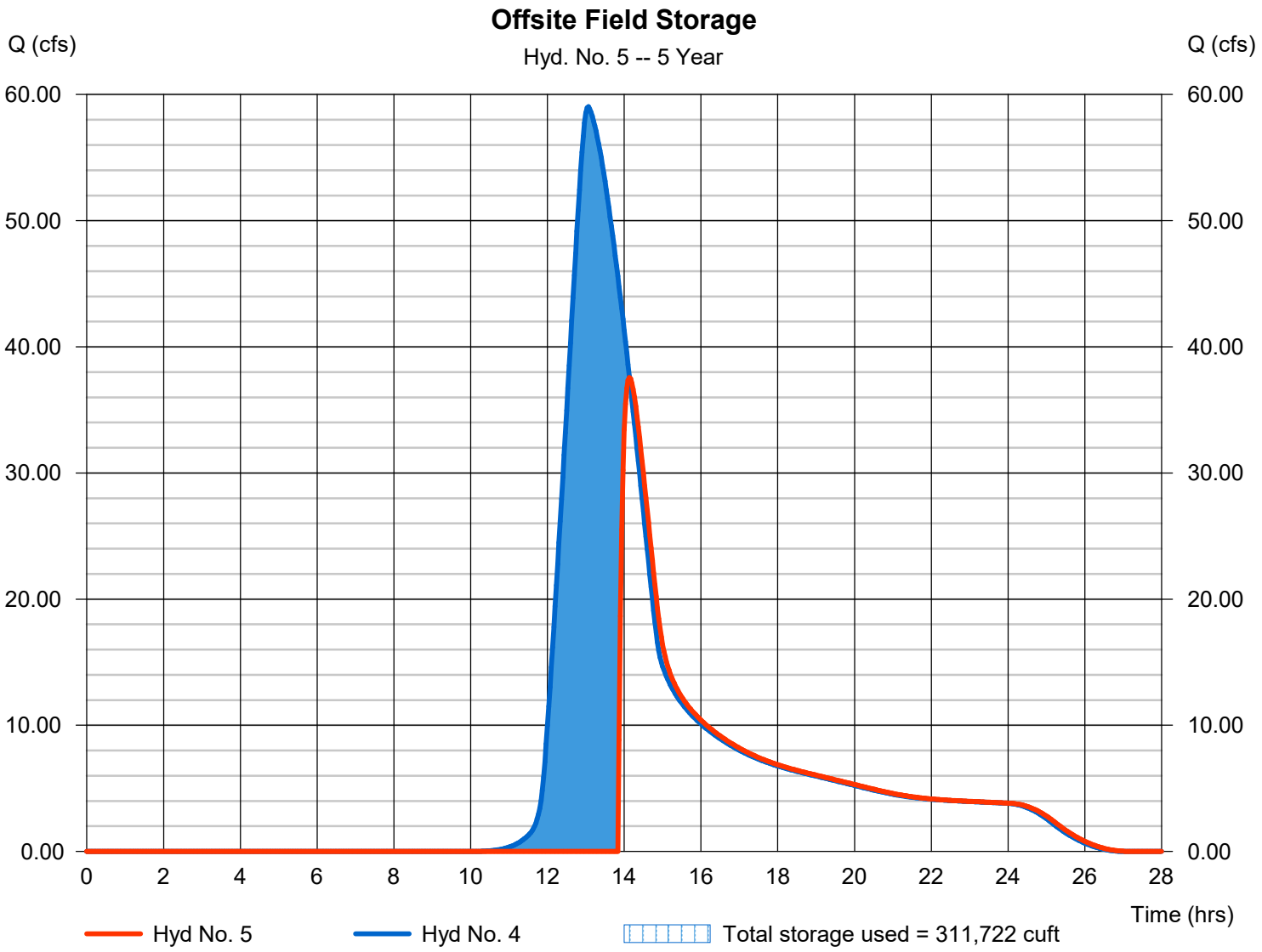
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 5

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 37.57 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.13 hrs
Time interval	= 2 min	Hyd. volume	= 346,928 cuft
Inflow hyd. No.	= 4 - Off-Site Basin B (lower)	Max. Elevation	= 956.37 ft
Reservoir name	= Offsite Field Storage LOWER	Max. Storage	= 311,722 cuft

Storage Indication method used.



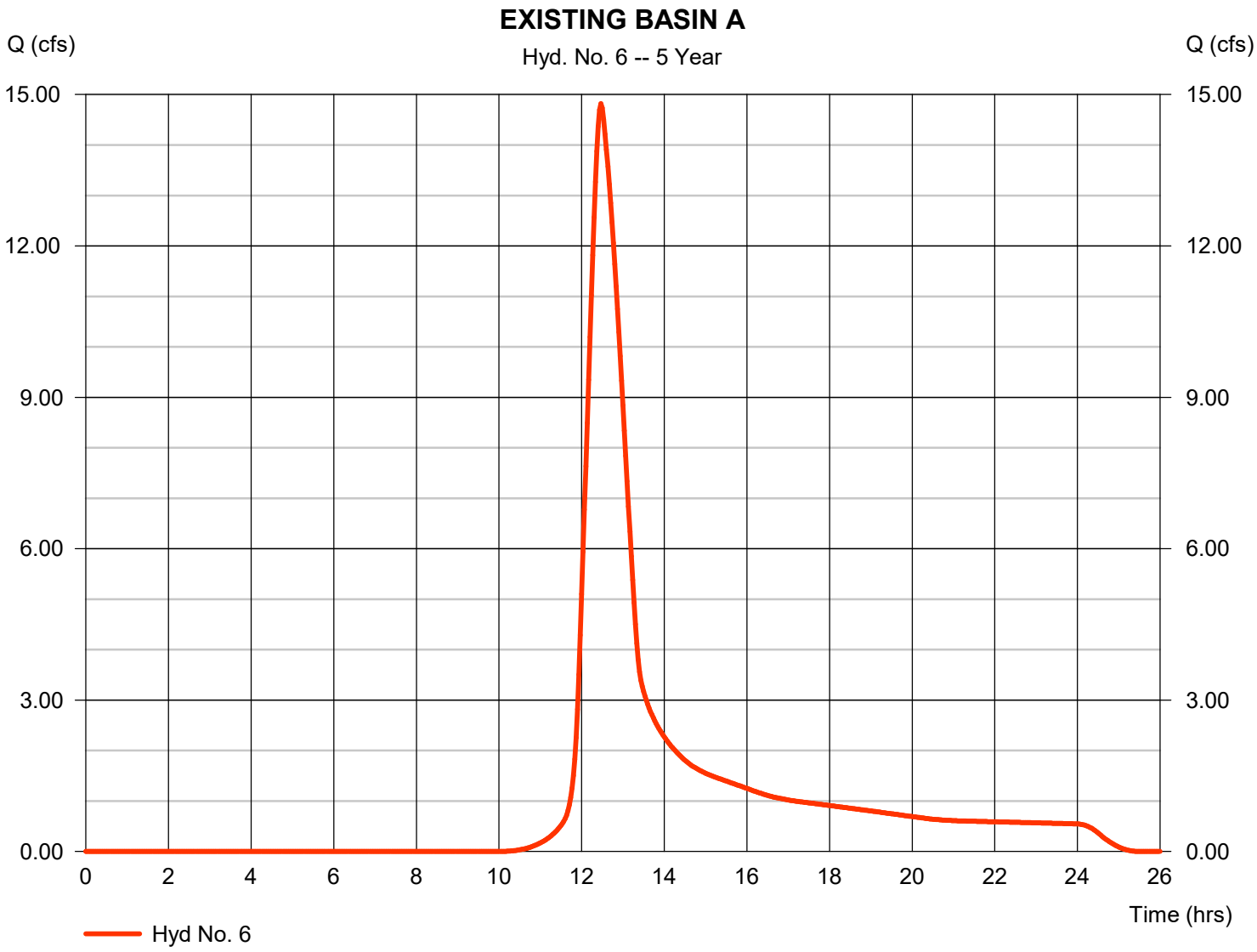
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 6

EXISTING BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 14.82 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 94,714 cuft
Drainage area	= 17.230 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 57.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



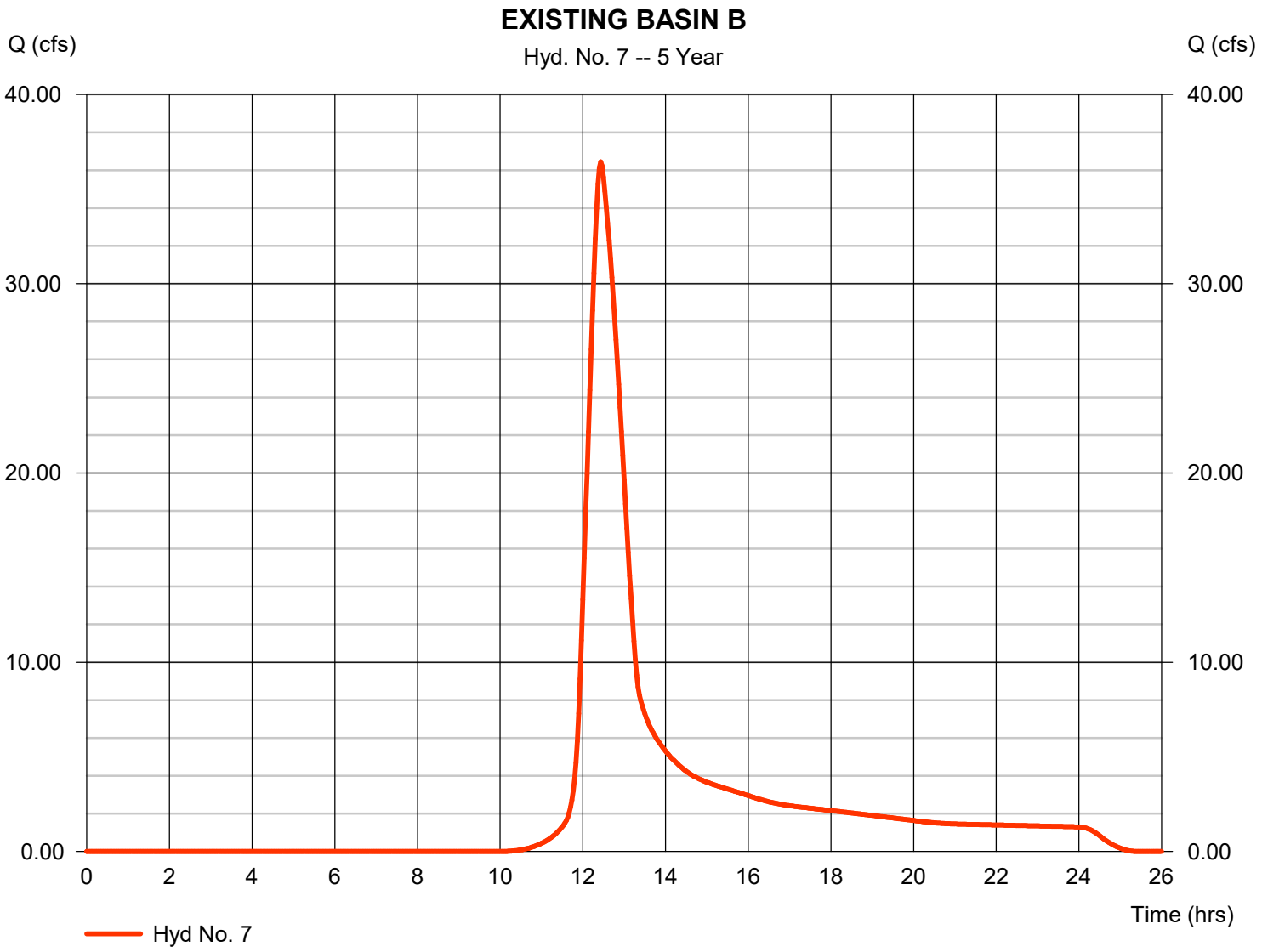
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 7

EXISTING BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 36.45 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 225,586 cuft
Drainage area	= 40.420 ac	Curve number	= 75
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 53.40 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



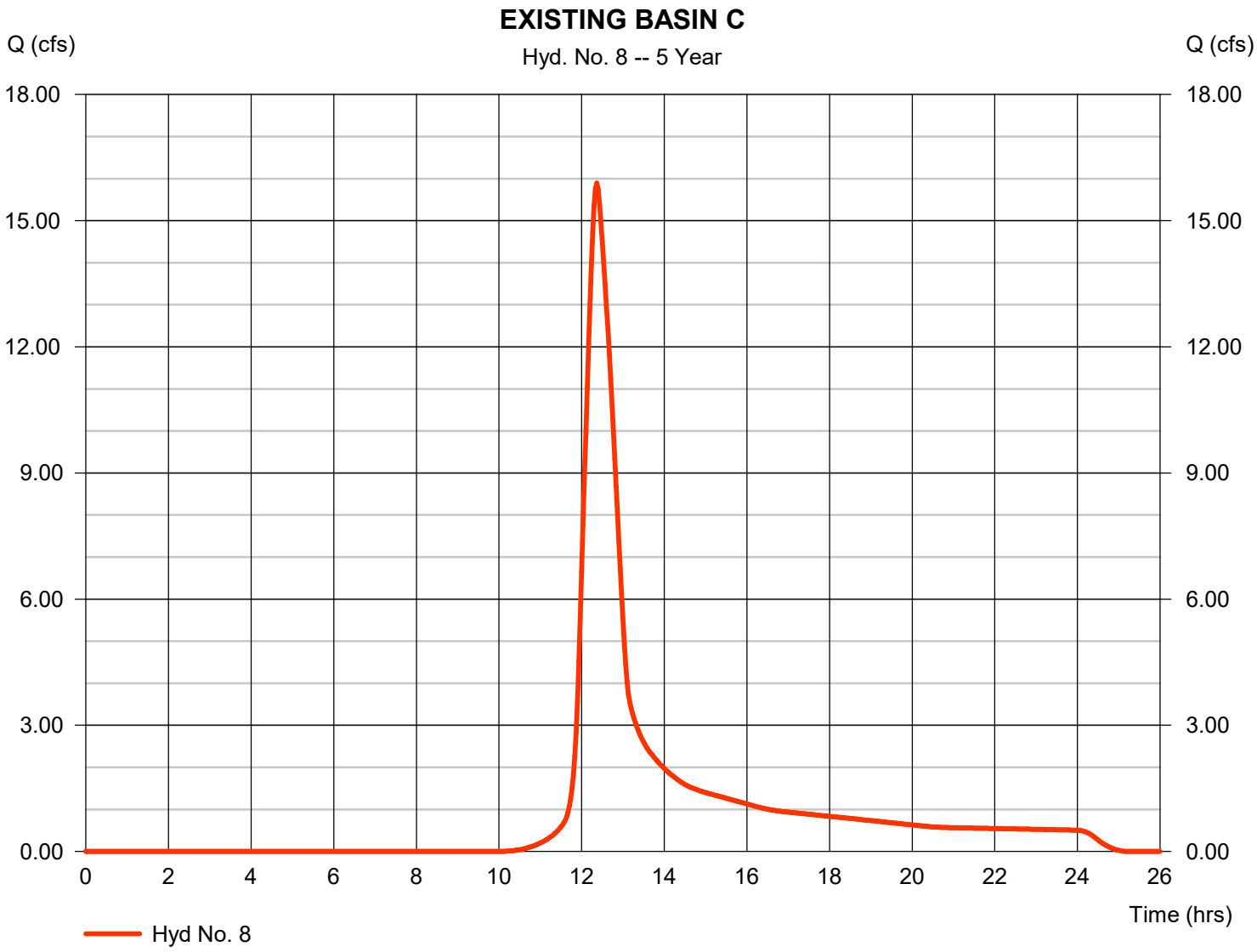
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 8

EXISTING BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 15.90 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 88,143 cuft
Drainage area	= 16.060 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 44.10 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



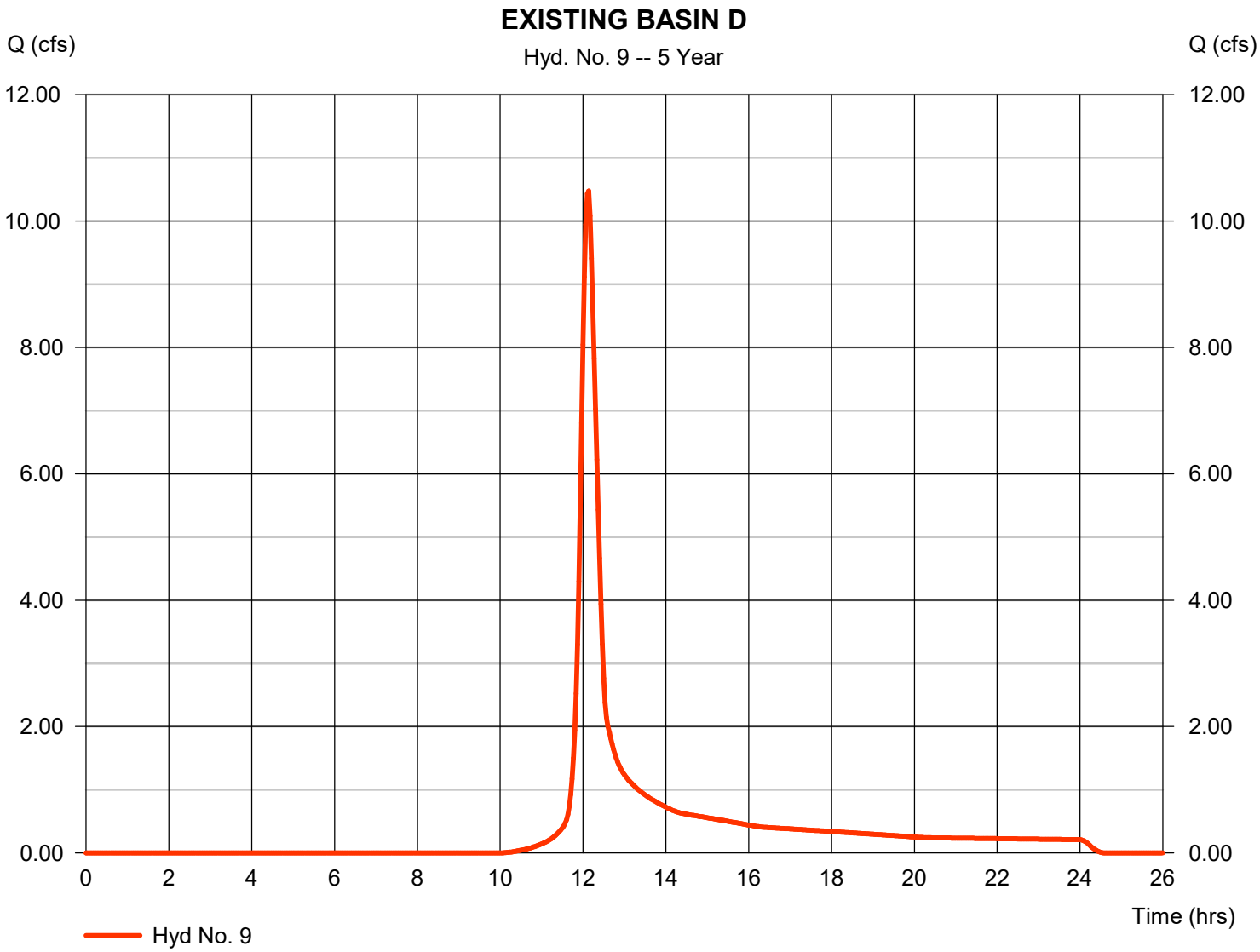
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 9

EXISTING BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 10.47 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 37,089 cuft
Drainage area	= 6.580 ac	Curve number	= 75
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.40 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



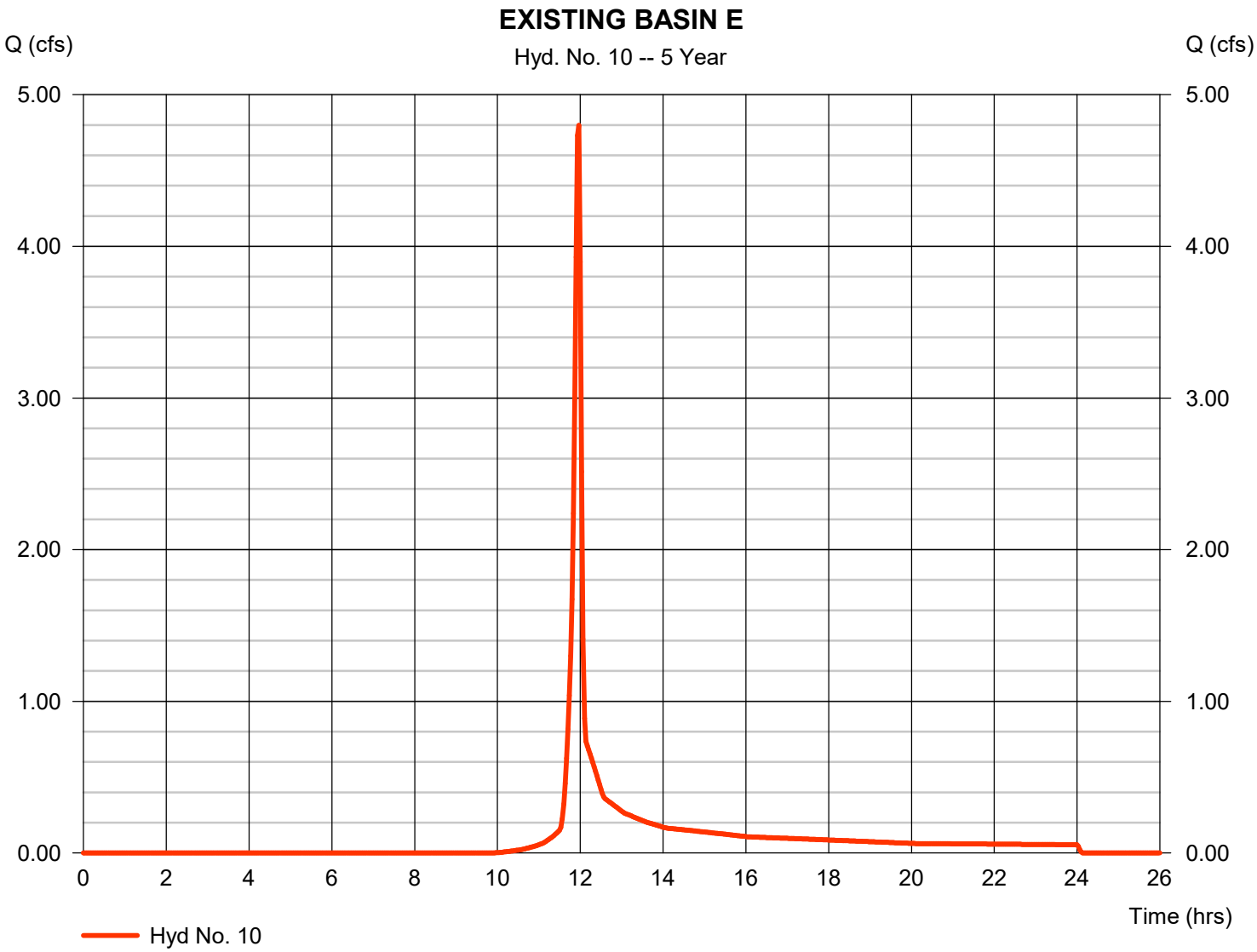
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 10

EXISTING BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 4.798 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 9,605 cuft
Drainage area	= 1.850 ac	Curve number	= 75
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 6.20 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



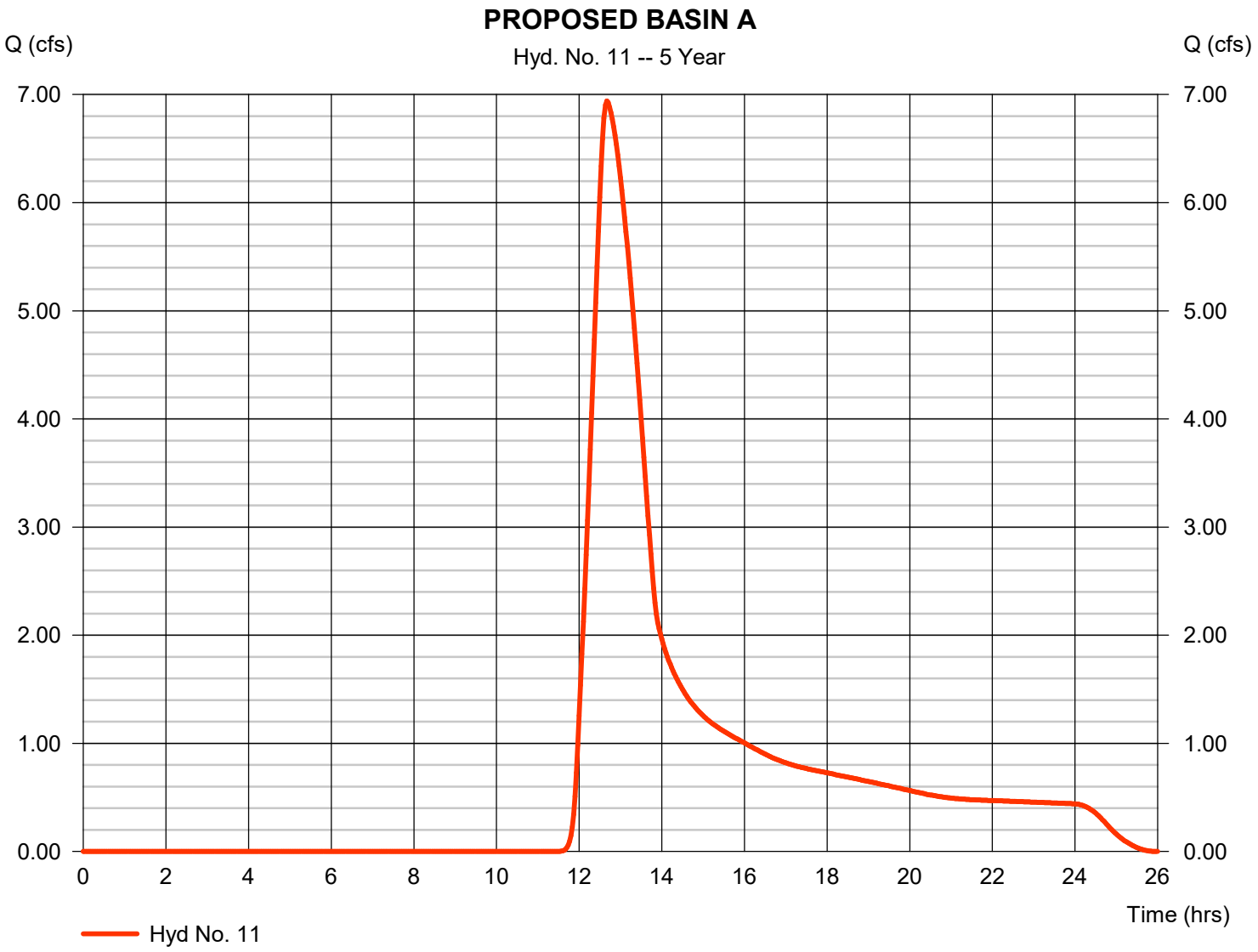
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 11

PROPOSED BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 6.942 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 61,741 cuft
Drainage area	= 17.360 ac	Curve number	= 66
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 72.80 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



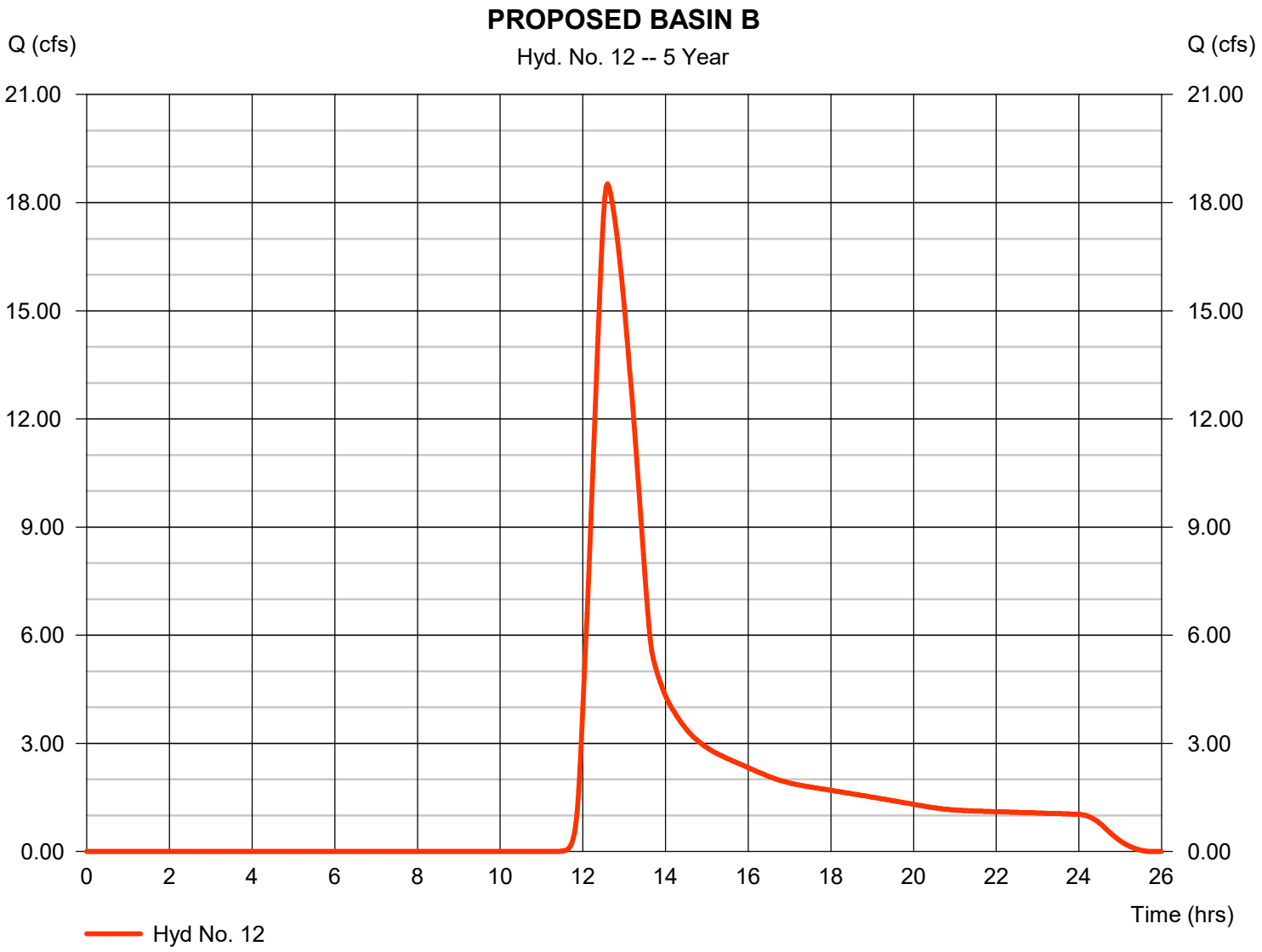
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 12

PROPOSED BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 18.52 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.60 hrs
Time interval	= 2 min	Hyd. volume	= 148,535 cuft
Drainage area	= 39.990 ac	Curve number	= 67
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 66.50 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



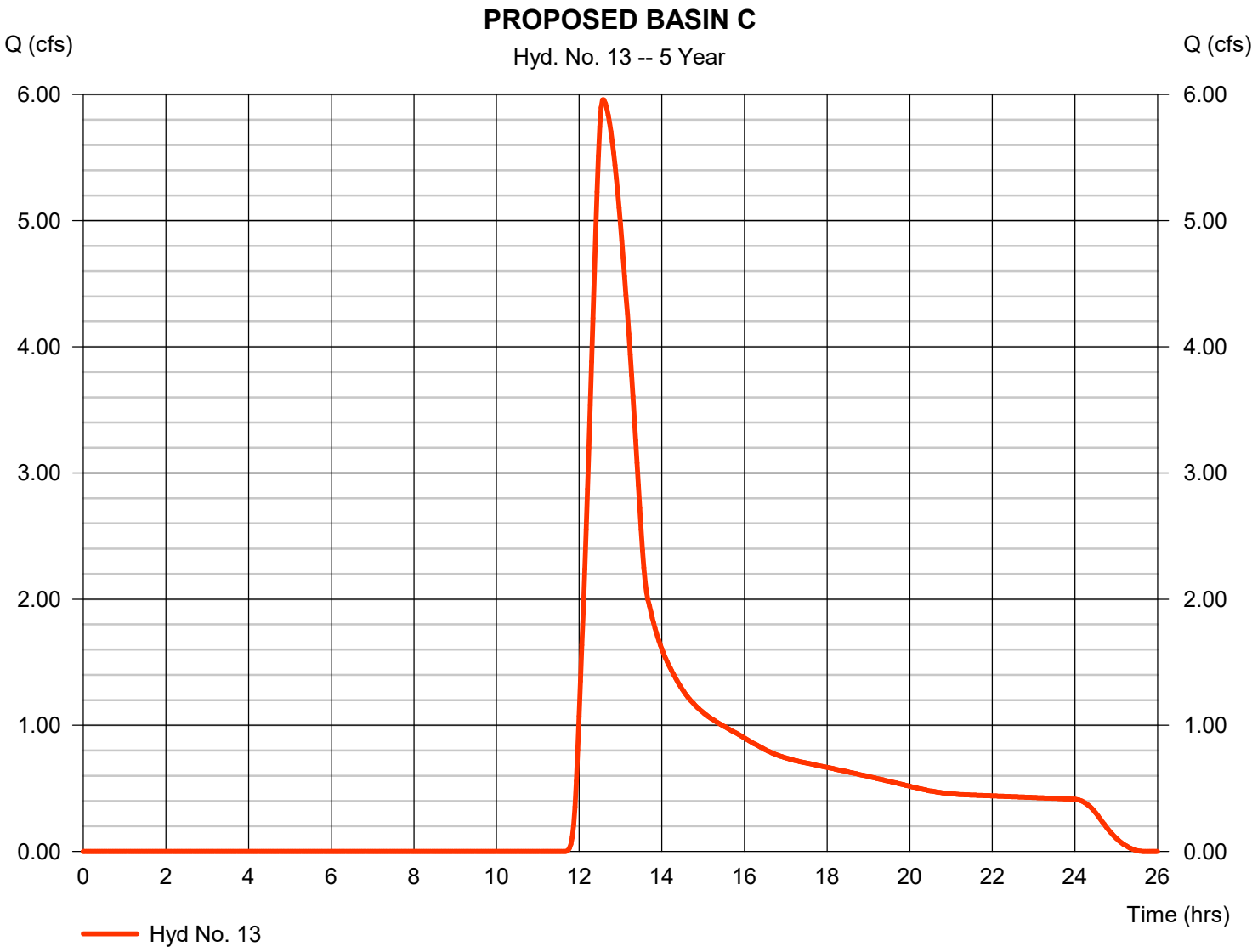
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 13

PROPOSED BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 5.958 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.57 hrs
Time interval	= 2 min	Hyd. volume	= 52,508 cuft
Drainage area	= 18.750 ac	Curve number	= 62
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.40 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



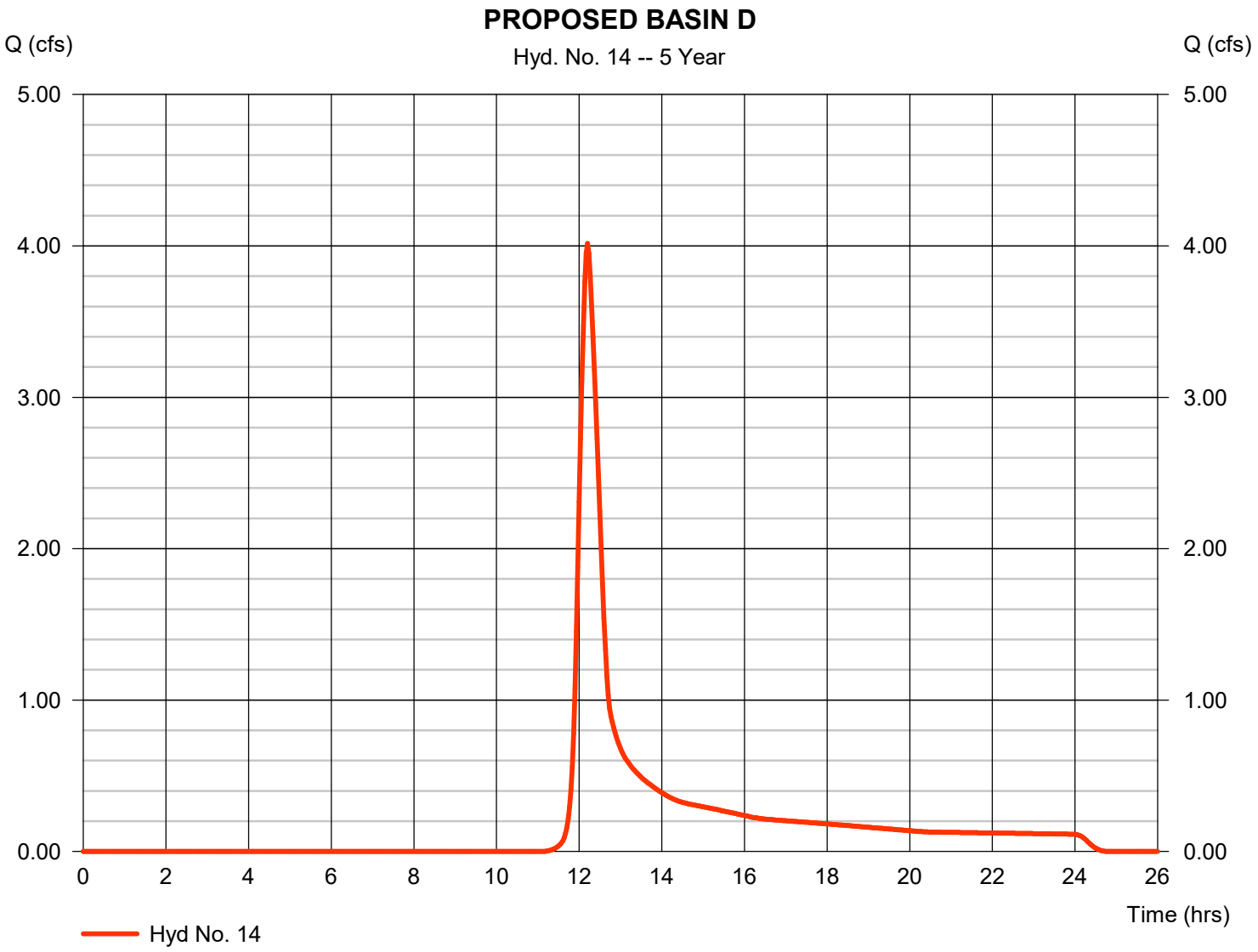
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 14

PROPOSED BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 4.016 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 17,454 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.60 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



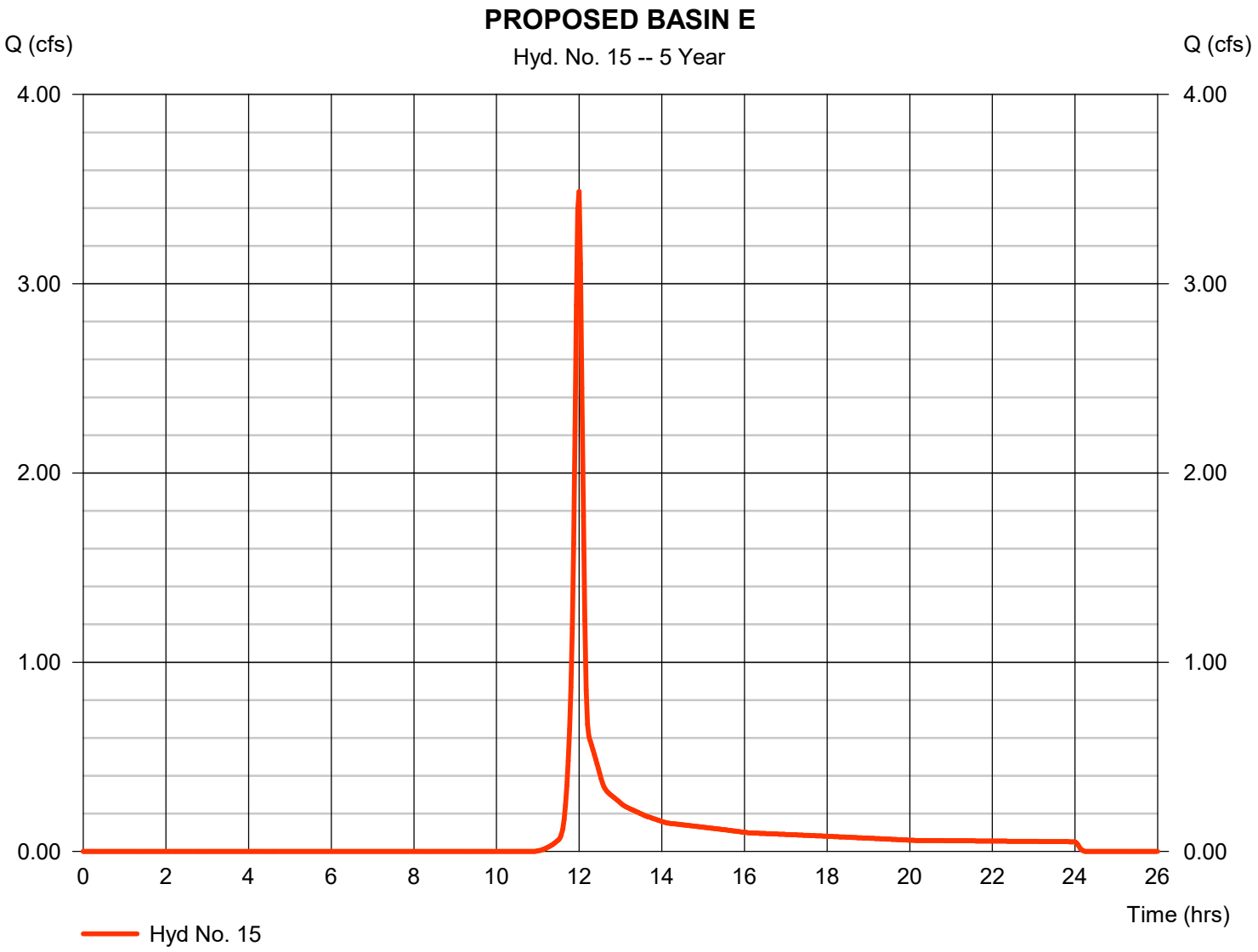
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 15

PROPOSED BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 3.487 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 8,089 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.20 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

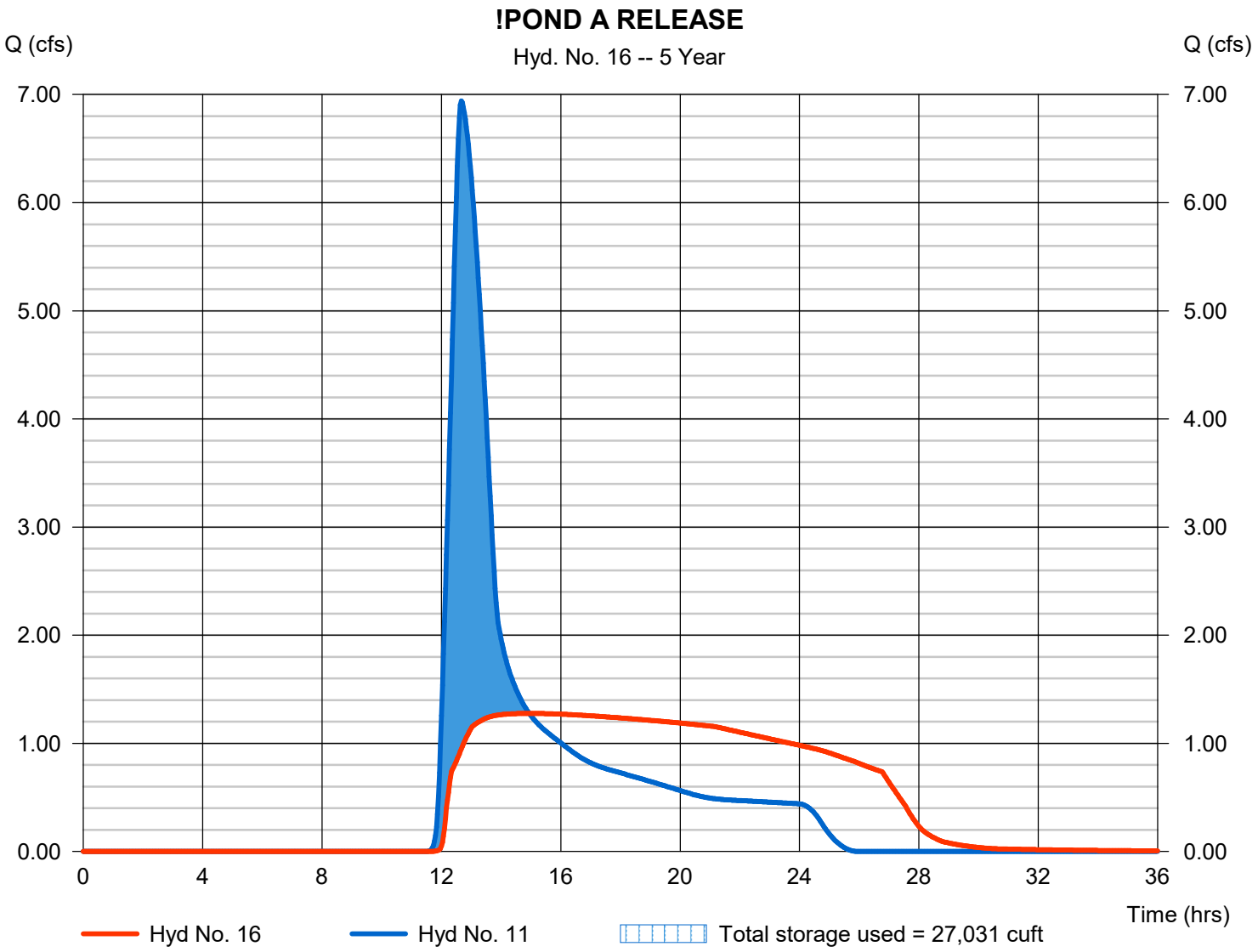
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 16

!POND A RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 1.276 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.93 hrs
Time interval	= 2 min	Hyd. volume	= 61,728 cuft
Inflow hyd. No.	= 11 - PROPOSED BASIN A	Max. Elevation	= 933.36 ft
Reservoir name	= POND A	Max. Storage	= 27,031 cuft

Storage Indication method used.



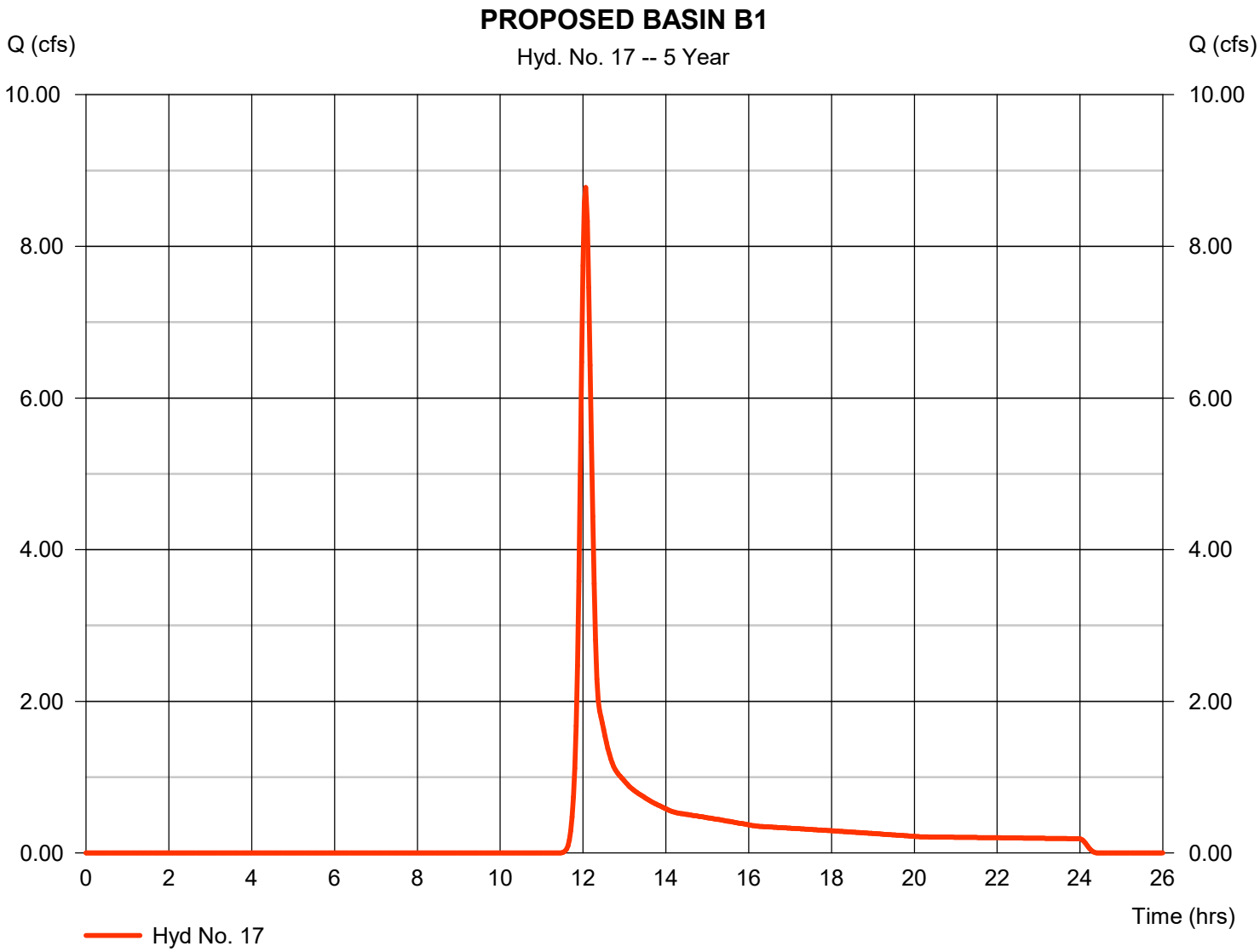
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 17

PROPOSED BASIN B1

Hydrograph type	= SCS Runoff	Peak discharge	= 8.777 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 26,894 cuft
Drainage area	= 7.800 ac	Curve number	= 66
Basin Slope	= 6.5 %	Hydraulic length	= 760 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.80 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



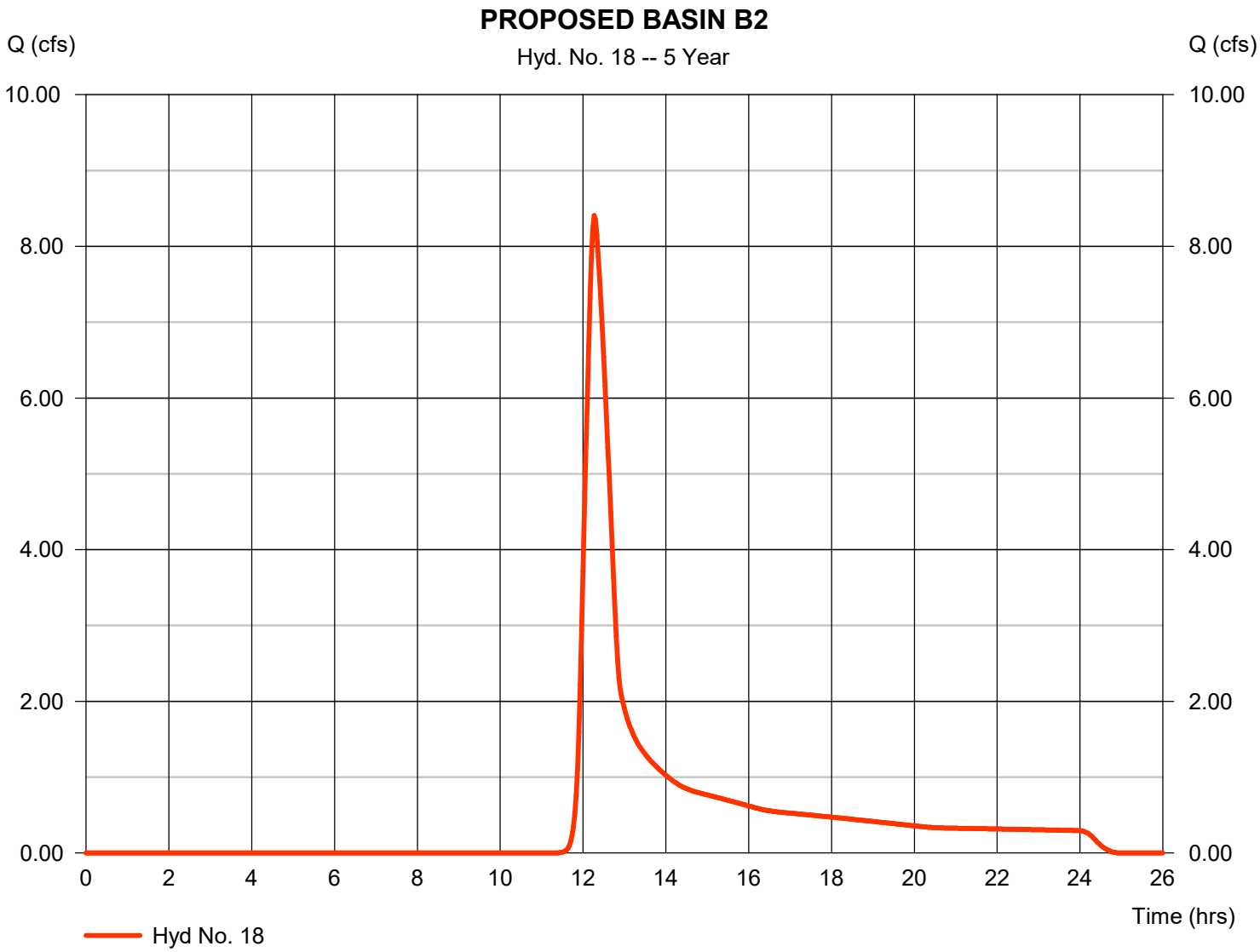
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 18

PROPOSED BASIN B2

Hydrograph type	= SCS Runoff	Peak discharge	= 8.407 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 43,086 cuft
Drainage area	= 11.660 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 1500 ft
Tc method	= LAG	Time of conc. (Tc)	= 34.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



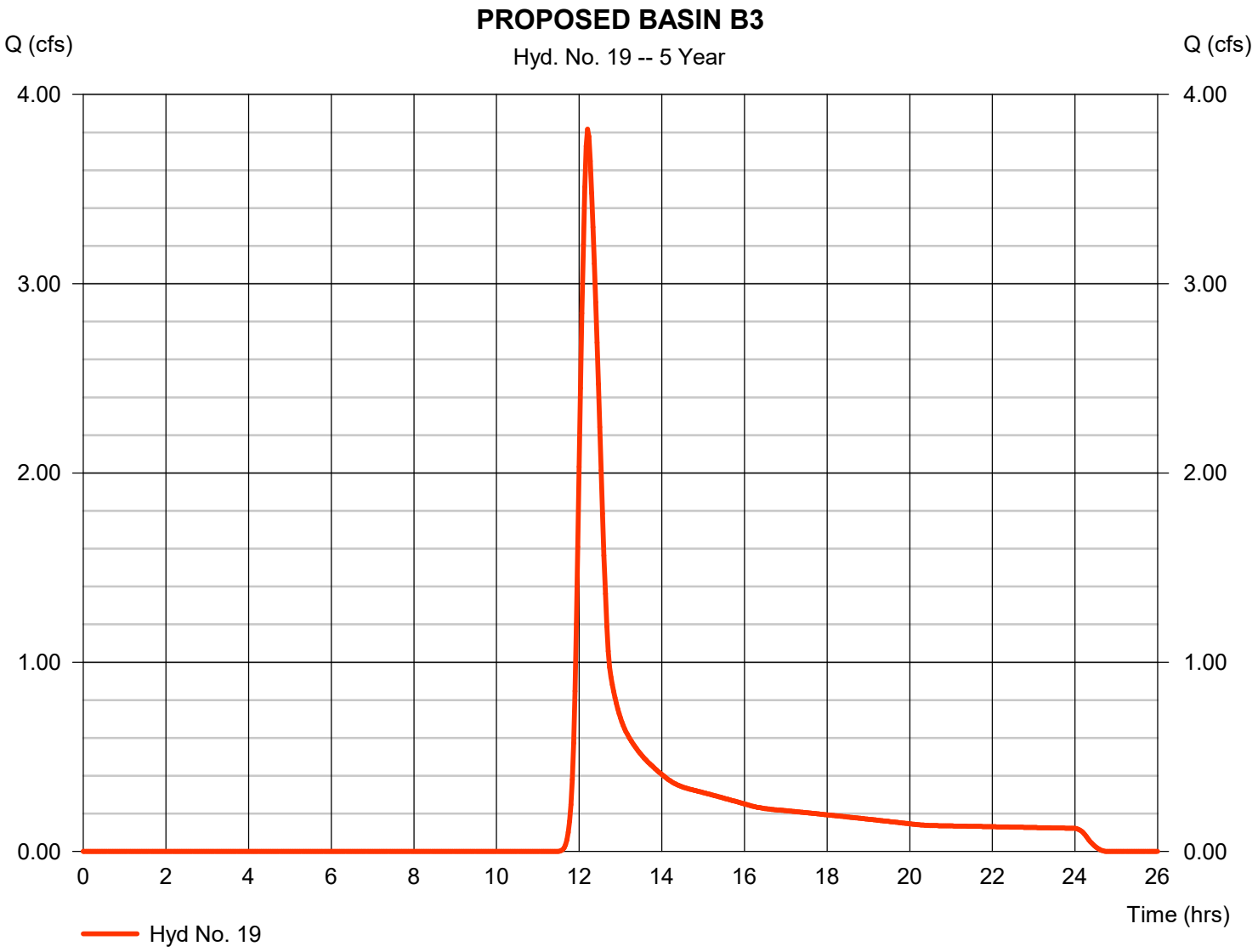
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 19

PROPOSED BASIN B3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.817 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 17,434 cuft
Drainage area	= 4.930 ac	Curve number	= 66
Basin Slope	= 2.7 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.30 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



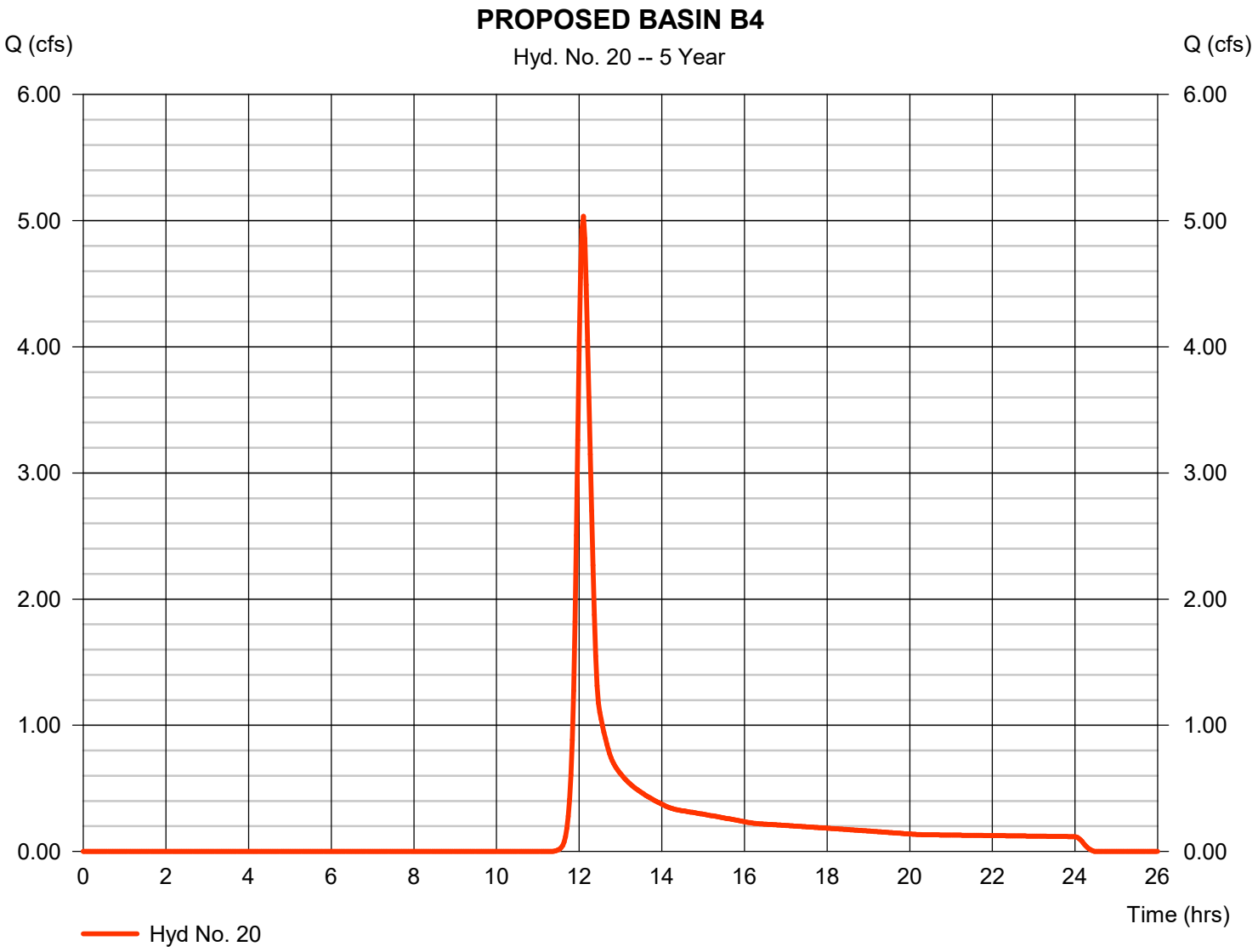
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 20

PROPOSED BASIN B4

Hydrograph type	= SCS Runoff	Peak discharge	= 5.035 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 17,231 cuft
Drainage area	= 4.610 ac	Curve number	= 67
Basin Slope	= 4.1 %	Hydraulic length	= 780 ft
Tc method	= LAG	Time of conc. (Tc)	= 18.60 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



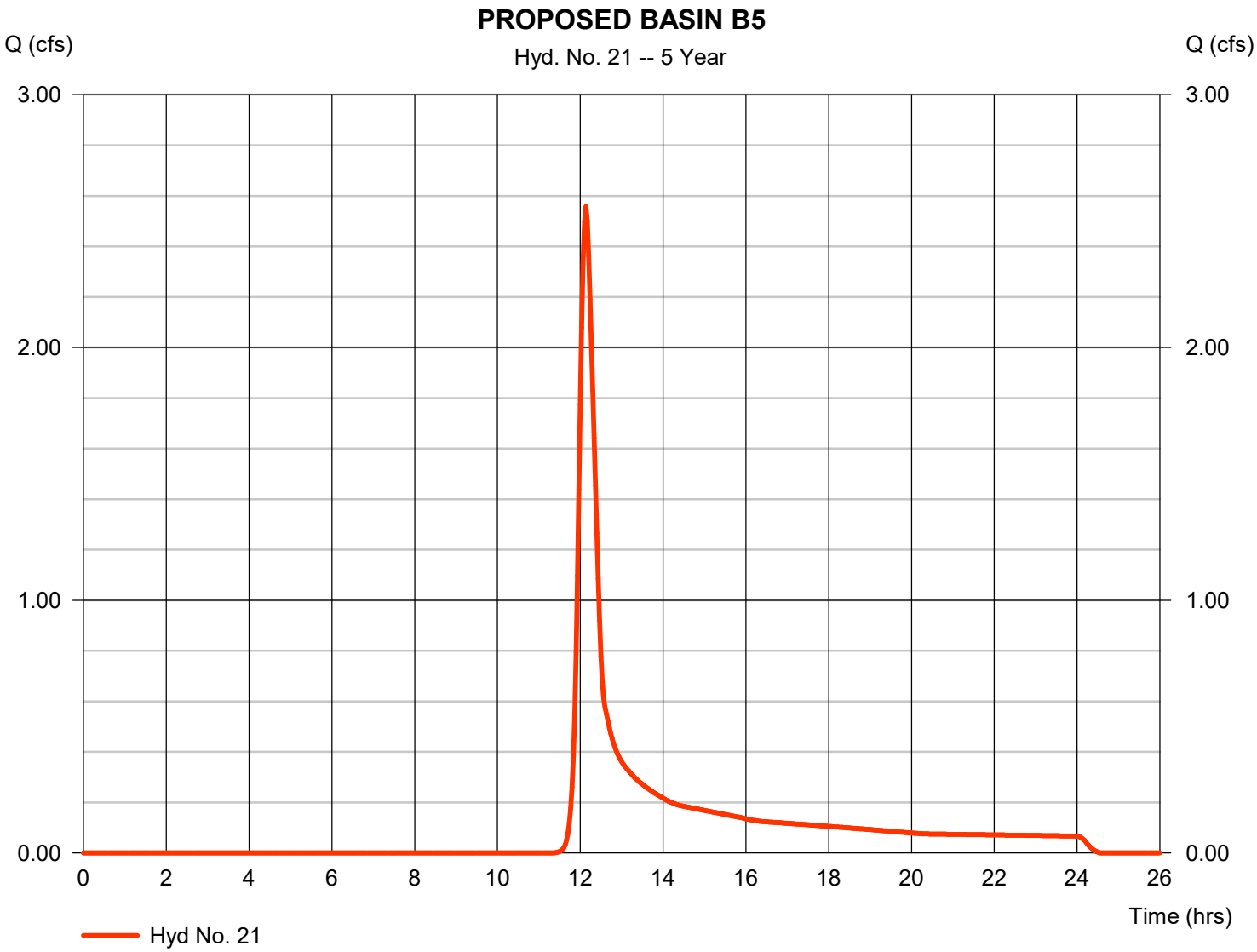
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 21

PROPOSED BASIN B5

Hydrograph type	= SCS Runoff	Peak discharge	= 2.557 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 9,777 cuft
Drainage area	= 2.570 ac	Curve number	= 67
Basin Slope	= 2.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.10 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



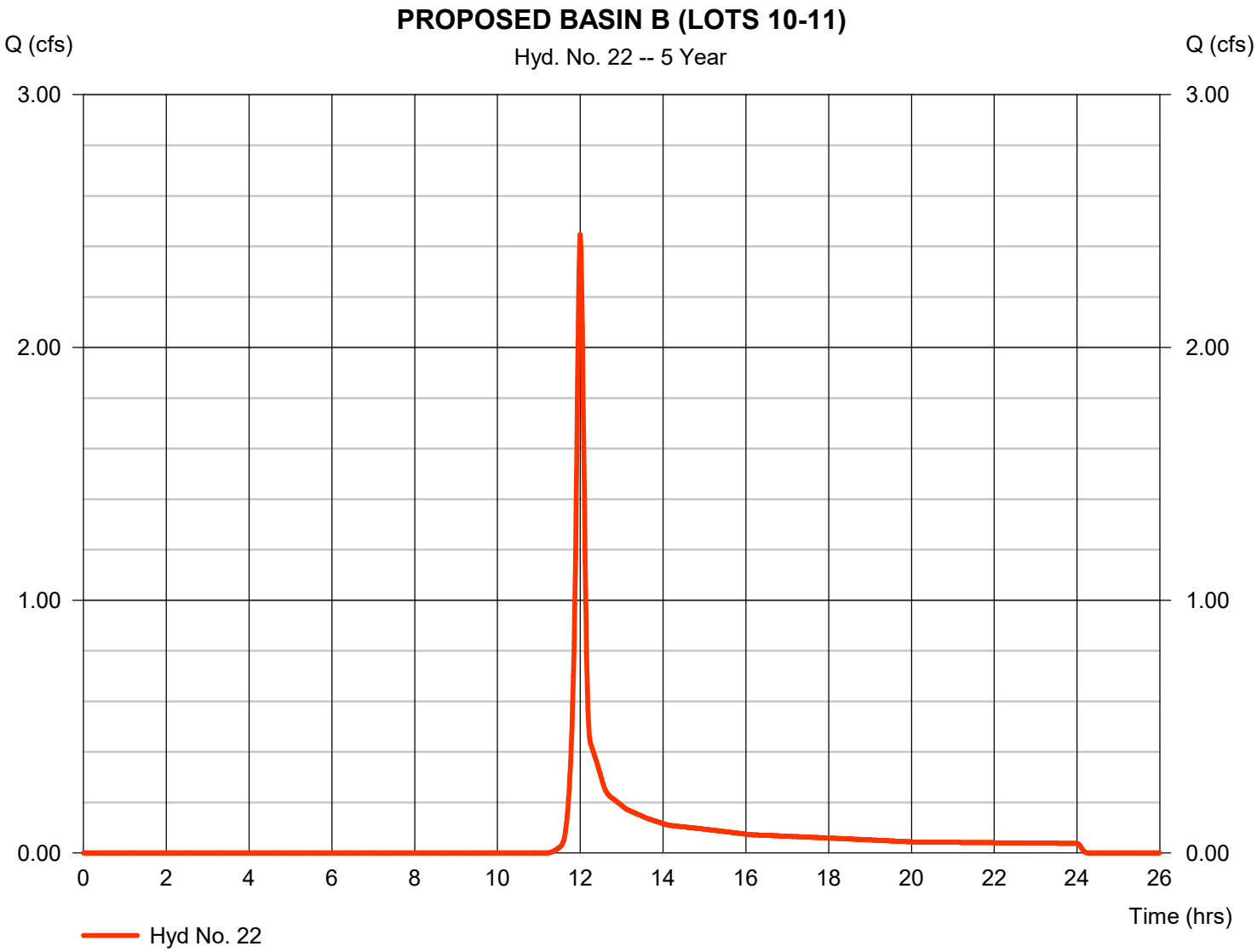
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 22

PROPOSED BASIN B (LOTS 10-11)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.448 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 5,719 cuft
Drainage area	= 1.450 ac	Curve number	= 68
Basin Slope	= 2.0 %	Hydraulic length	= 100 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



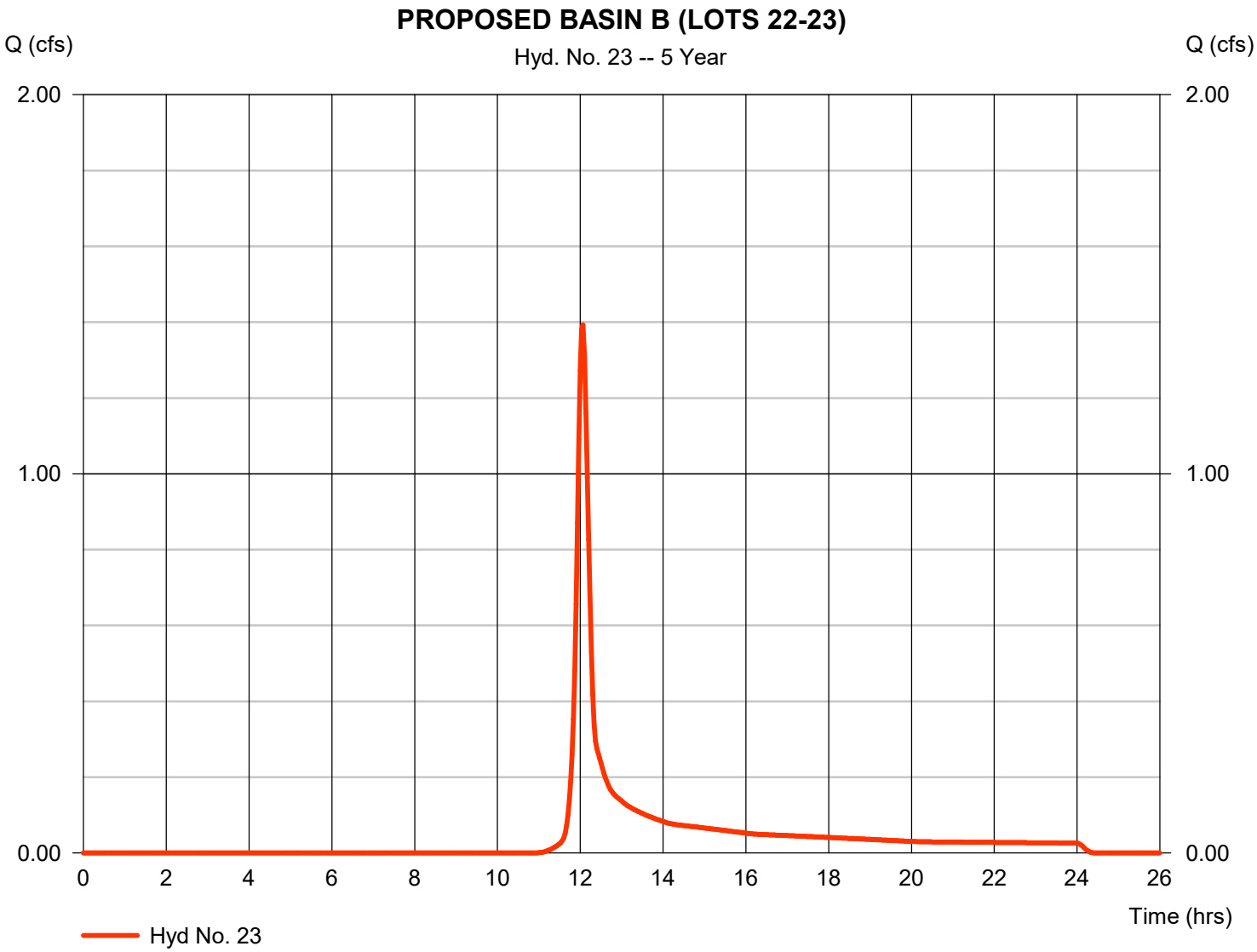
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 23

PROPOSED BASIN B (LOTS 22-23)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.393 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 4,093 cuft
Drainage area	= 0.960 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



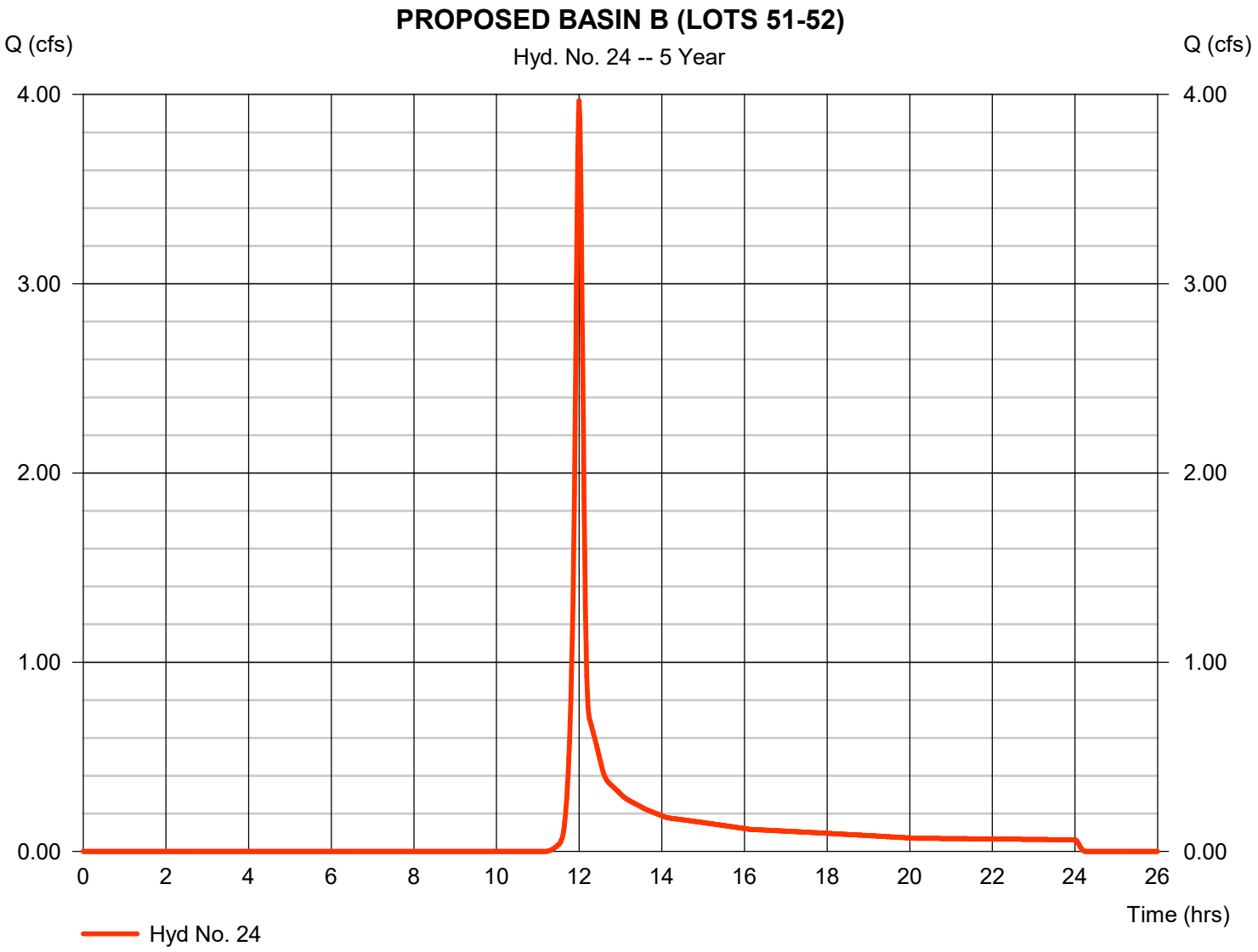
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 24

PROPOSED BASIN B (LOTS 51-52)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.967 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 9,269 cuft
Drainage area	= 2.350 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



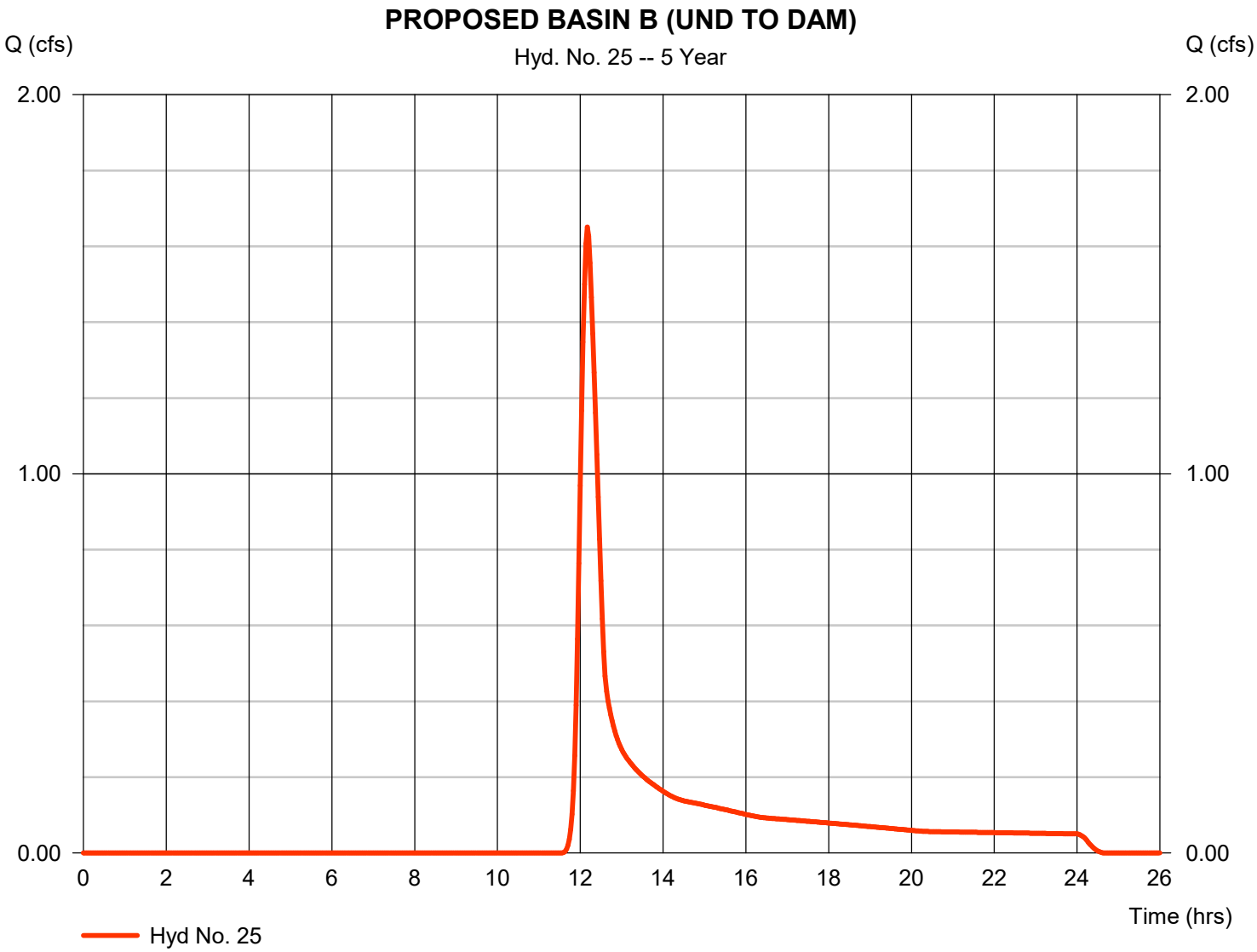
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 25

PROPOSED BASIN B (UND TO DAM)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.651 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 7,004 cuft
Drainage area	= 2.130 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

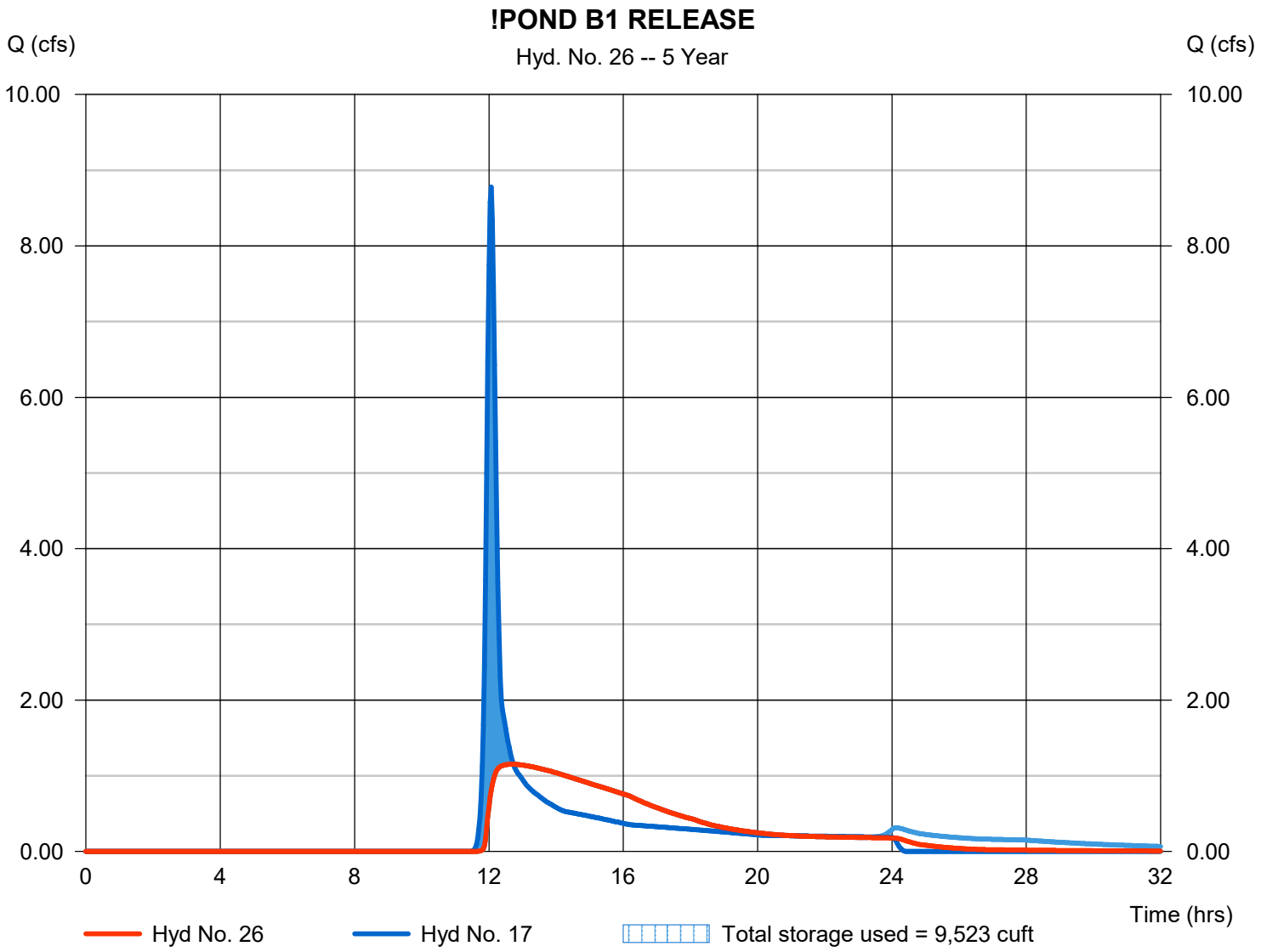
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 26

!POND B1 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 1.153 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 24,953 cuft
Inflow hyd. No.	= 17 - PROPOSED BASIN B1	Max. Elevation	= 935.99 ft
Reservoir name	= POND B1	Max. Storage	= 9,523 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

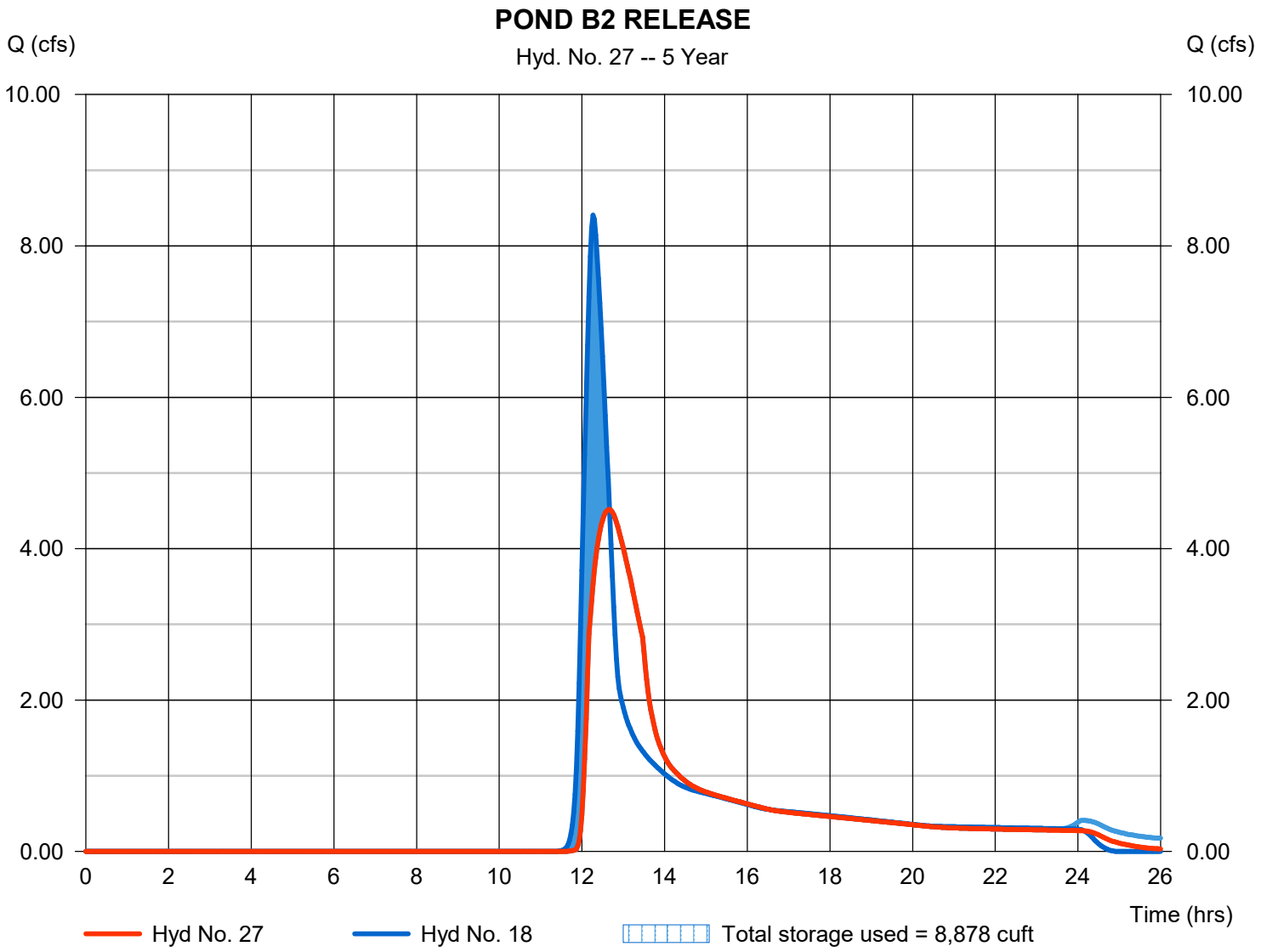
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 27

POND B2 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 4.517 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 40,934 cuft
Inflow hyd. No.	= 18 - PROPOSED BASIN B2	Max. Elevation	= 939.49 ft
Reservoir name	= POND B2	Max. Storage	= 8,878 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



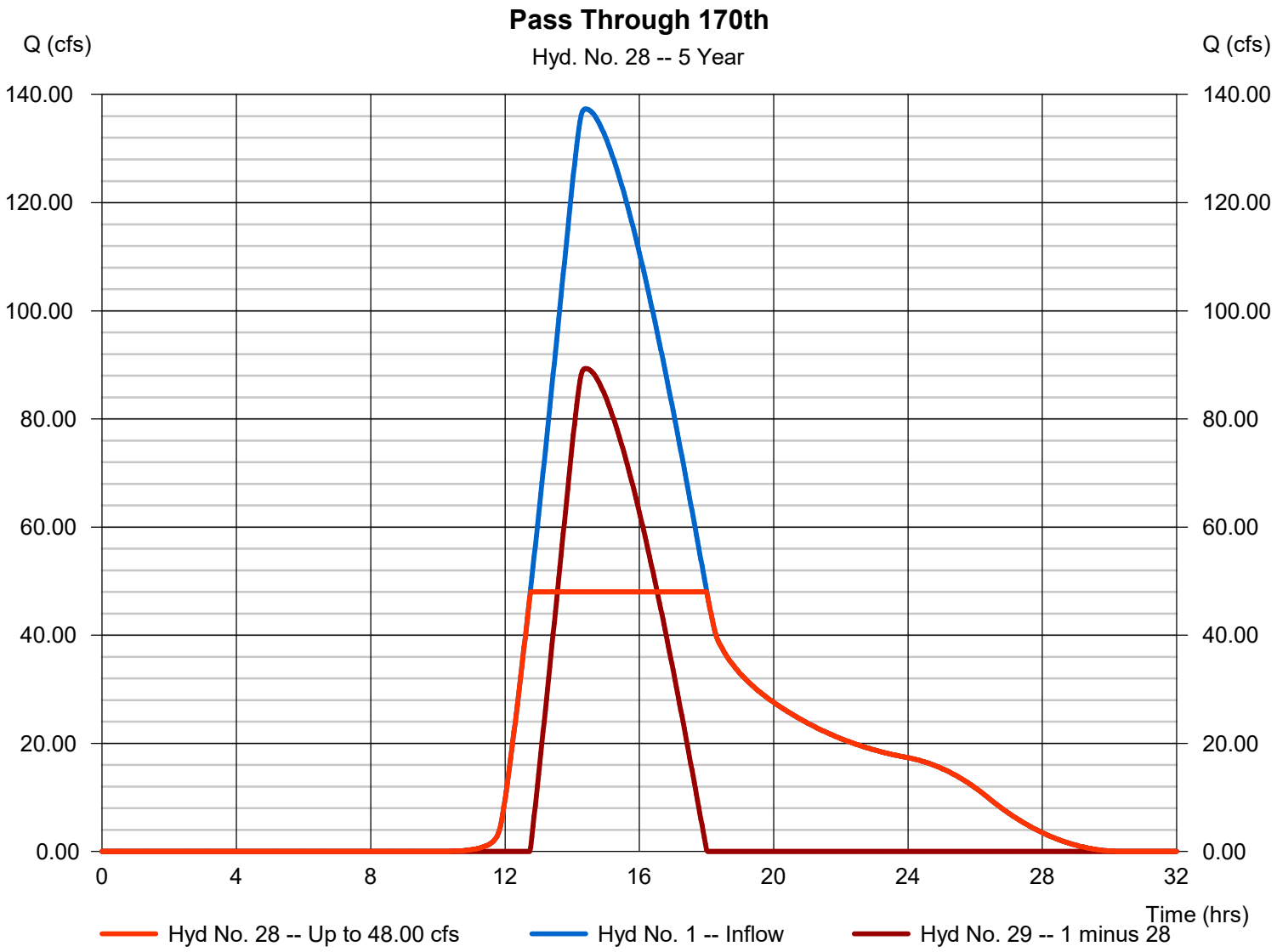
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 28

Pass Through 170th

Hydrograph type	= Diversion1	Peak discharge	= 48.00 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.77 hrs
Time interval	= 2 min	Hyd. volume	= 1,715,593 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 29
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



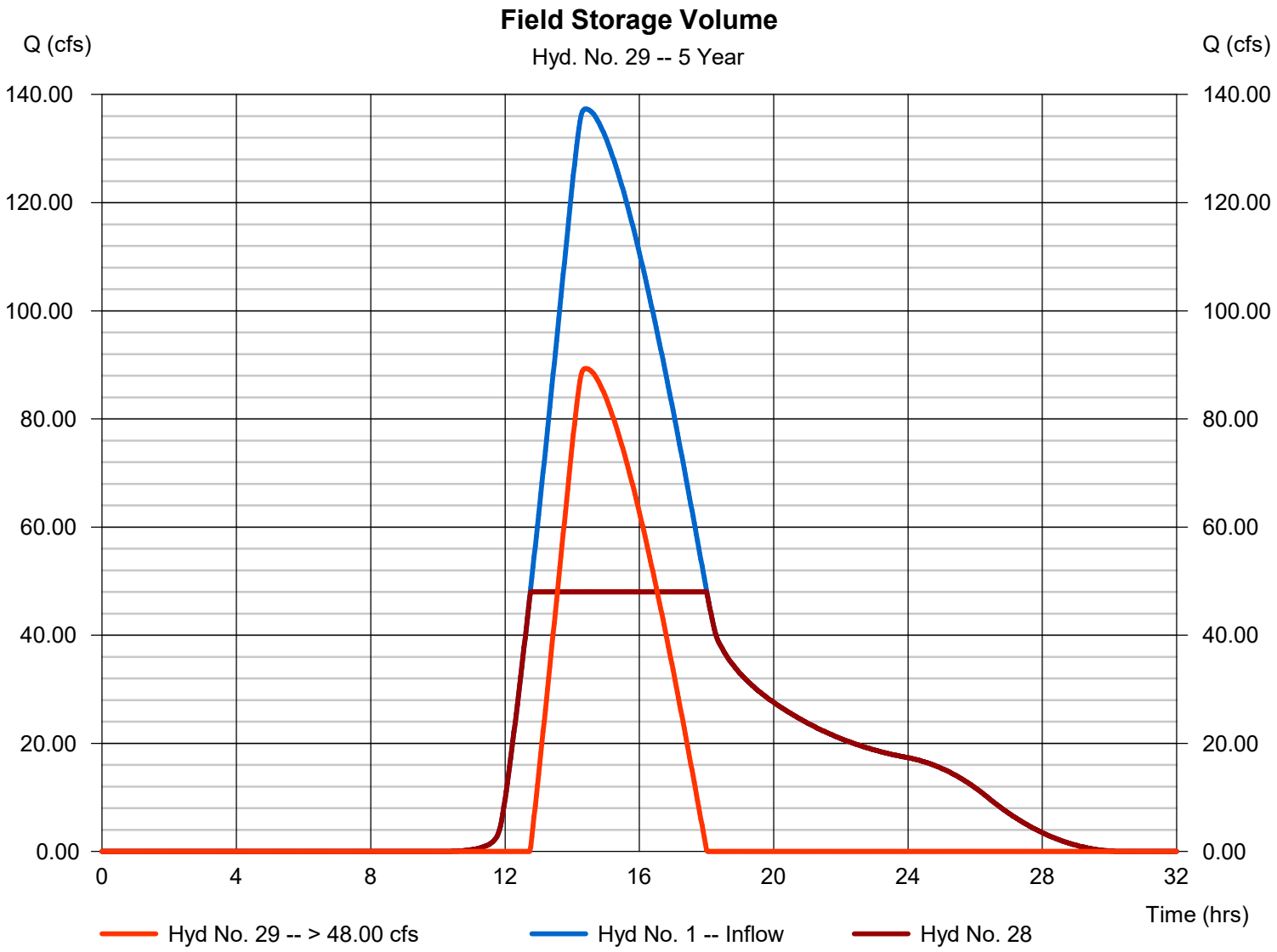
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 29

Field Storage Volume

Hydrograph type	= Diversion2	Peak discharge	= 89.32 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.40 hrs
Time interval	= 2 min	Hyd. volume	= 981,361 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 28
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



Hydrograph Report

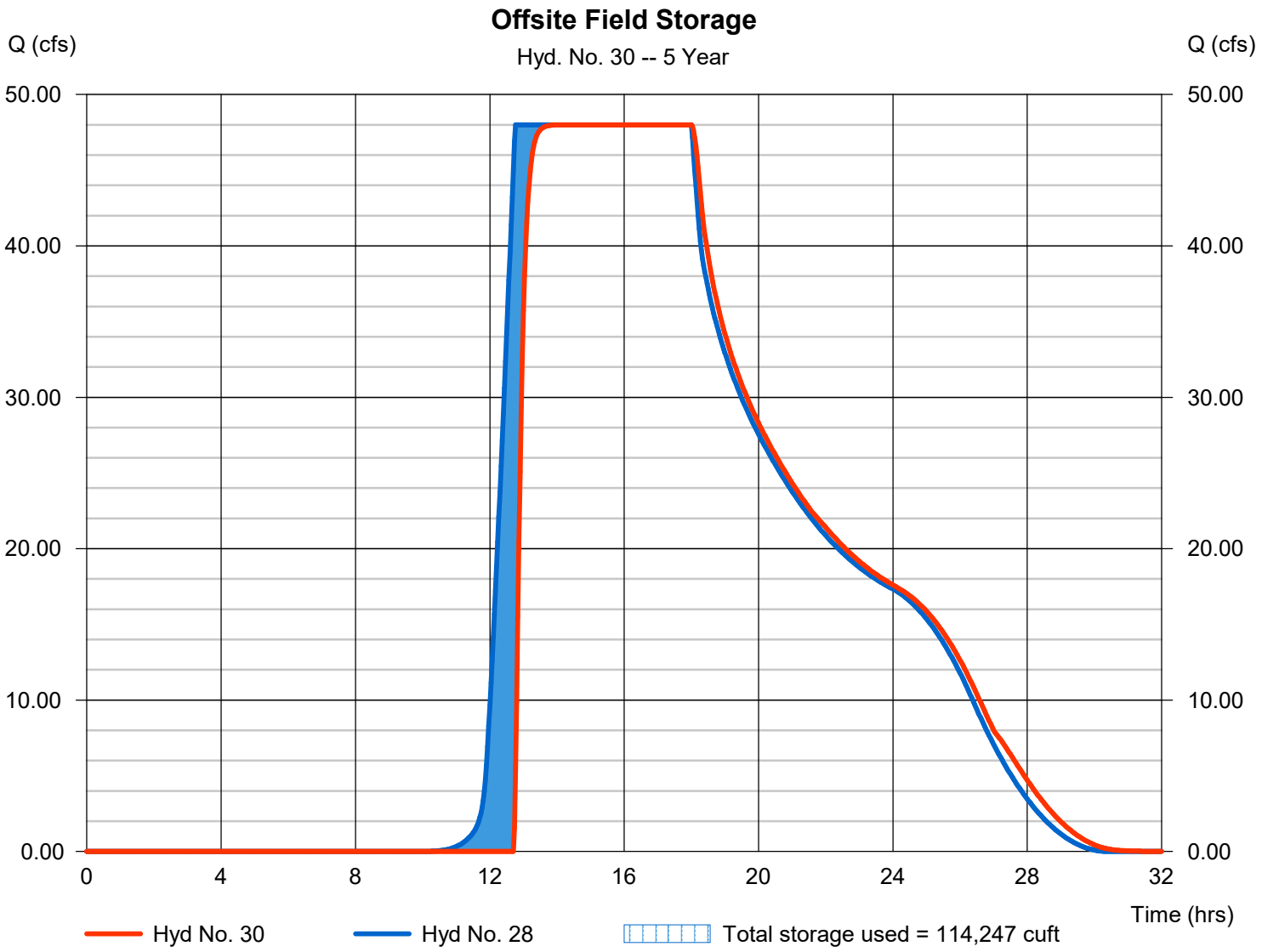
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 30

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 48.00 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.73 hrs
Time interval	= 2 min	Hyd. volume	= 1,637,068 cuft
Inflow hyd. No.	= 28 - Pass Through 170th	Max. Elevation	= 957.83 ft
Reservoir name	= Offsite Field Storage UPPER	Max. Storage	= 114,247 cuft

Storage Indication method used.



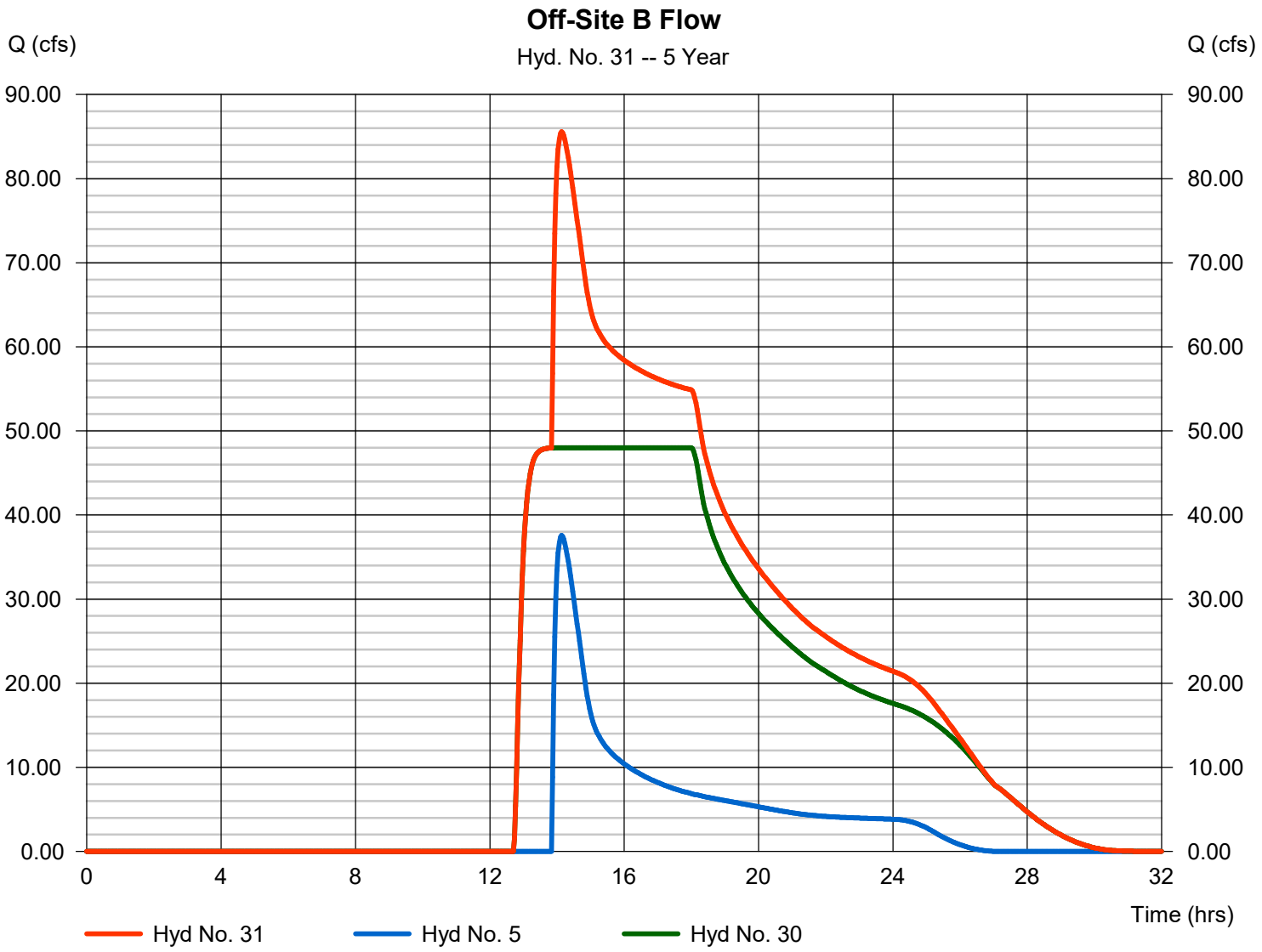
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 31

Off-Site B Flow

Hydrograph type	= Combine	Peak discharge	= 85.57 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.13 hrs
Time interval	= 2 min	Hyd. volume	= 1,983,995 cuft
Inflow hyds.	= 5, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

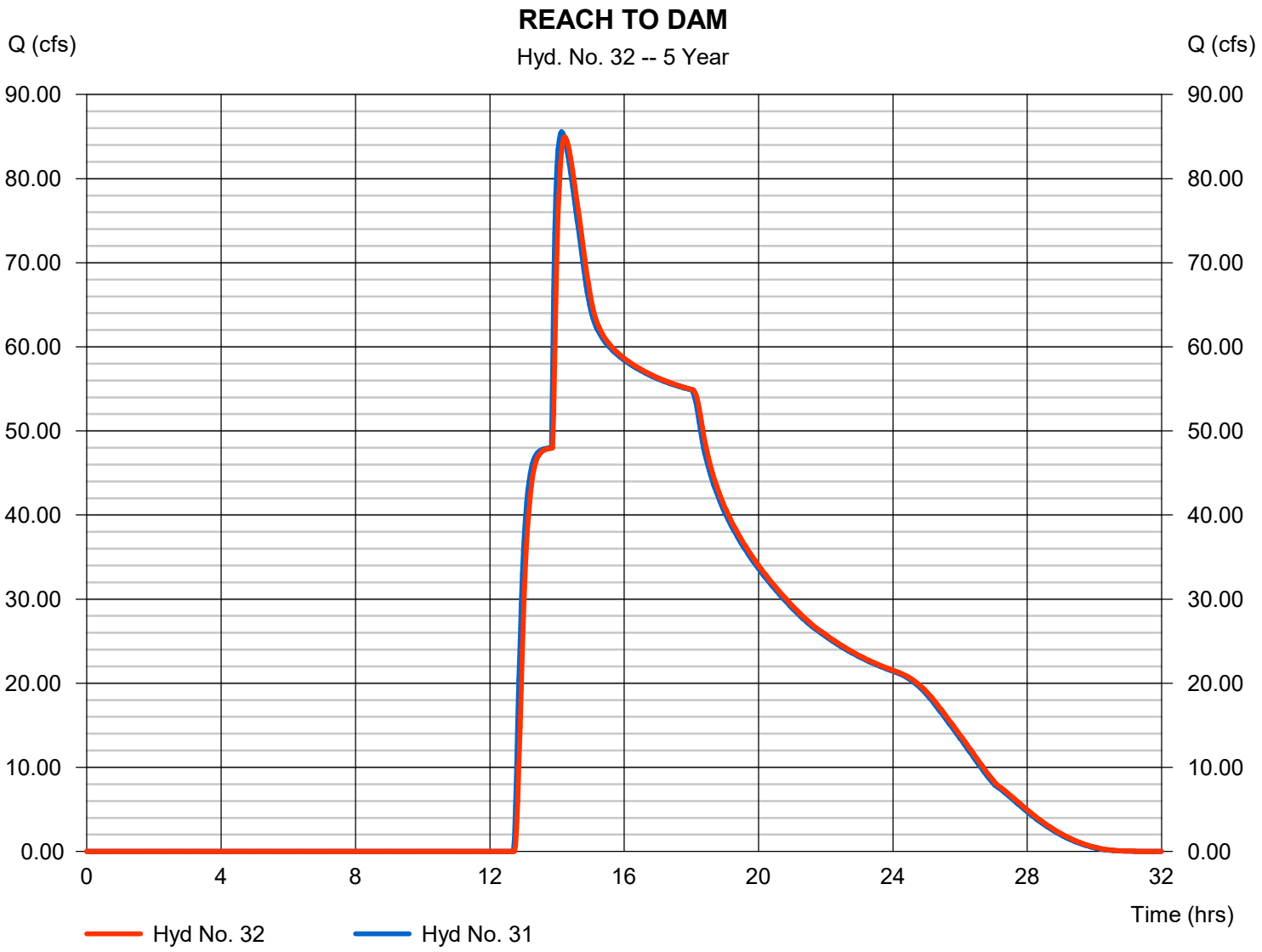
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 32

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 84.97 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.23 hrs
Time interval	= 2 min	Hyd. volume	= 1,983,983 cuft
Inflow hyd. No.	= 31 - Off-Site B Flow	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 3.34 ft/s	Routing coeff.	= 0.4474

Modified Att-Kin routing method used.



Hydrograph Report

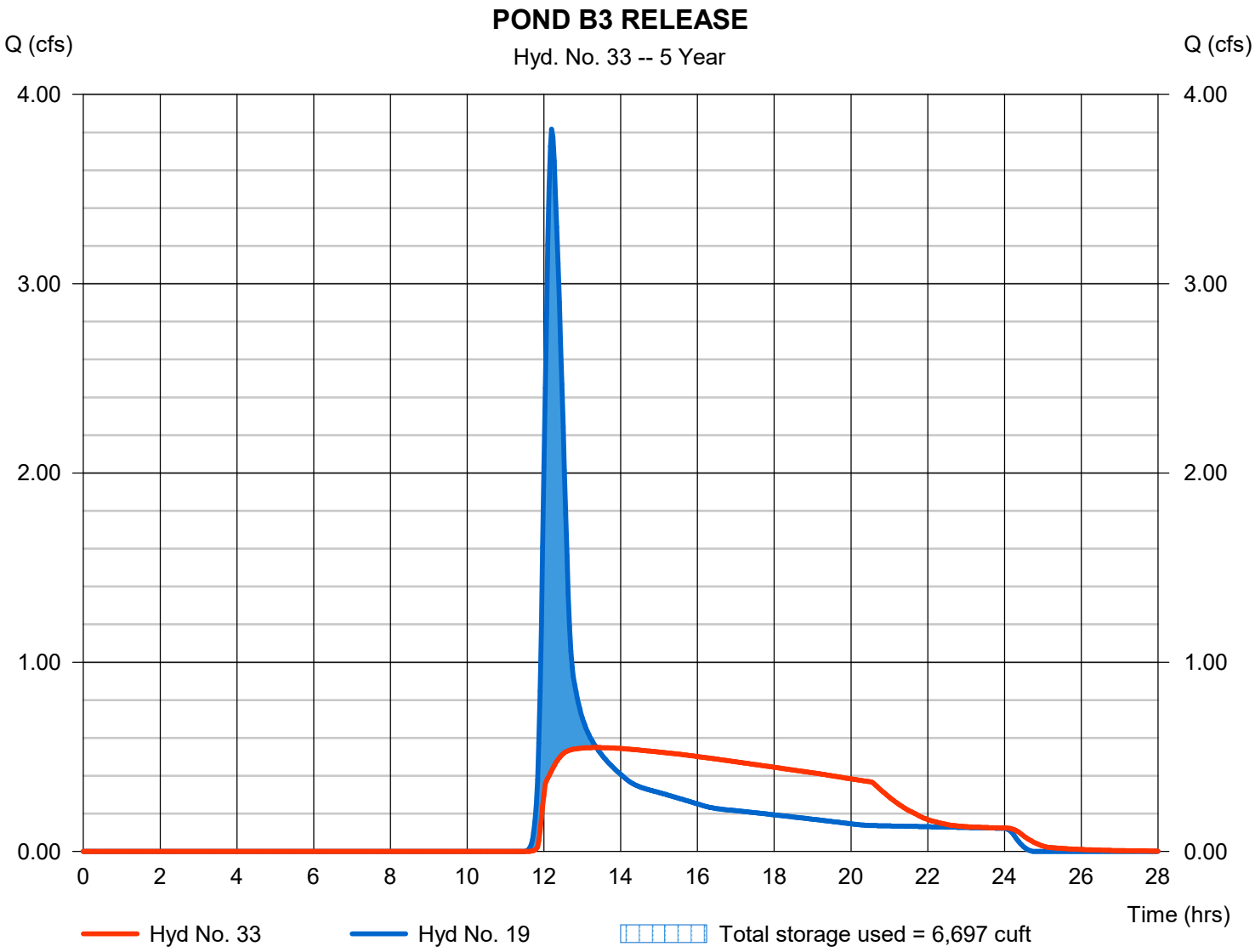
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 33

POND B3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.549 cfs
Storm frequency	= 5 yrs	Time to peak	= 13.37 hrs
Time interval	= 2 min	Hyd. volume	= 17,430 cuft
Inflow hyd. No.	= 19 - PROPOSED BASIN B3	Max. Elevation	= 939.00 ft
Reservoir name	= POND B3	Max. Storage	= 6,697 cuft

Storage Indication method used.



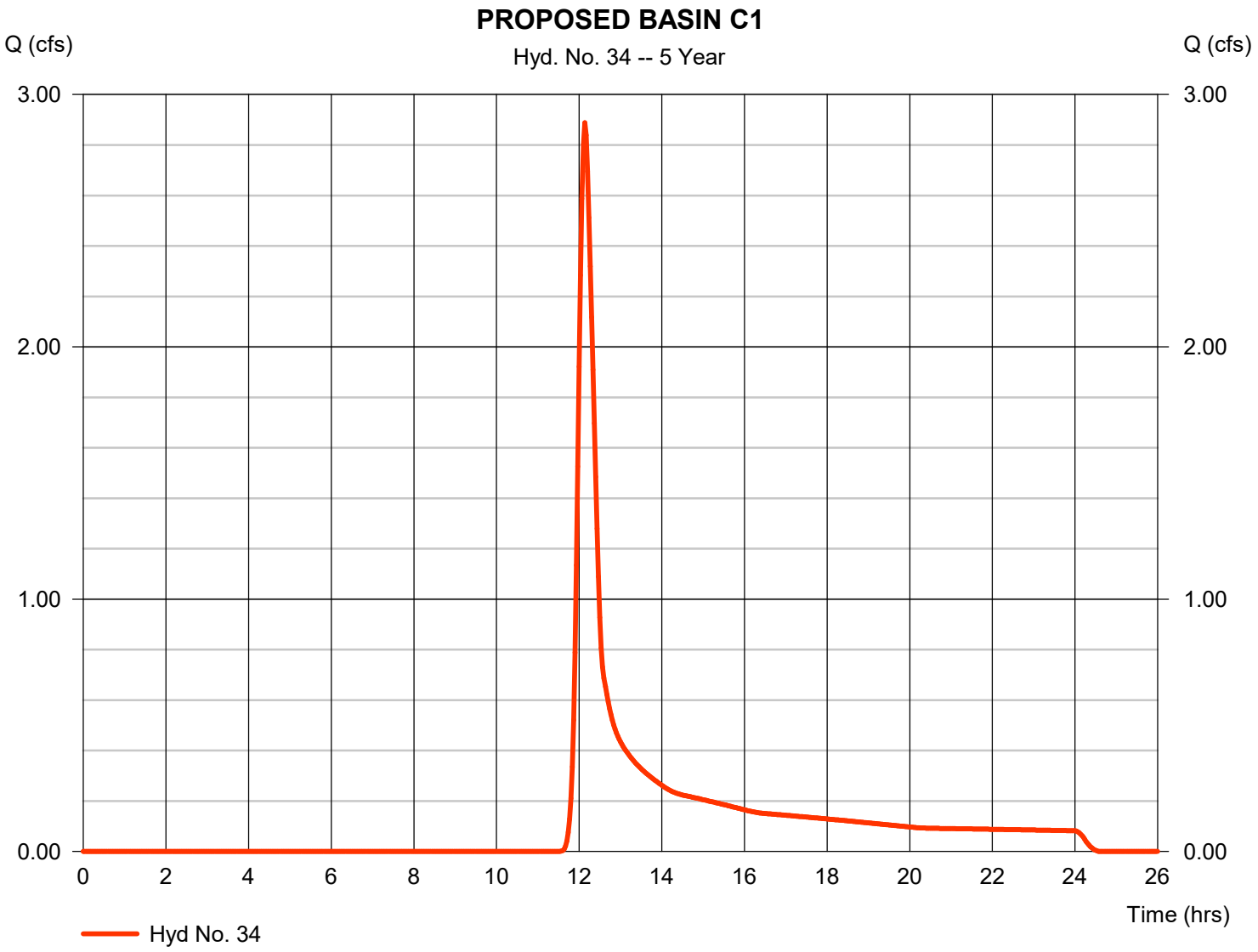
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 34

PROPOSED BASIN C1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.888 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 11,458 cuft
Drainage area	= 3.370 ac	Curve number	= 65
Basin Slope	= 2.3 %	Hydraulic length	= 630 ft
Tc method	= LAG	Time of conc. (Tc)	= 22.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



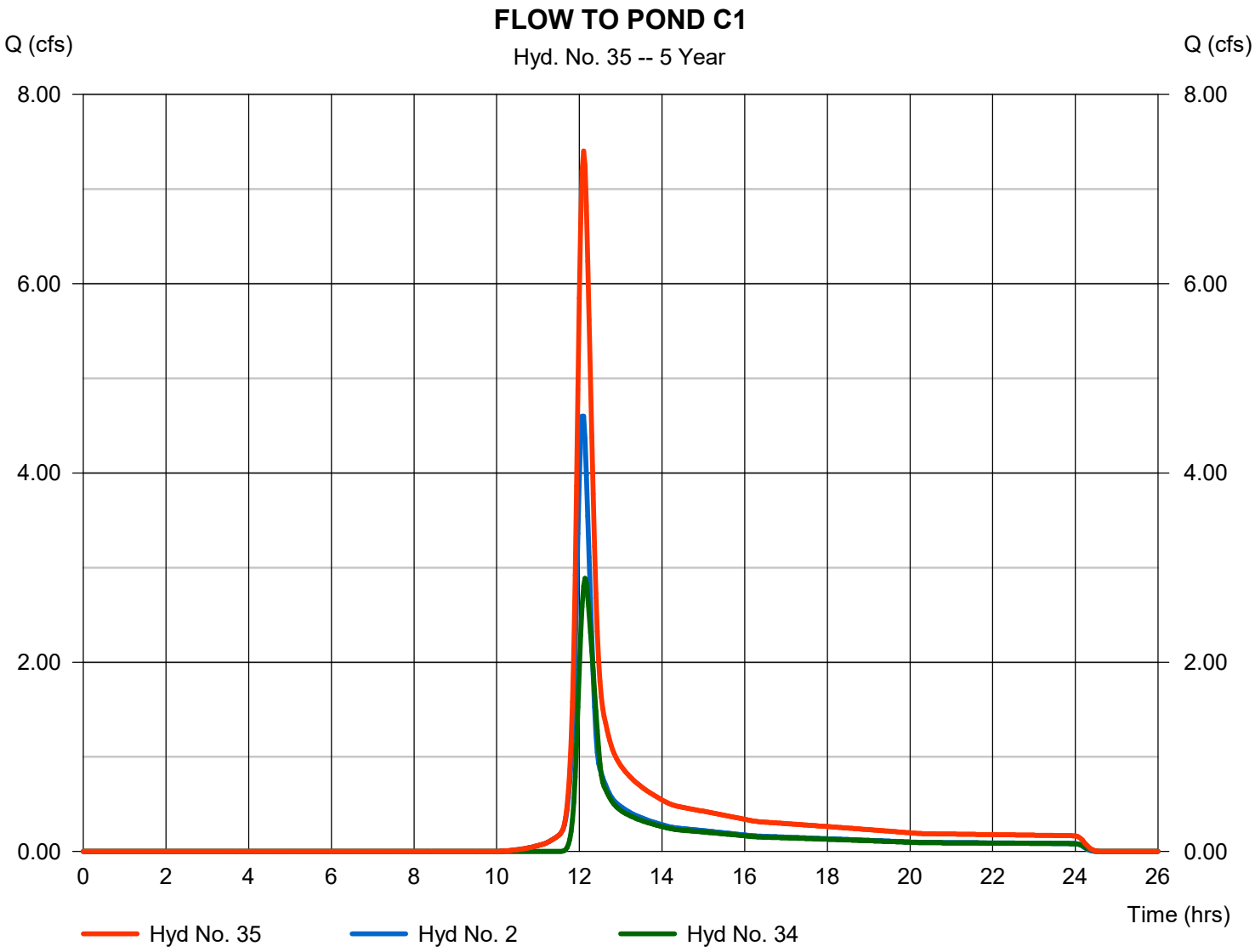
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 35

FLOW TO POND C1

Hydrograph type	= Combine	Peak discharge	= 7.403 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 26,188 cuft
Inflow hyds.	= 2, 34	Contrib. drain. area	= 6.030 ac



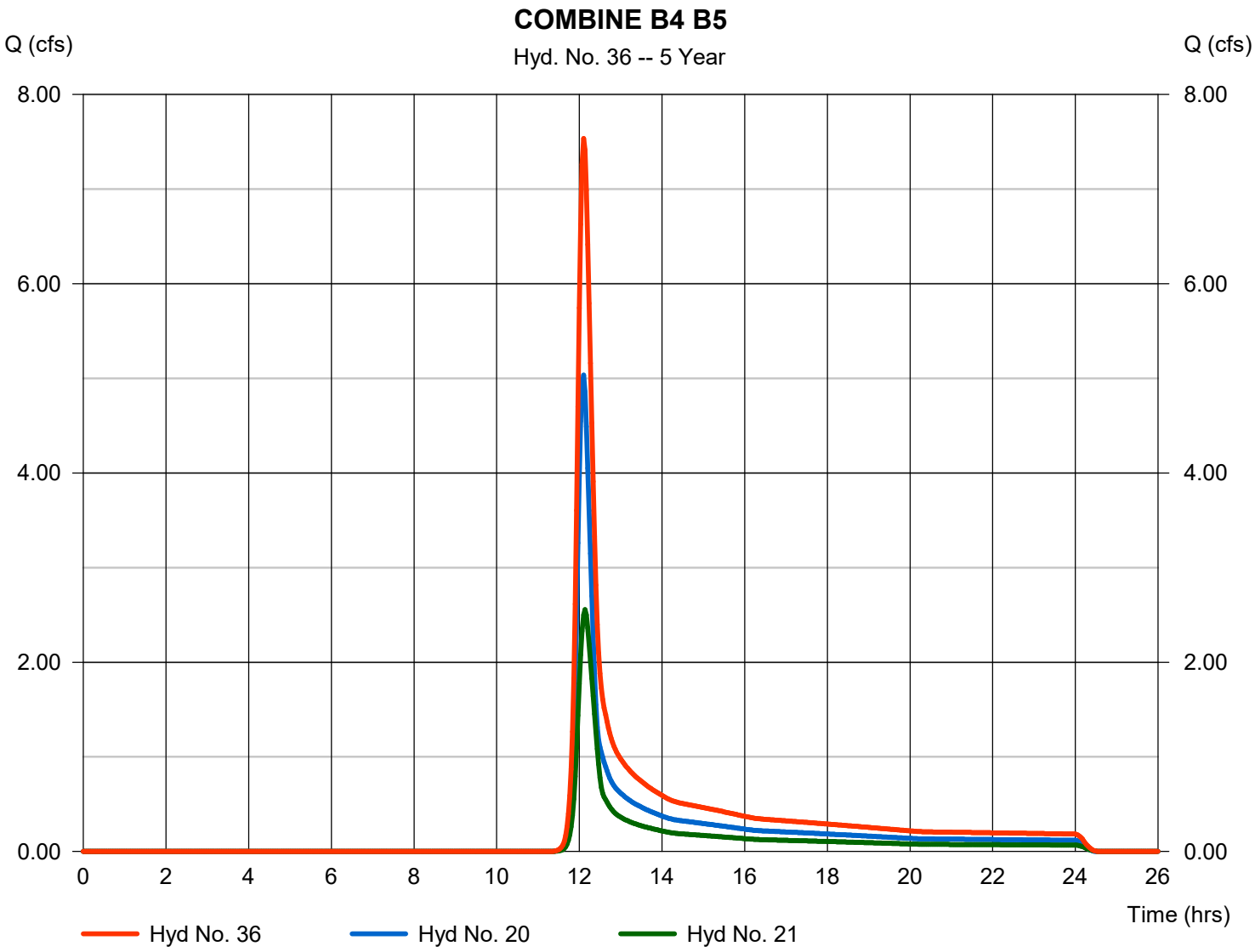
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 36

COMBINE B4 B5

Hydrograph type	= Combine	Peak discharge	= 7.535 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 27,008 cuft
Inflow hyds.	= 20, 21	Contrib. drain. area	= 7.180 ac



Hydrograph Report

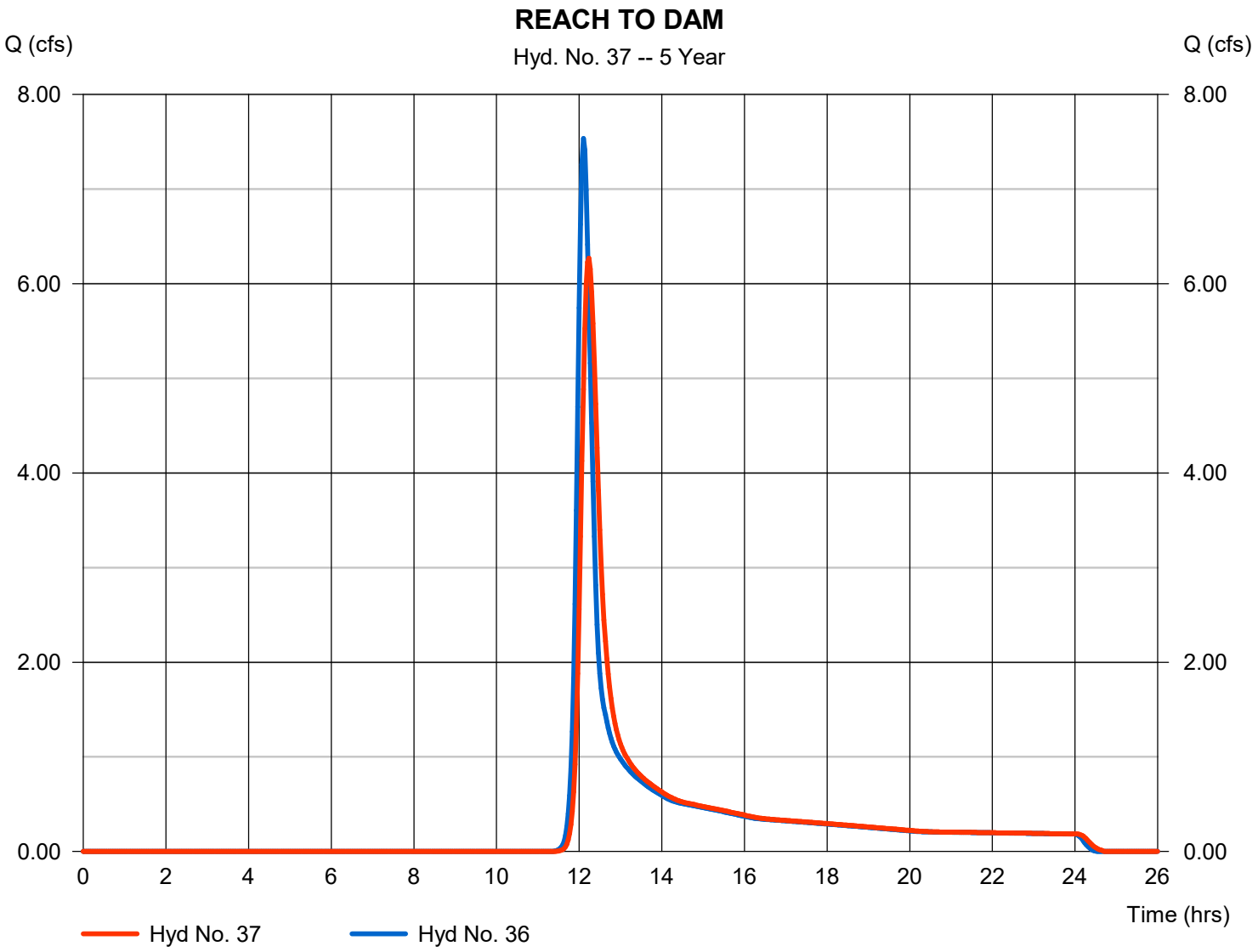
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 37

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 6.271 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 27,004 cuft
Inflow hyd. No.	= 36 - COMBINE B4 B5	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 1.59 ft/s	Routing coeff.	= 0.2418

Modified Att-Kin routing method used.



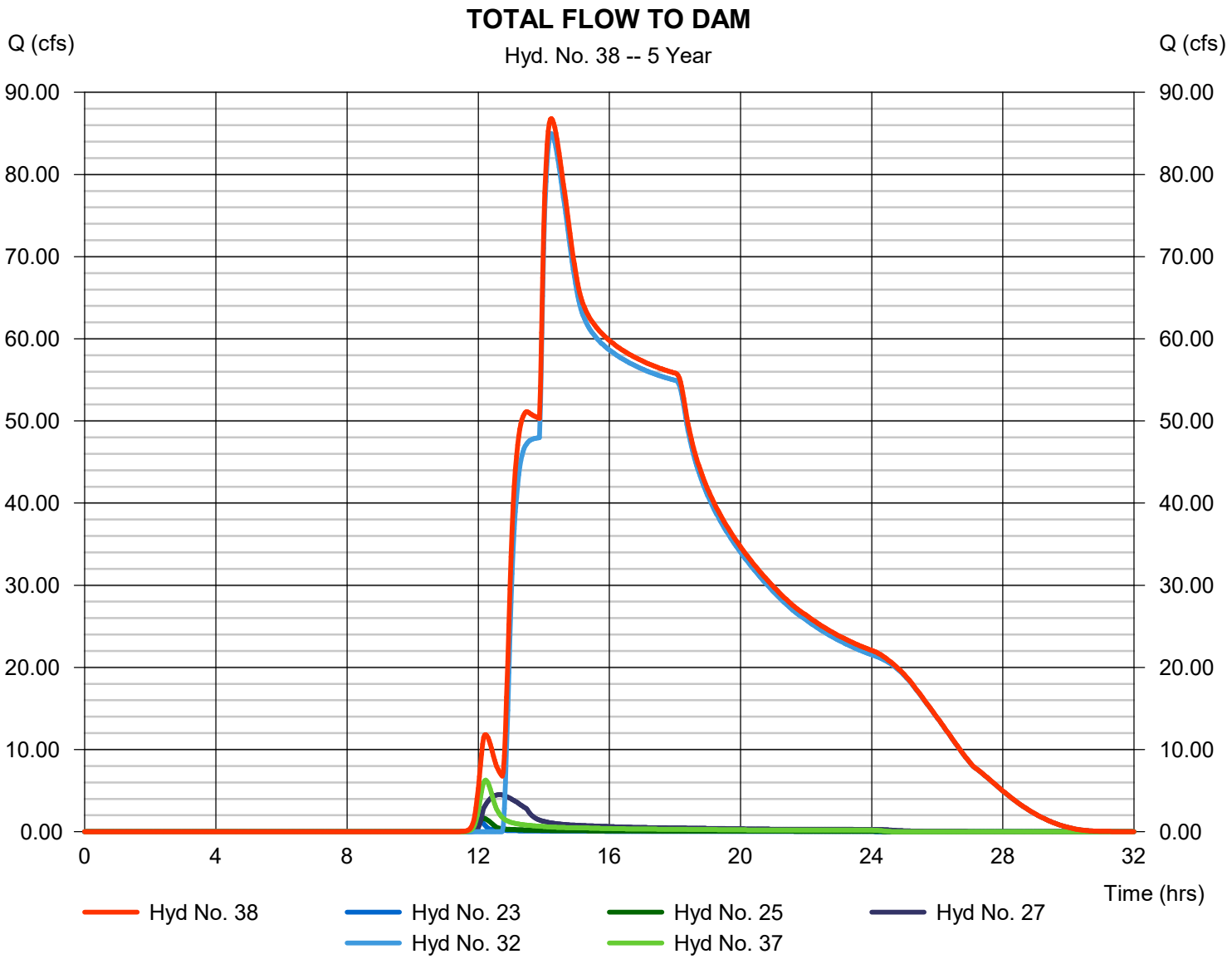
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 38

TOTAL FLOW TO DAM

Hydrograph type	= Combine	Peak discharge	= 86.83 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.23 hrs
Time interval	= 2 min	Hyd. volume	= 2,063,017 cuft
Inflow hyds.	= 23, 25, 27, 32, 37	Contrib. drain. area	= 3.090 ac



Hydrograph Report

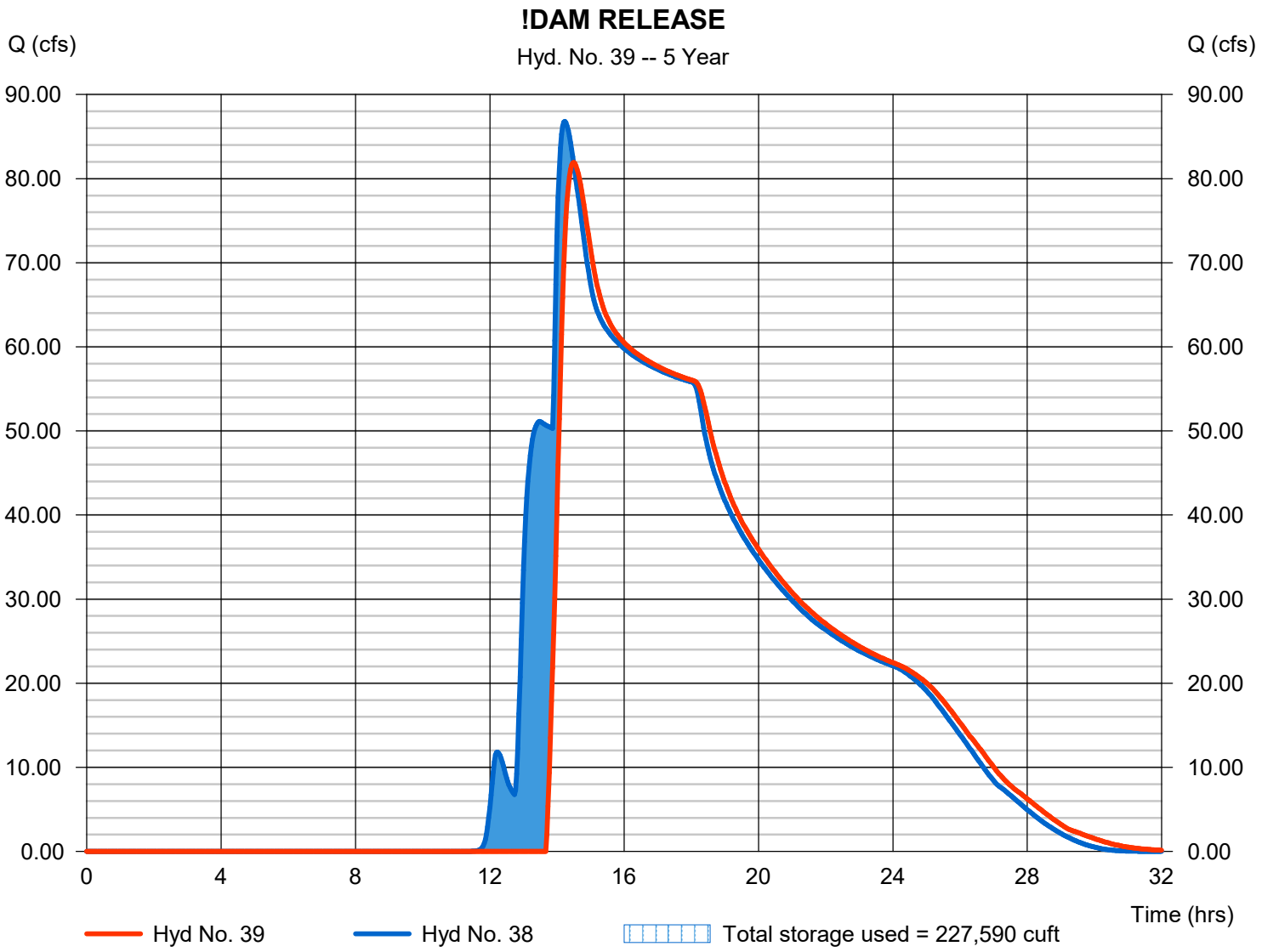
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 39

!DAM RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 81.93 cfs
Storm frequency	= 5 yrs	Time to peak	= 14.50 hrs
Time interval	= 2 min	Hyd. volume	= 1,904,853 cuft
Inflow hyd. No.	= 38 - TOTAL FLOW TO DAM	Max. Elevation	= 942.99 ft
Reservoir name	= EXISTING DAM	Max. Storage	= 227,590 cuft

Storage Indication method used.



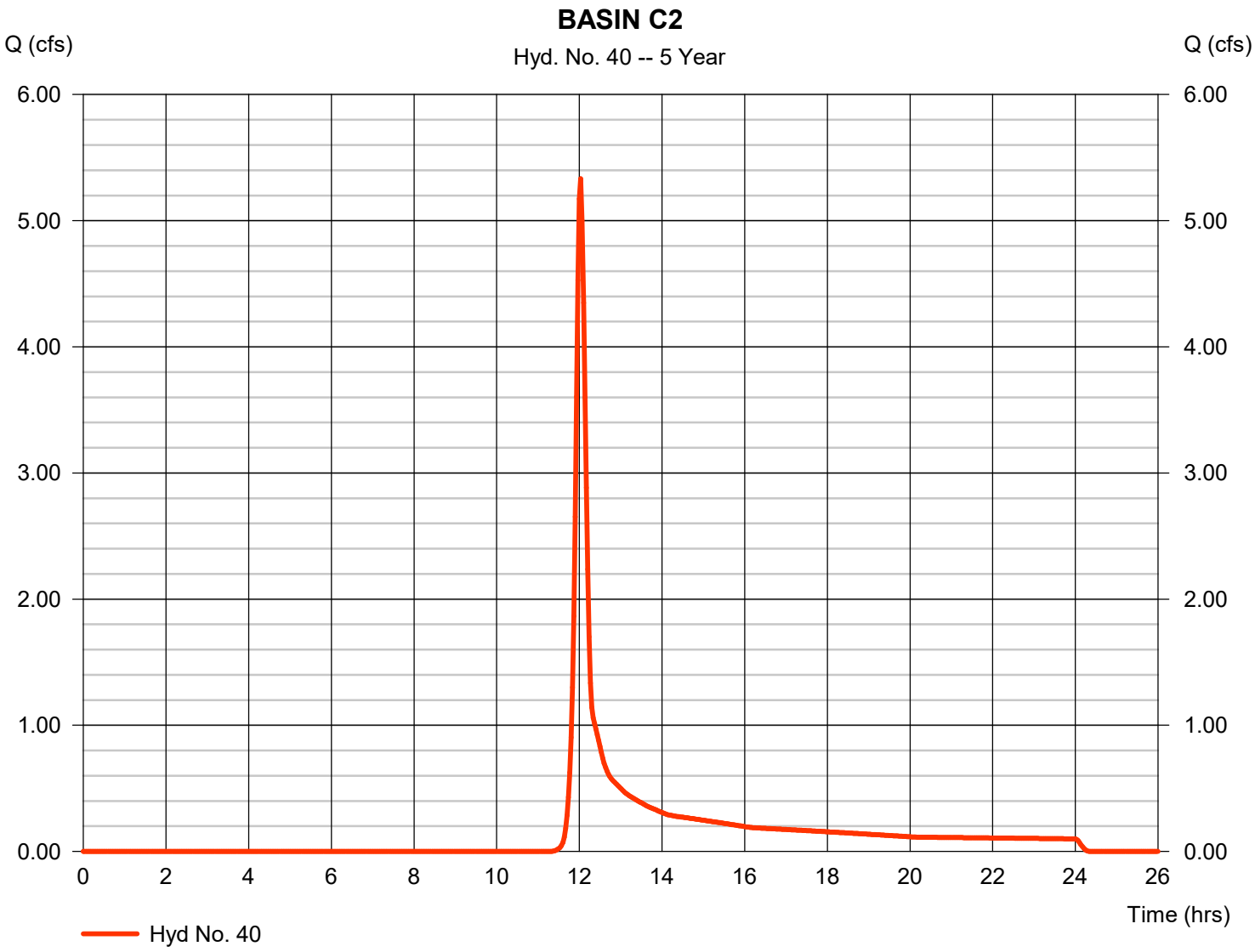
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 40

BASIN C2

Hydrograph type	= SCS Runoff	Peak discharge	= 5.334 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 14,686 cuft
Drainage area	= 3.810 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 457 ft
Tc method	= LAG	Time of conc. (Tc)	= 13.10 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



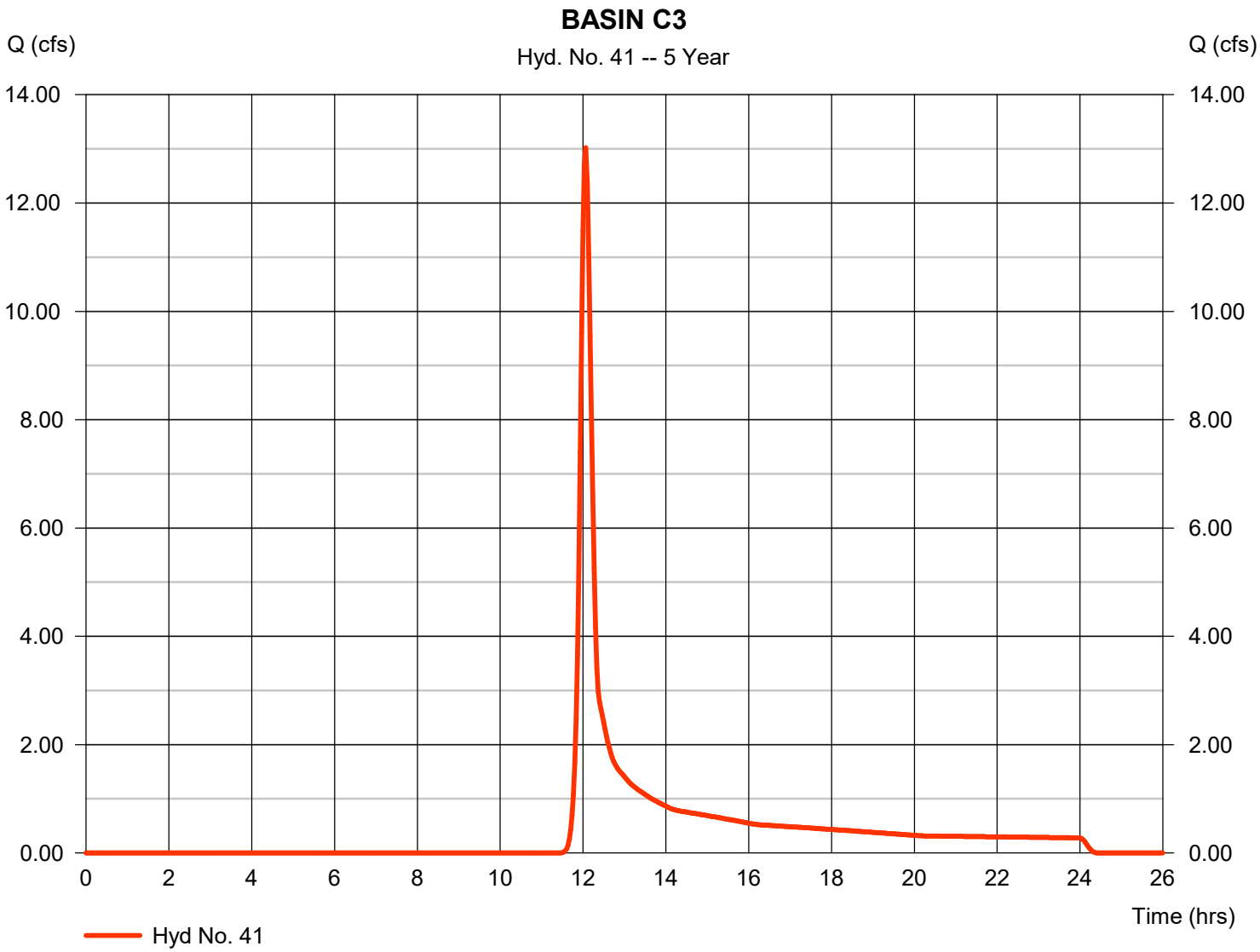
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 41

BASIN C3

Hydrograph type	= SCS Runoff	Peak discharge	= 13.02 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 39,893 cuft
Drainage area	= 11.570 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



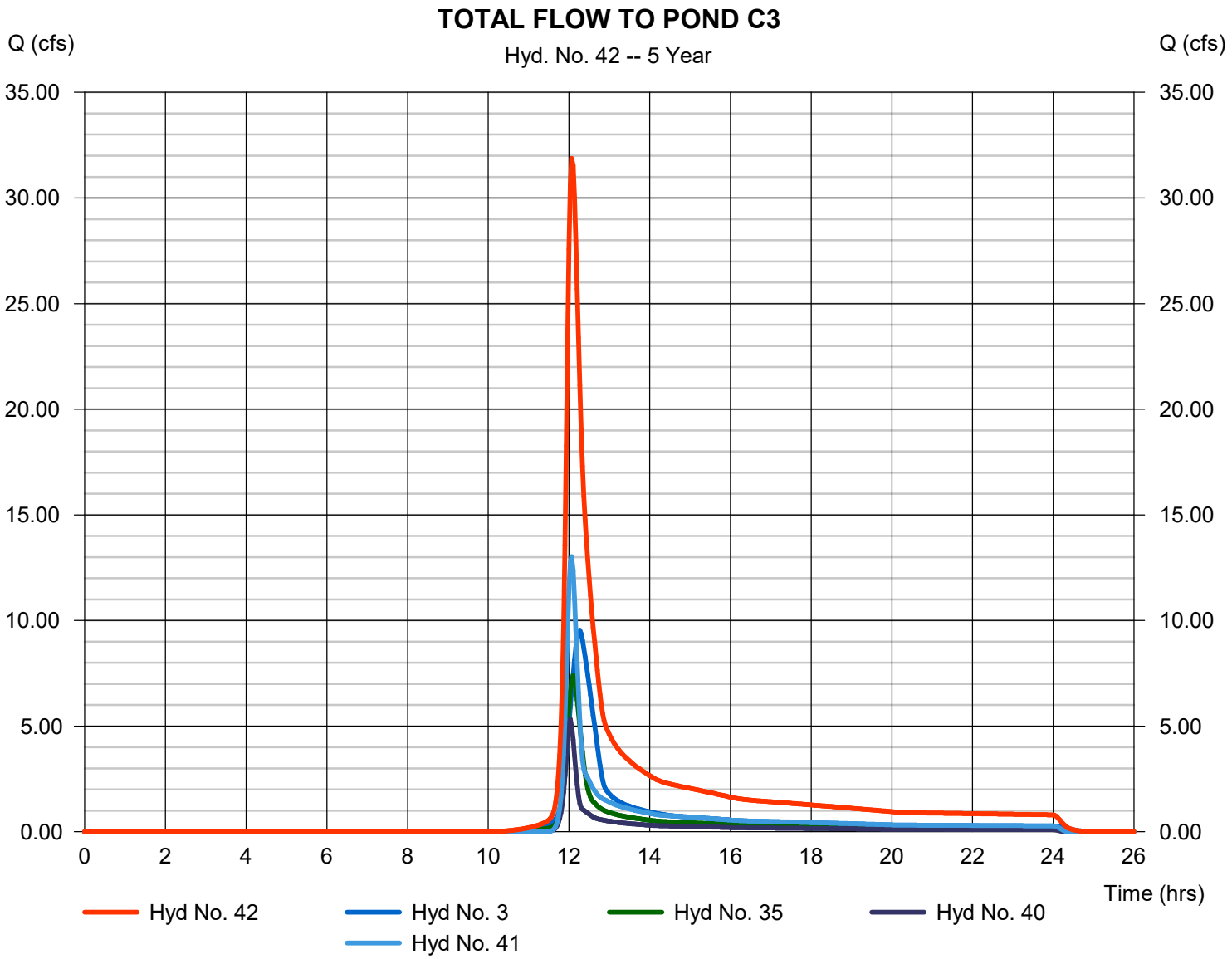
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 42

TOTAL FLOW TO POND C3

Hydrograph type	= Combine	Peak discharge	= 31.88 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 125,332 cuft
Inflow hyds.	= 3, 35, 40, 41	Contrib. drain. area	= 23.520 ac



Hydrograph Report

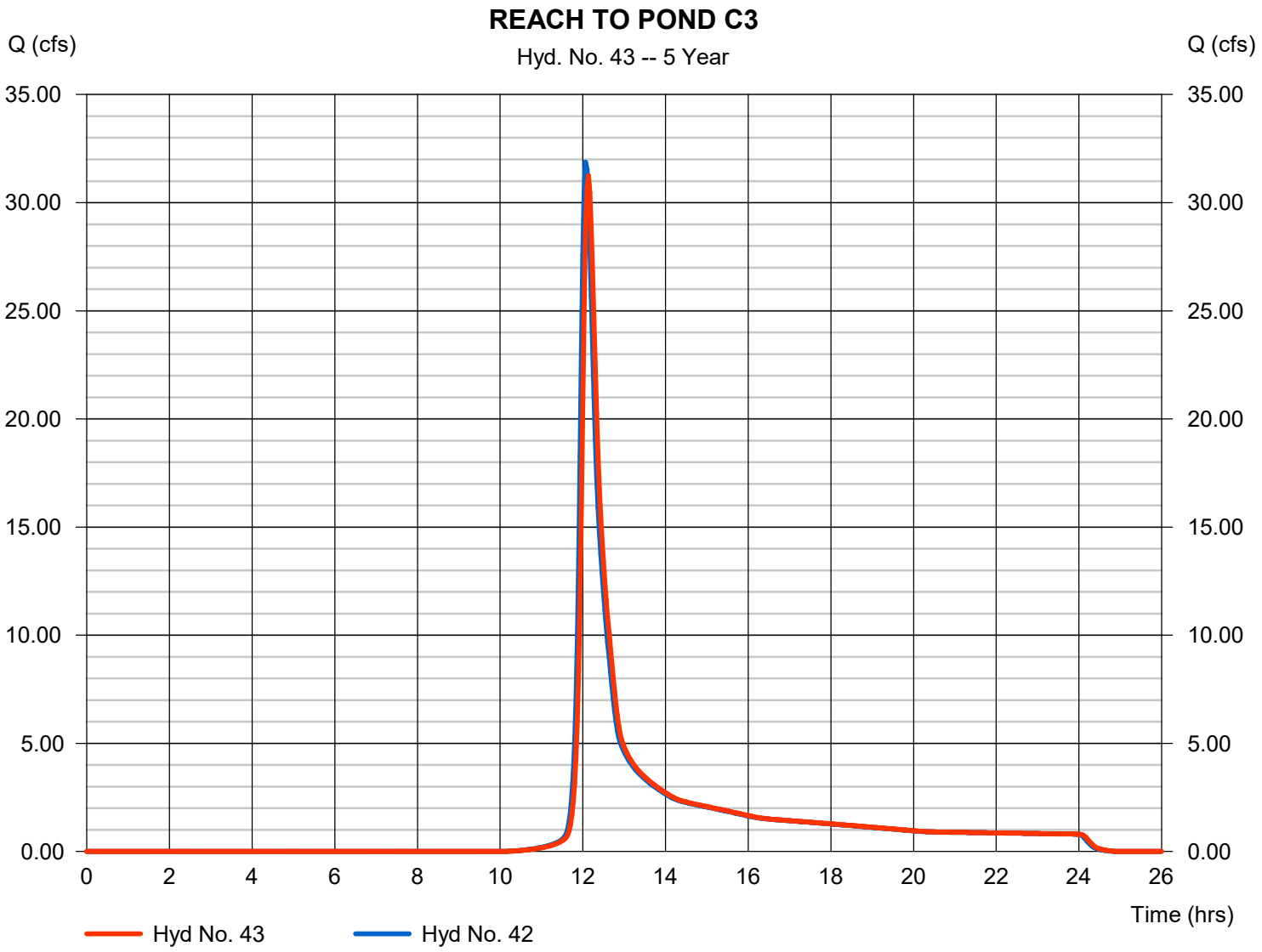
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 43

REACH TO POND C3

Hydrograph type	= Reach	Peak discharge	= 31.24 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 125,330 cuft
Inflow hyd. No.	= 42 - TOTAL FLOW TO POND C3	Section type	= Trapezoidal
Reach length	= 450.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 2.47 ft/s	Routing coeff.	= 0.6433

Modified Att-Kin routing method used.



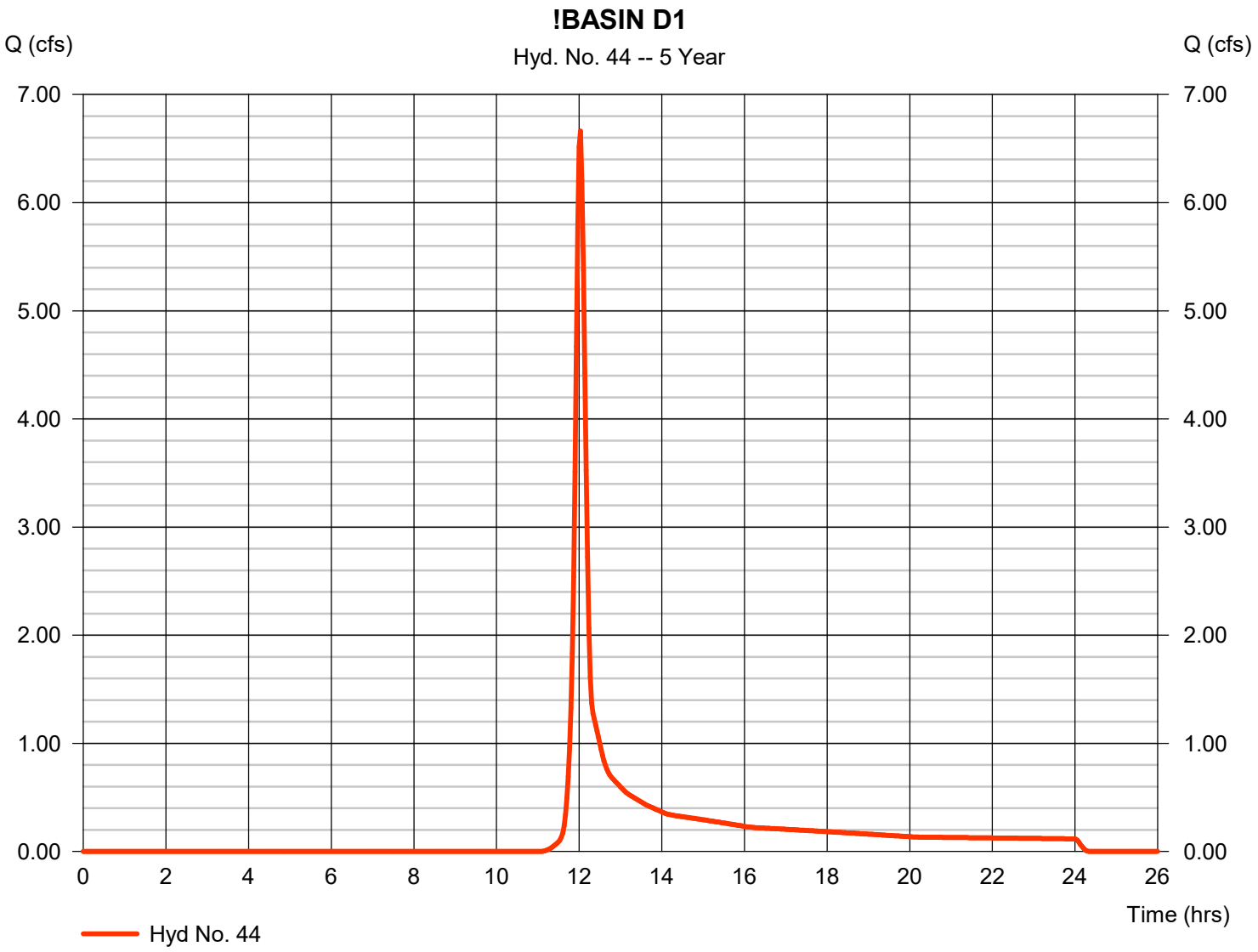
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 44

!BASIN D1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.662 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 17,999 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



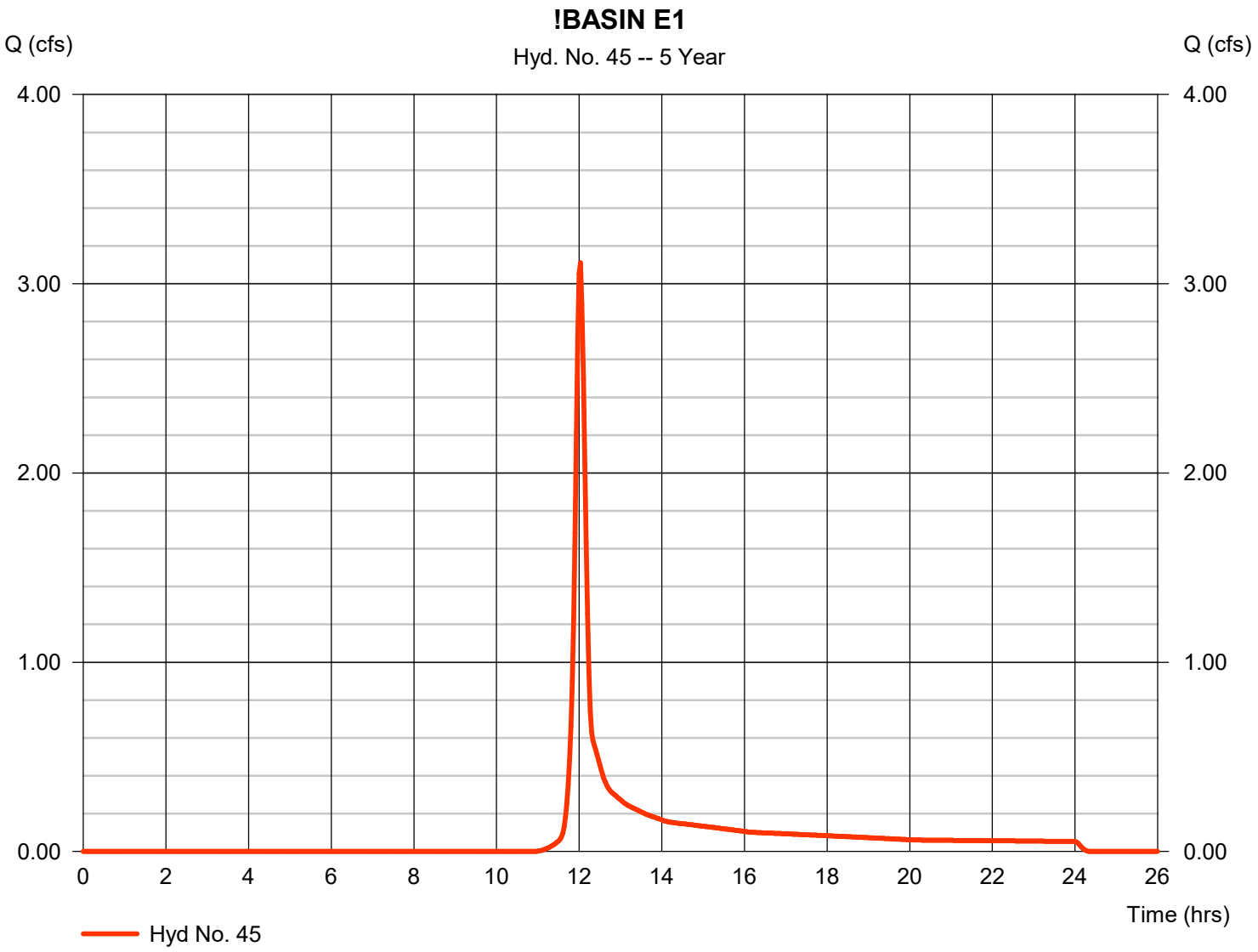
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 45

!BASIN E1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.111 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 8,342 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

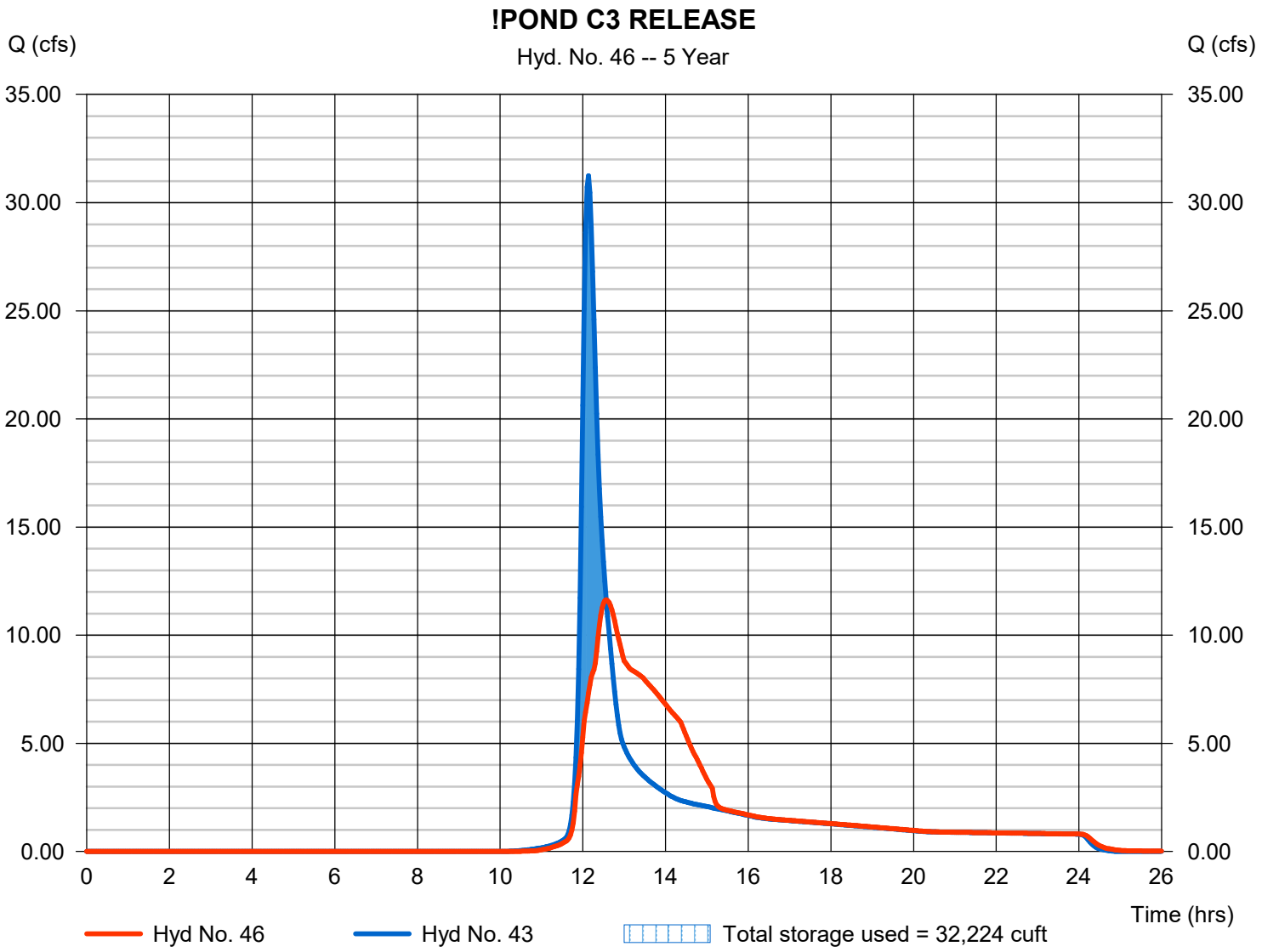
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 46

!POND C3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 11.63 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.57 hrs
Time interval	= 2 min	Hyd. volume	= 125,327 cuft
Inflow hyd. No.	= 43 - REACH TO POND C3	Max. Elevation	= 939.49 ft
Reservoir name	= POND C3	Max. Storage	= 32,224 cuft

Storage Indication method used.



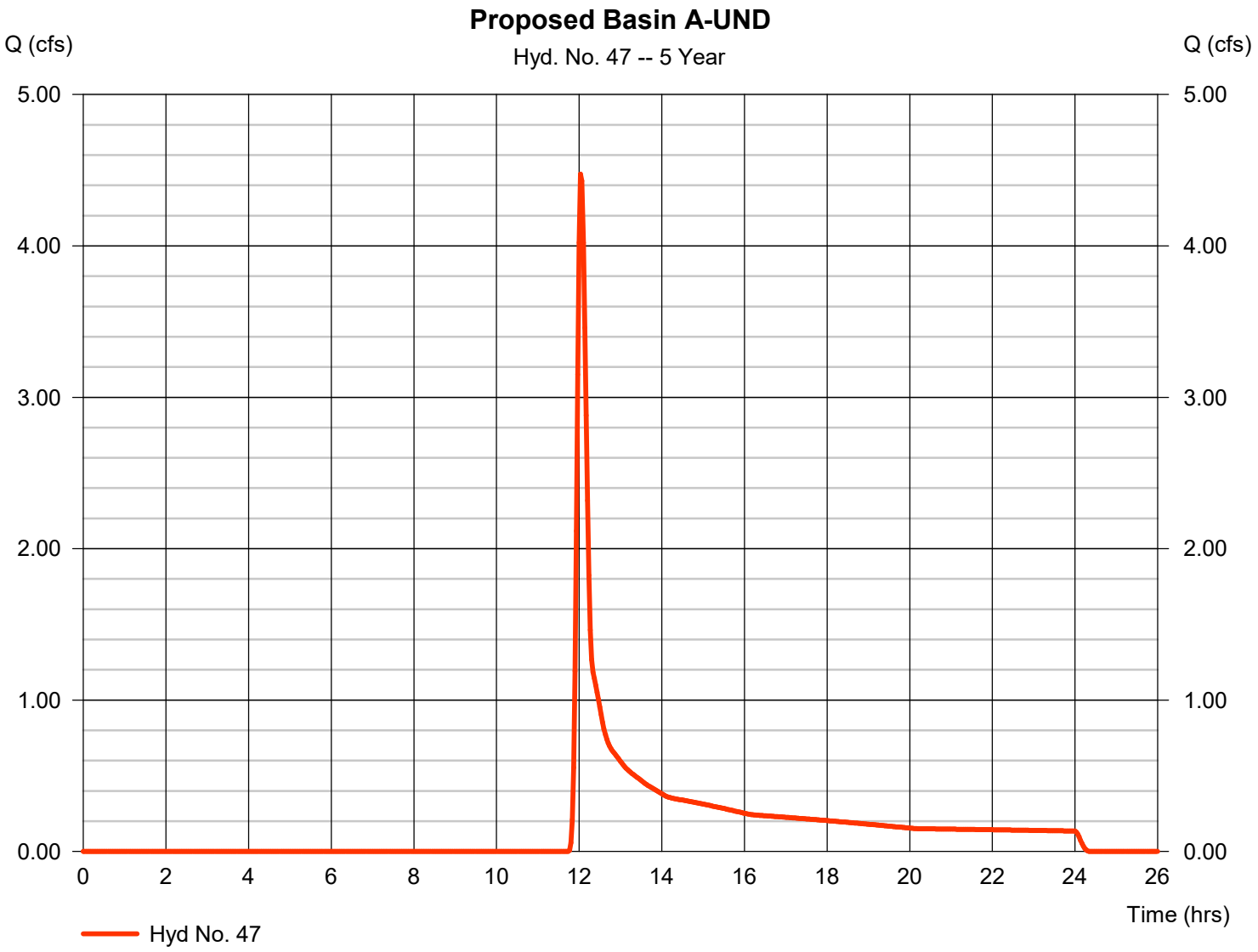
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 47

Proposed Basin A-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 4.474 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 15,502 cuft
Drainage area	= 7.130 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



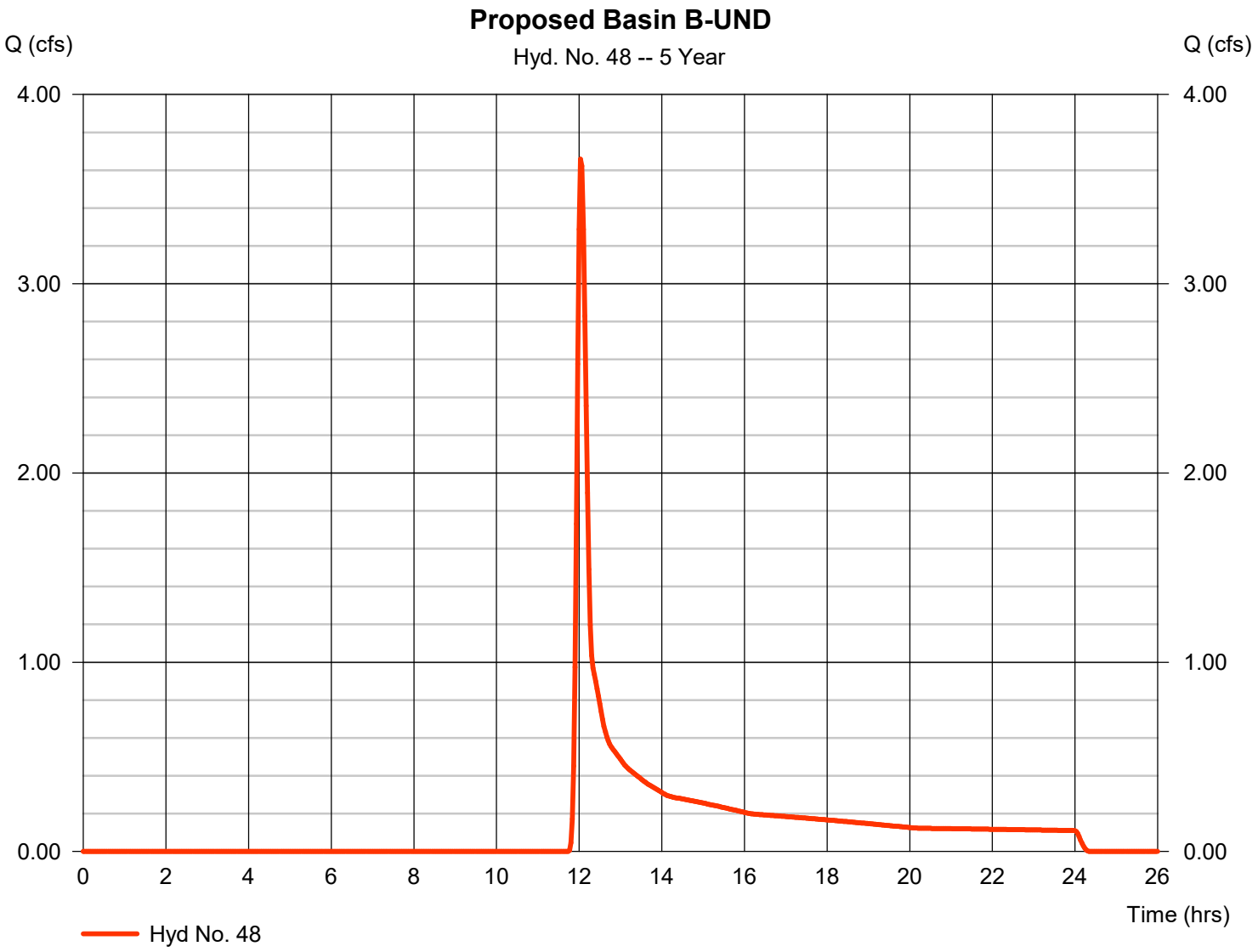
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 48

Proposed Basin B-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 3.658 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 12,675 cuft
Drainage area	= 5.830 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



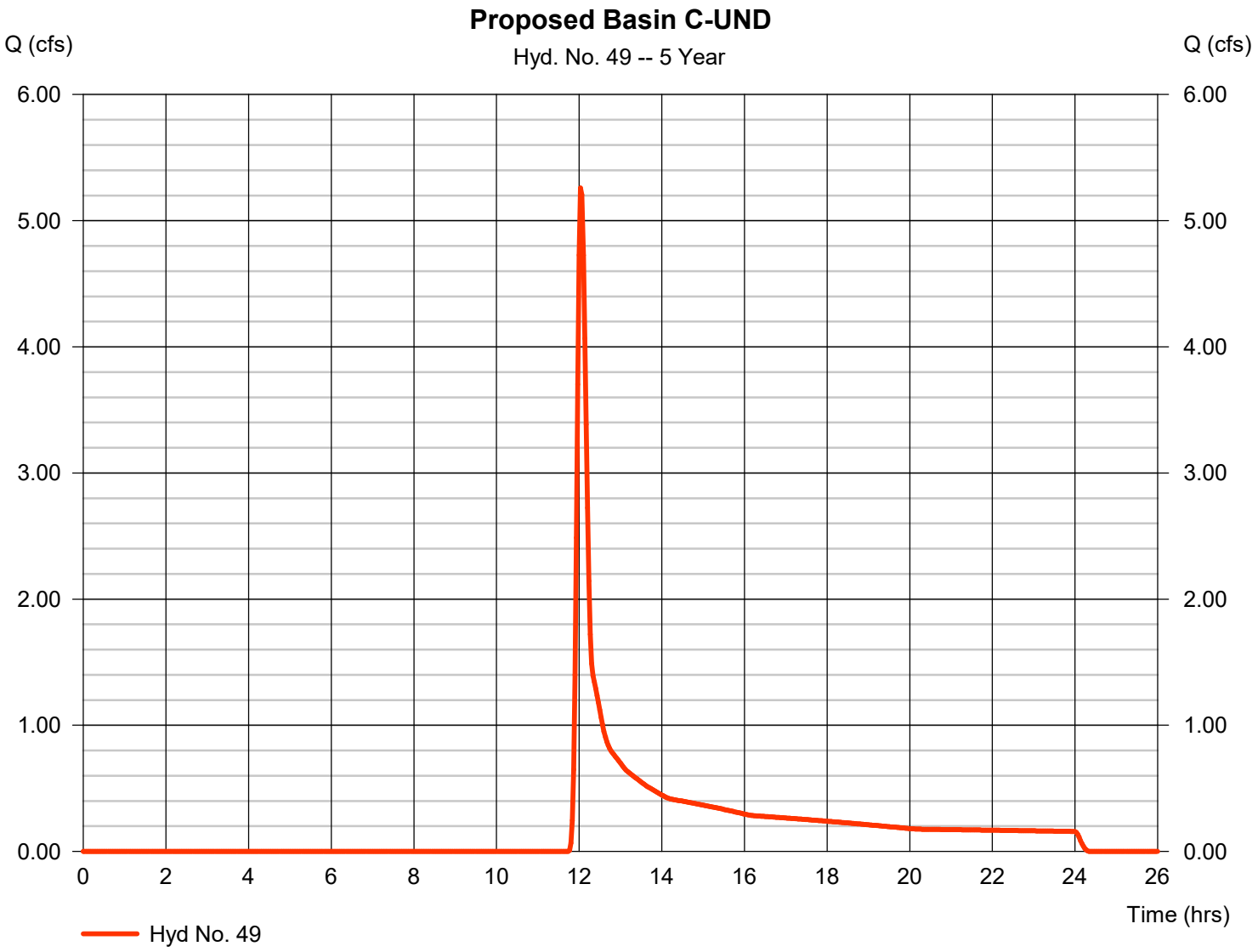
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 49

Proposed Basin C-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 5.258 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 18,219 cuft
Drainage area	= 8.380 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

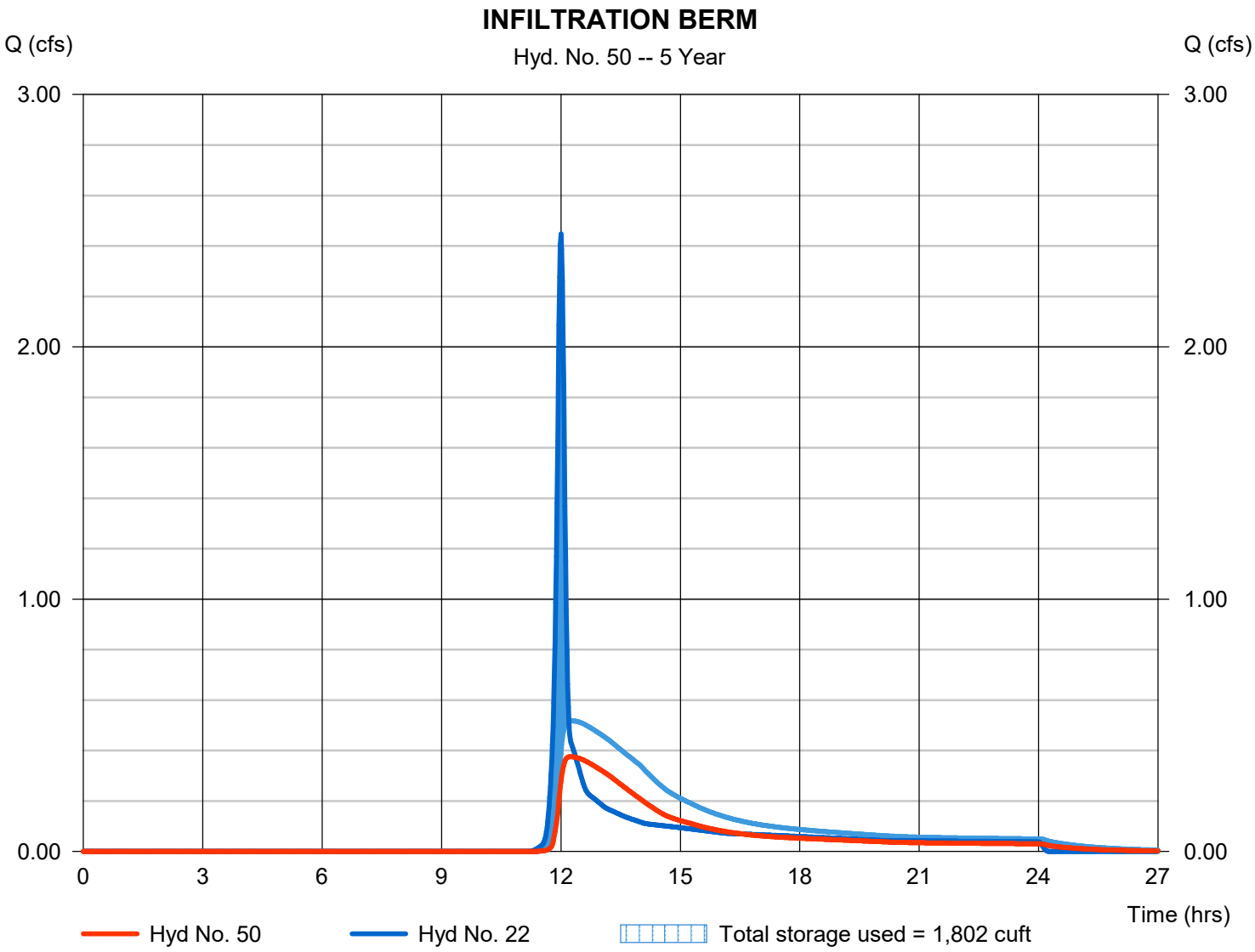
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 50

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 0.375 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.23 hrs
Time interval	= 1 min	Hyd. volume	= 4,657 cuft
Inflow hyd. No.	= 22 - PROPOSED BASIN B (LOTS 10-11)	Max. Elevation	= 946.43 ft
Reservoir name	= LOT 10 11	Max. Storage	= 1,802 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

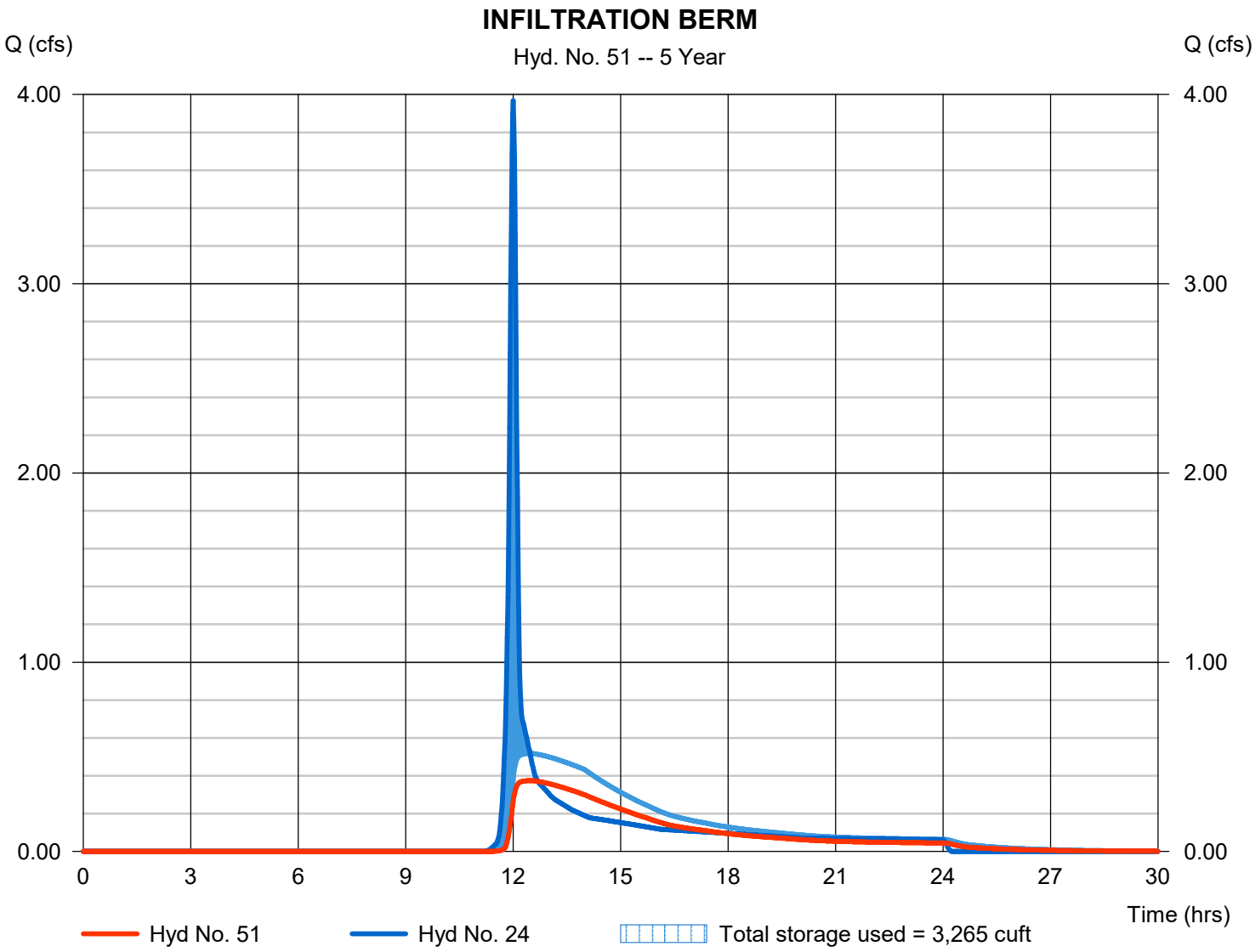
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 51

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 0.375 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.47 hrs
Time interval	= 1 min	Hyd. volume	= 6,601 cuft
Inflow hyd. No.	= 24 - PROPOSED BASIN B (LOTS 51-52)	Max. Elevation	= 941.43 ft
Reservoir name	= LOT 51 52	Max. Storage	= 3,265 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	406.78	2	860	7,522,774	------	------	------	Off-Site Basin B (upper)
2	SCS Runoff	13.13	2	724	41,089	------	------	------	Off-Site Basin C1
3	SCS Runoff	27.45	2	734	124,309	------	------	------	Off-Site Basin C2
4	SCS Runoff	173.35	2	782	1,797,958	------	------	------	Off-Site Basin B (lower)
5	Reservoir	137.35	2	820	1,500,308	4	957.17	463,124	Offsite Field Storage
6	SCS Runoff	42.94	2	748	264,192	------	------	------	EXISTING BASIN A
7	SCS Runoff	105.59	2	746	629,239	------	------	------	EXISTING BASIN B
8	SCS Runoff	45.88	2	740	245,861	------	------	------	EXISTING BASIN C
9	SCS Runoff	29.96	2	726	103,455	------	------	------	EXISTING BASIN D
10	SCS Runoff	13.13	2	716	26,791	------	------	------	EXISTING BASIN E
11	SCS Runoff	27.32	2	758	209,072	------	------	------	PROPOSED BASIN A
12	SCS Runoff	69.81	2	754	490,893	------	------	------	PROPOSED BASIN B
13	SCS Runoff	28.26	2	752	197,963	------	------	------	PROPOSED BASIN C
14	SCS Runoff	13.70	2	730	55,078	------	------	------	PROPOSED BASIN D
15	SCS Runoff	10.91	2	718	24,971	------	------	------	PROPOSED BASIN E
16	Reservoir	3.502	2	898	209,059	11	935.42	116,512	!POND A RELEASE
17	SCS Runoff	32.34	2	722	91,072	------	------	------	PROPOSED BASIN B1
18	SCS Runoff	31.10	2	736	142,394	------	------	------	PROPOSED BASIN B2
19	SCS Runoff	14.58	2	732	59,038	------	------	------	PROPOSED BASIN B3
20	SCS Runoff	18.11	2	724	56,945	------	------	------	PROPOSED BASIN B4
21	SCS Runoff	9.280	2	726	32,313	------	------	------	PROPOSED BASIN B5
22	SCS Runoff	8.162	1	719	18,462	------	------	------	PROPOSED BASIN B (LOTS 10-11)
23	SCS Runoff	4.506	2	722	12,634	------	------	------	PROPOSED BASIN B (LOTS 22-23)
24	SCS Runoff	13.23	1	719	29,921	------	------	------	PROPOSED BASIN B (LOTS 51-52)
25	SCS Runoff	6.529	2	728	24,322	------	------	------	PROPOSED BASIN B (UND TO DAM
26	Reservoir	10.38	2	736	86,153	17	938.74	35,289	!POND B1 RELEASE
27	Reservoir	13.57	2	760	137,801	18	941.89	45,904	POND B2 RELEASE
28	Diversion1	48.00	2	718	2,566,277	1	------	------	Pass Through 170th
29	Diversion2	358.78	2	860	4,956,494	1	------	------	Field Storage Volume
30	Reservoir	48.00	2	824	2,487,752	28	957.83	114,247	Offsite Field Storage
31	Combine	185.35	2	820	3,988,059	5, 30	------	------	Off-Site B Flow
32	Reach	185.26	2	824	3,988,046	31	------	------	REACH TO DAM
33	Reservoir	0.829	2	908	59,034	19	941.26	33,523	POND B3 RELEASE
34	SCS Runoff	11.36	2	726	39,791	------	------	------	PROPOSED BASIN C1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
35	Combine	24.28	2	726	80,879	2, 34	------	------	FLOW TO POND C1
36	Combine	27.26	2	726	89,258	20, 21,	------	------	COMBINE B4 B5
37	Reach	24.81	2	730	89,255	36	------	------	REACH TO DAM
38	Combine	195.69	2	822	4,252,055	23, 25, 27, 32, 37	------	------	TOTAL FLOW TO DAM
39	Reservoir	194.31	2	832	4,093,896	38	943.76	296,169	!DAM RELEASE
40	SCS Runoff	18.68	2	720	48,534	------	------	------	BASIN C2
41	SCS Runoff	47.97	2	722	135,090	------	------	------	BASIN C3
42	Combine	109.07	2	724	388,812	3, 35, 40, 41	------	------	TOTAL FLOW TO POND C3
43	Reach	108.52	2	726	388,810	42	------	------	REACH TO POND C3
44	SCS Runoff	21.90	2	720	56,799	------	------	------	!BASIN D1
45	SCS Runoff	9.933	2	720	25,751	------	------	------	!BASIN E1
46	Reservoir	47.14	2	744	388,808	43	941.49	100,913	!POND C3 RELEASE
47	SCS Runoff	25.09	2	722	66,490	------	------	------	Proposed Basin A-UND
48	SCS Runoff	20.51	2	722	54,367	------	------	------	Proposed Basin B-UND
49	SCS Runoff	29.49	2	722	78,147	------	------	------	Proposed Basin C-UND
50	Reservoir	8.081	1	720	16,431	22	946.56	1,985	INFILTRATION BERM
51	Reservoir	13.08	1	720	25,027	24	941.55	3,588	INFILTRATION BERM

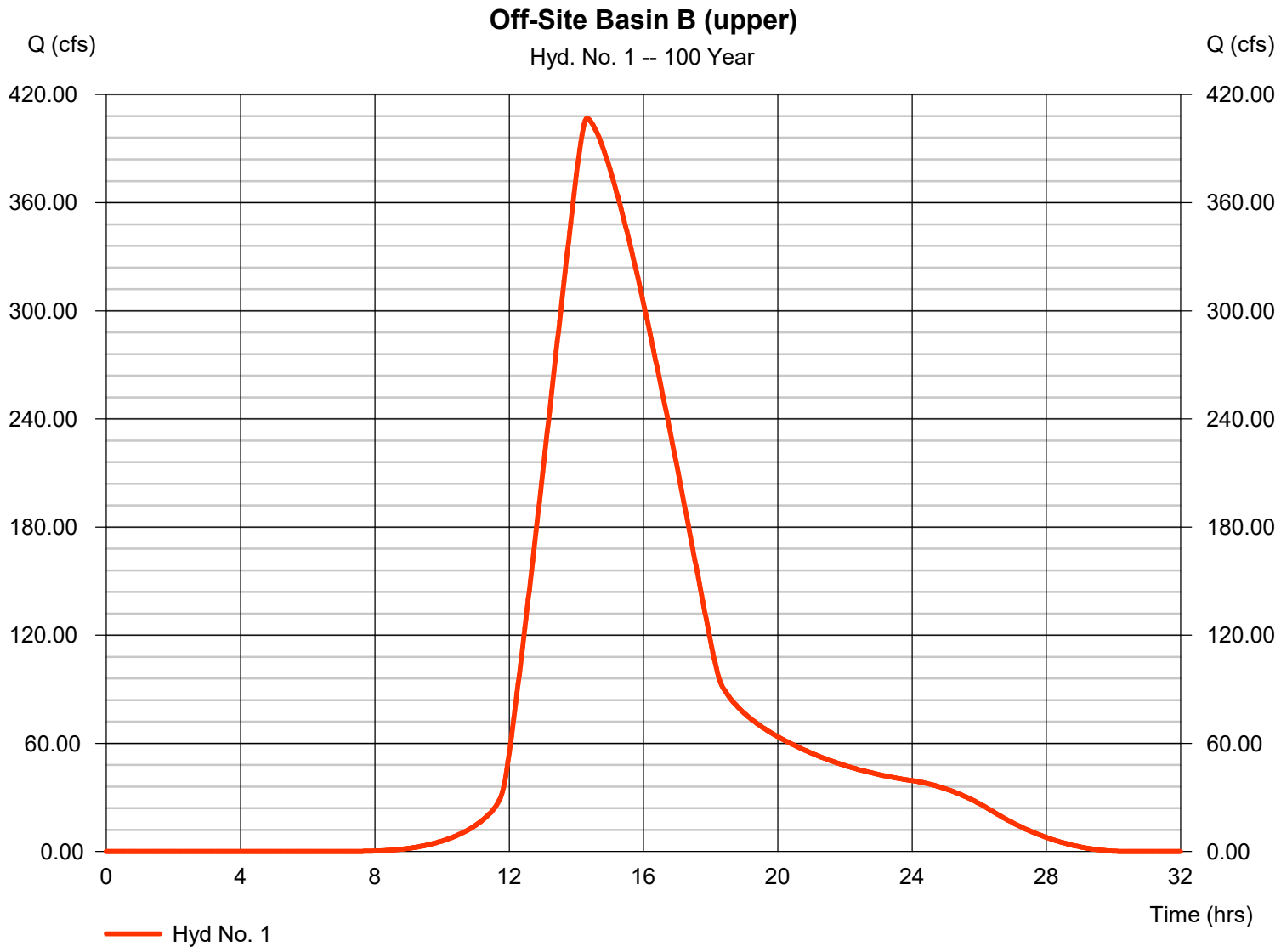
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 1

Off-Site Basin B (upper)

Hydrograph type	= SCS Runoff	Peak discharge	= 406.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 14.33 hrs
Time interval	= 2 min	Hyd. volume	= 7,522,774 cuft
Drainage area	= 487.010 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 8797 ft
Tc method	= LAG	Time of conc. (Tc)	= 243.10 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



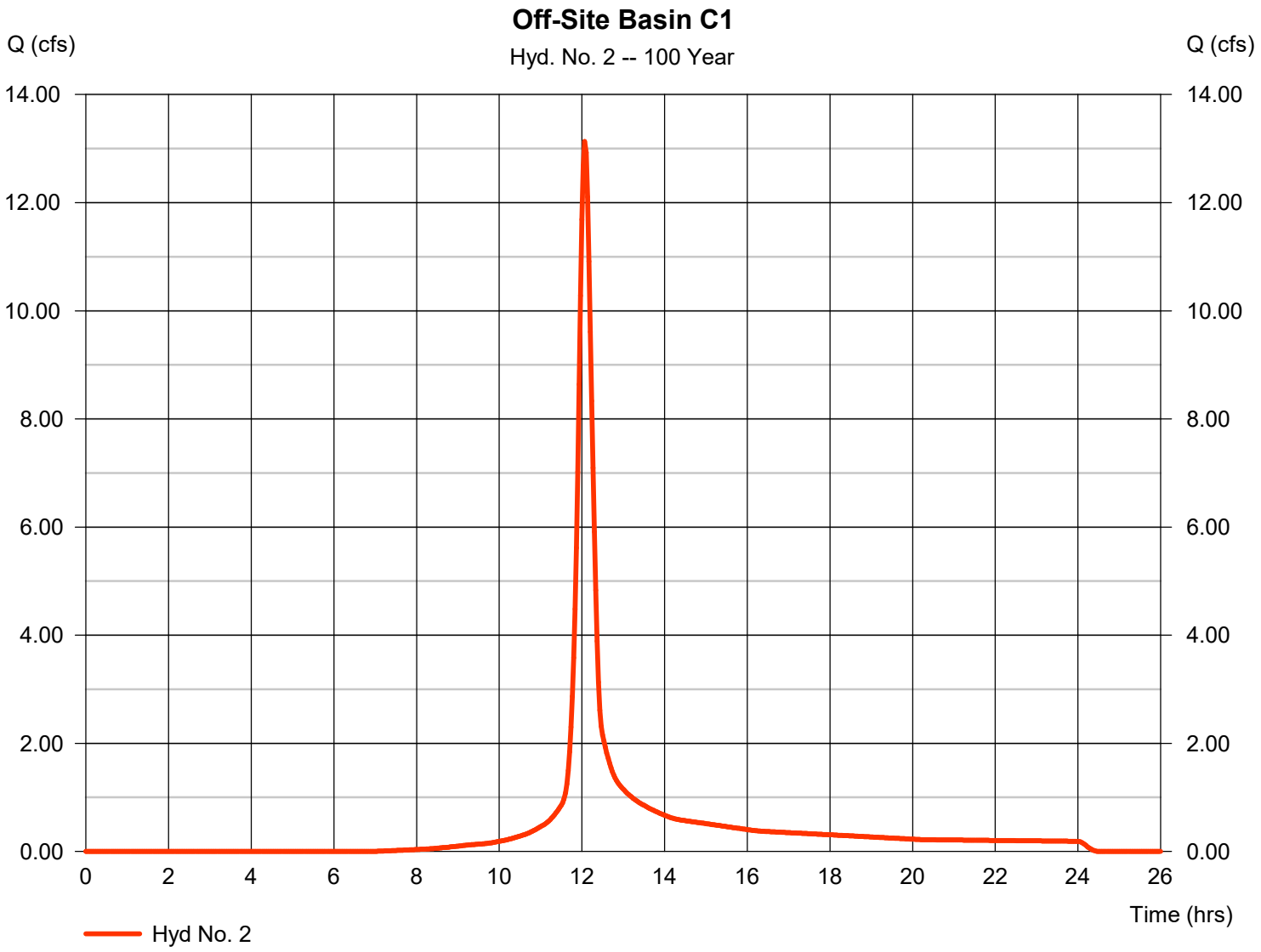
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 2

Off-Site Basin C1

Hydrograph type	= SCS Runoff	Peak discharge	= 13.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 41,089 cuft
Drainage area	= 2.660 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 392 ft
Tc method	= LAG	Time of conc. (Tc)	= 20.10 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



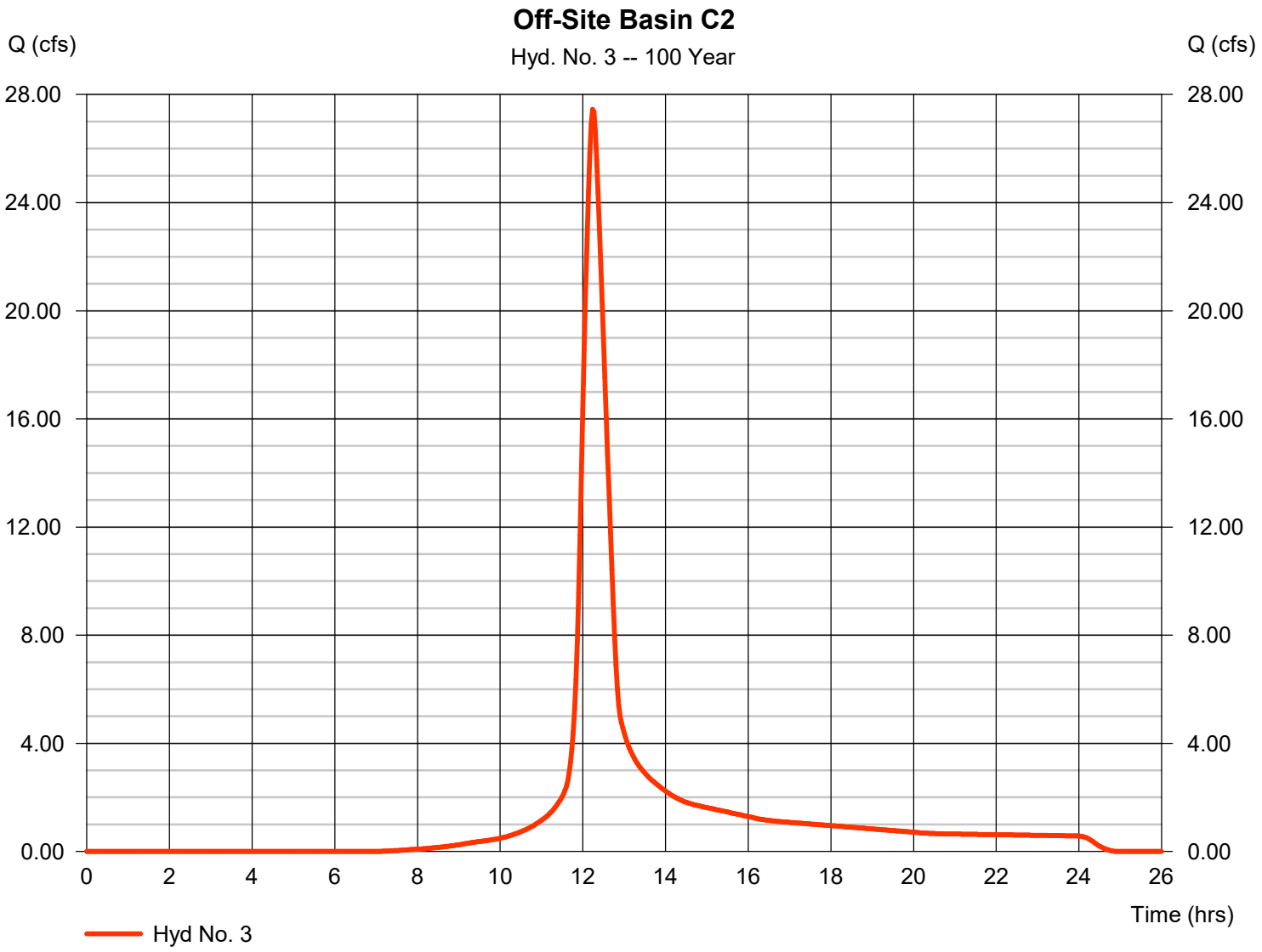
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 3

Off-Site Basin C2

Hydrograph type	= SCS Runoff	Peak discharge	= 27.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 124,309 cuft
Drainage area	= 8.140 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 820 ft
Tc method	= LAG	Time of conc. (Tc)	= 36.40 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



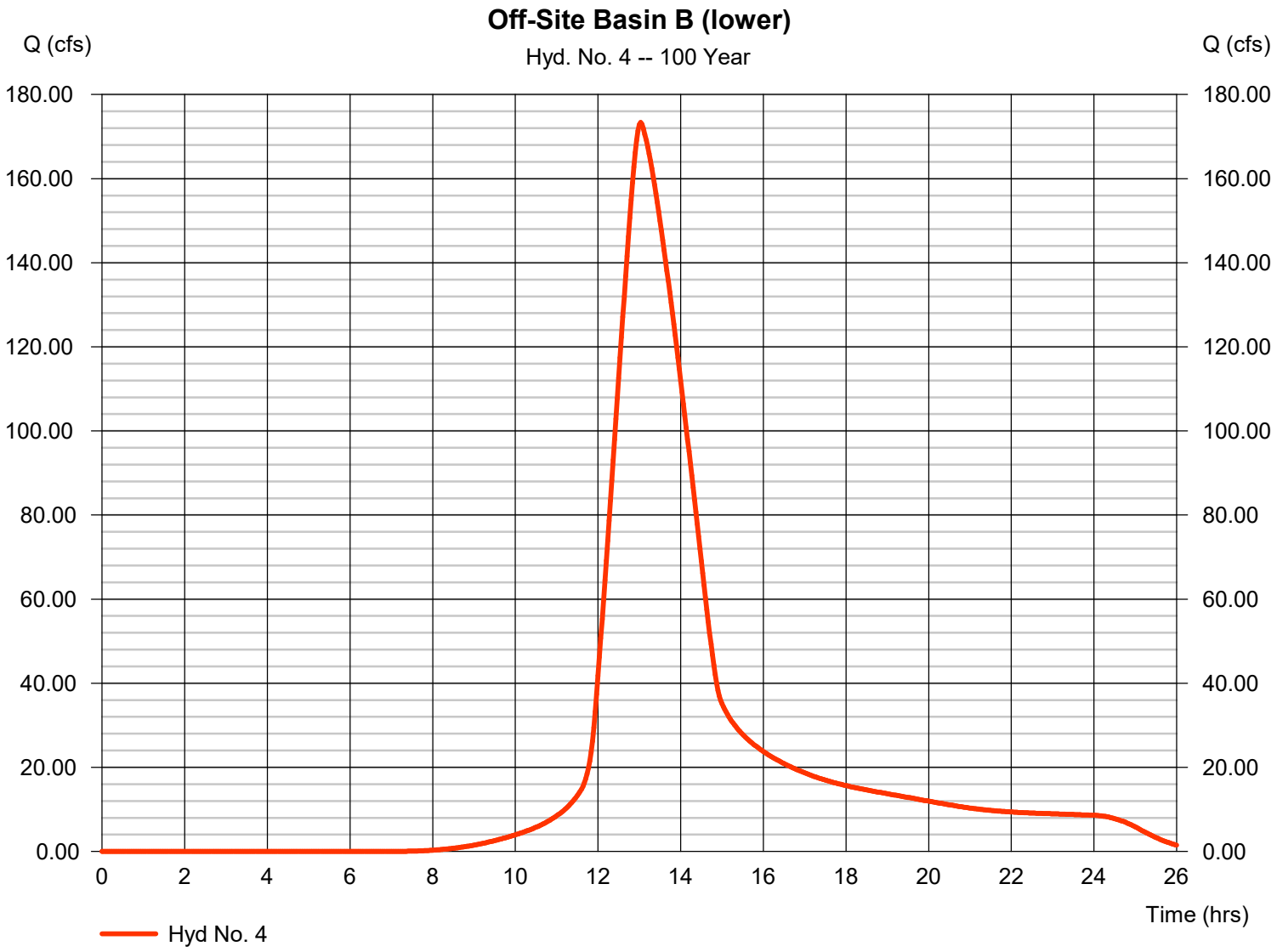
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 4

Off-Site Basin B (lower)

Hydrograph type	= SCS Runoff	Peak discharge	= 173.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,797,958 cuft
Drainage area	= 115.970 ac	Curve number	= 75
Basin Slope	= 0.8 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 113.60 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

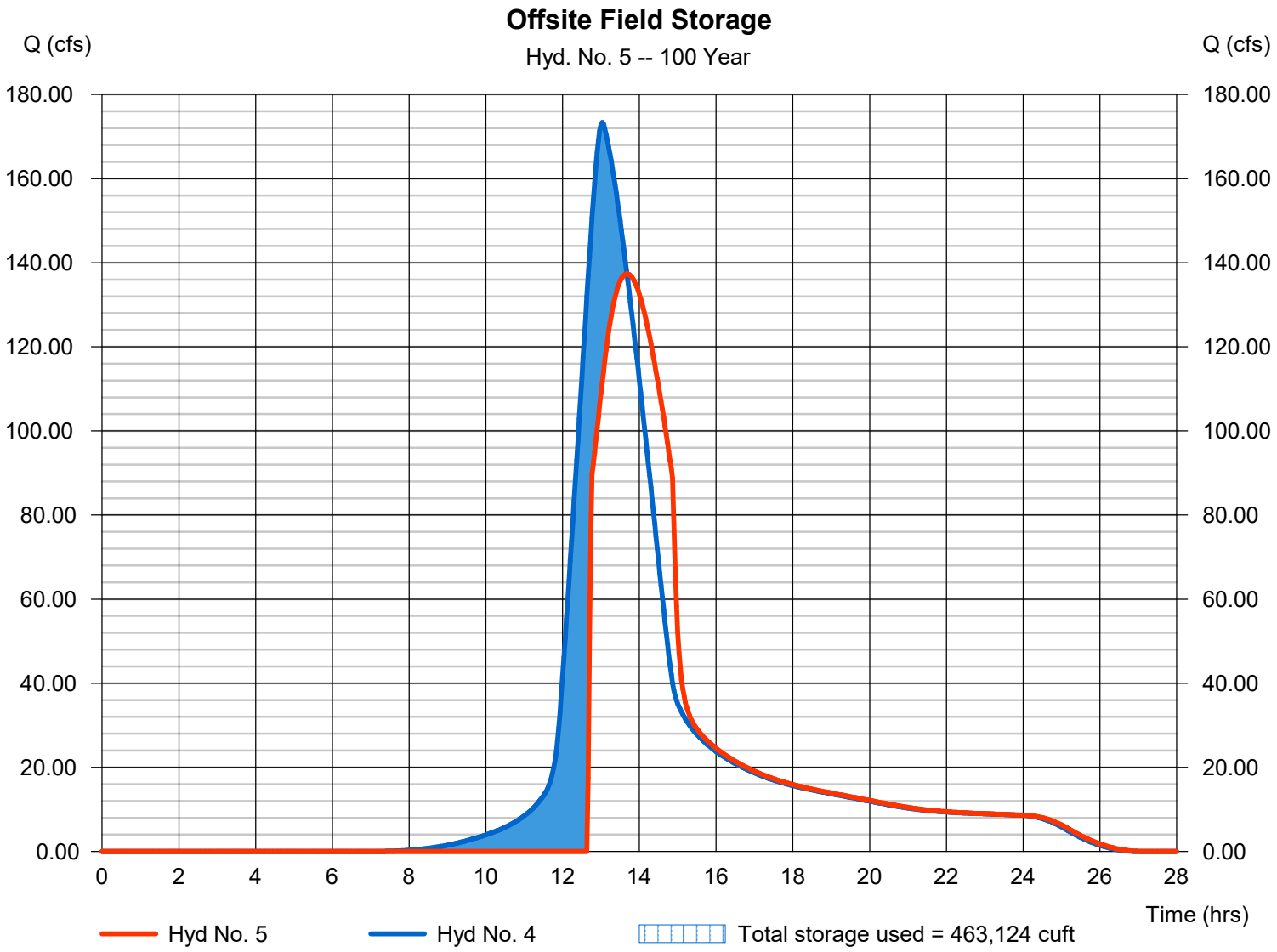
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 5

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 137.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.67 hrs
Time interval	= 2 min	Hyd. volume	= 1,500,308 cuft
Inflow hyd. No.	= 4 - Off-Site Basin B (lower)	Max. Elevation	= 957.17 ft
Reservoir name	= Offsite Field Storage LOWER	Max. Storage	= 463,124 cuft

Storage Indication method used.



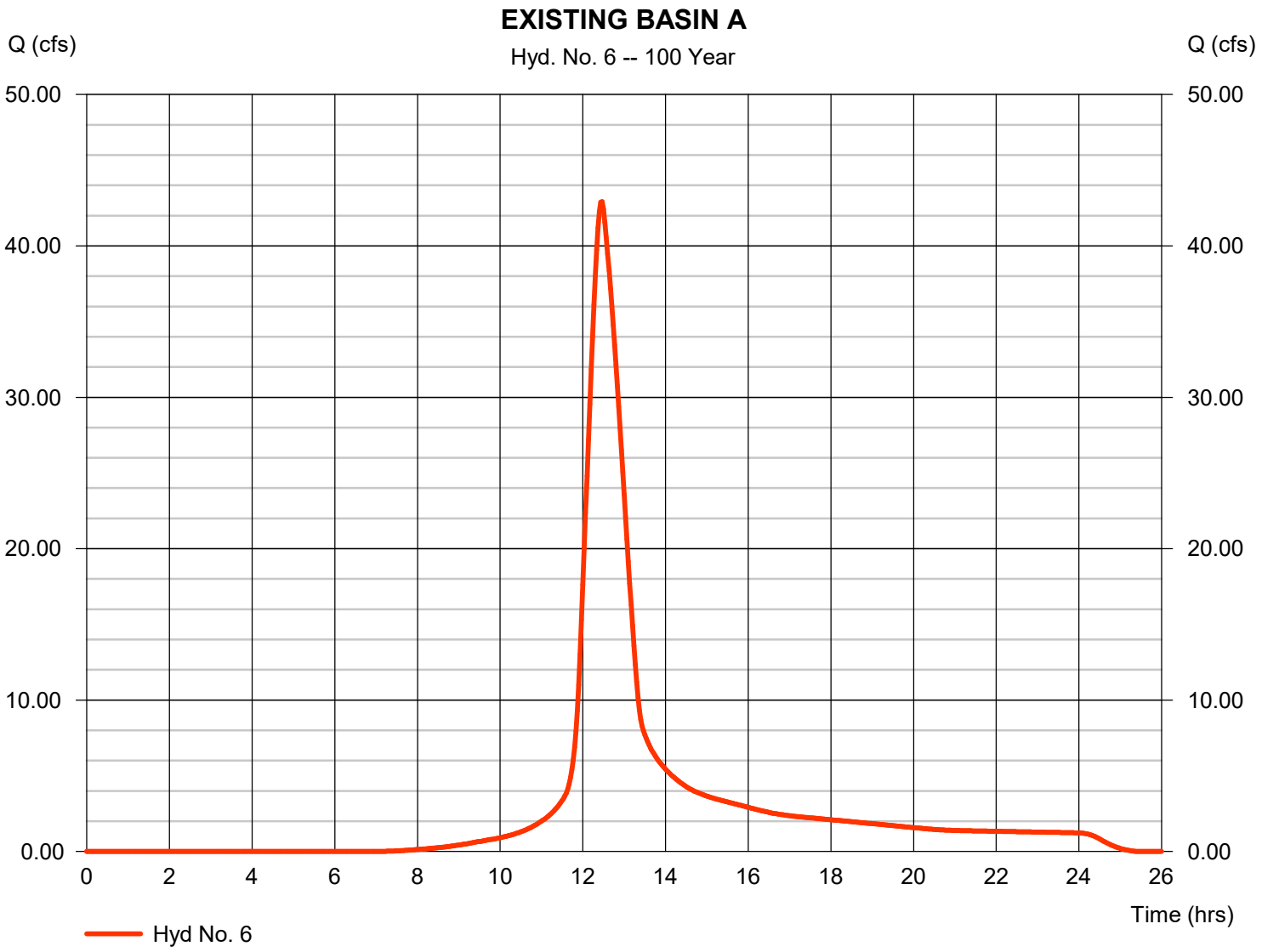
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 6

EXISTING BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 42.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 264,192 cuft
Drainage area	= 17.230 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 57.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



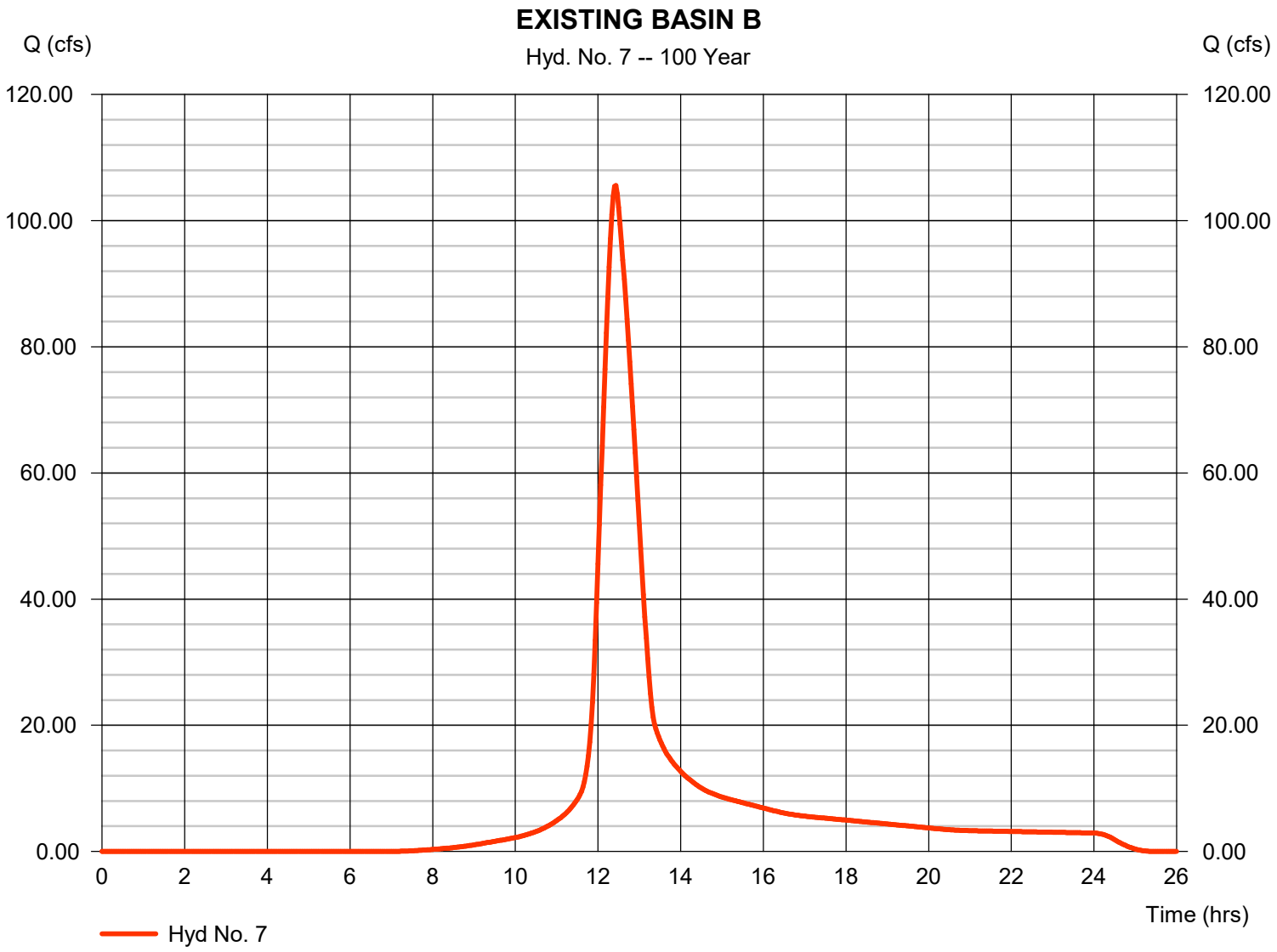
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 7

EXISTING BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 105.59 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 629,239 cuft
Drainage area	= 40.420 ac	Curve number	= 75
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 53.40 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



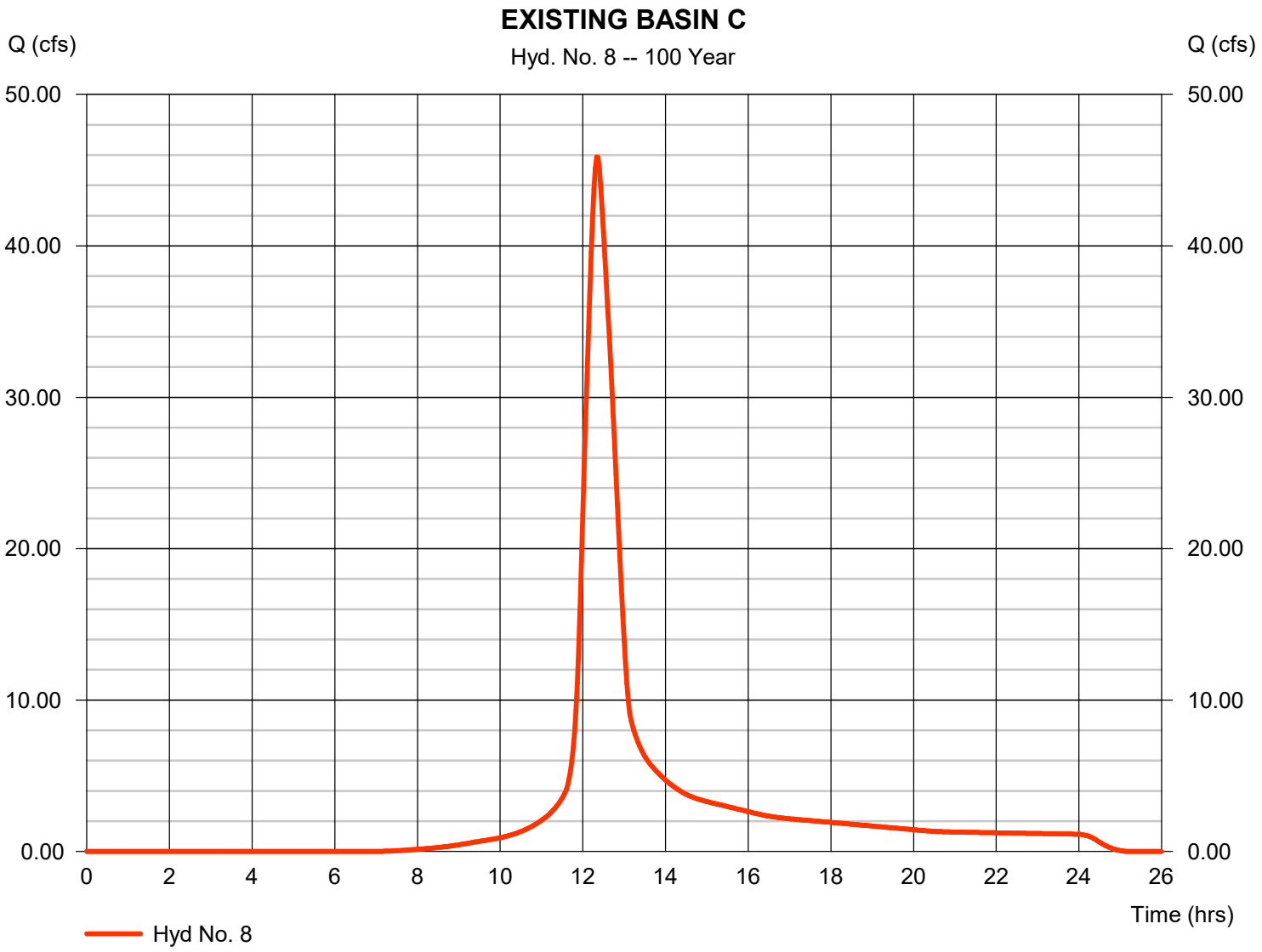
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 8

EXISTING BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 45.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 245,861 cuft
Drainage area	= 16.060 ac	Curve number	= 75
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 44.10 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



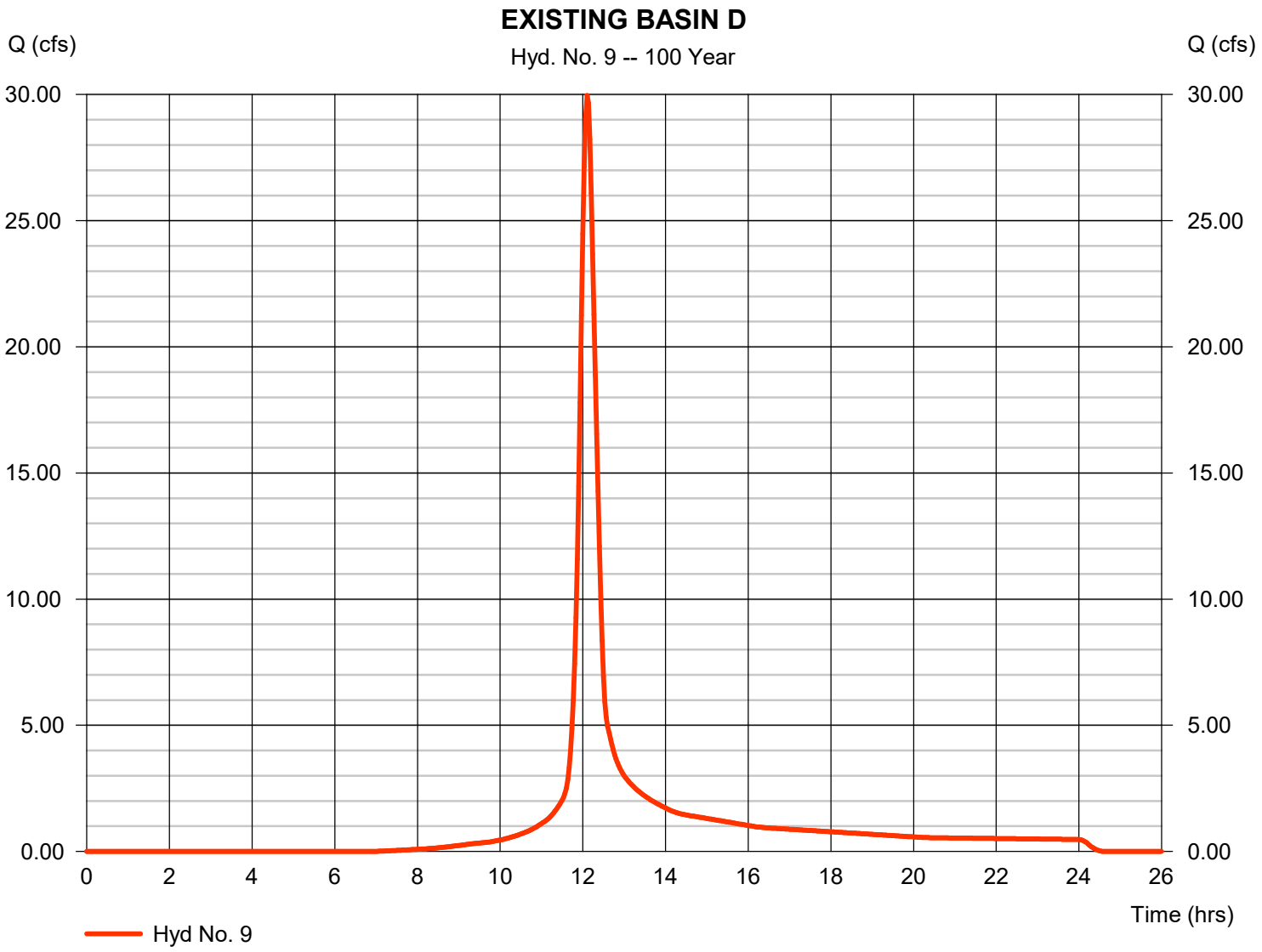
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 9

EXISTING BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 29.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 103,455 cuft
Drainage area	= 6.580 ac	Curve number	= 75
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.40 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



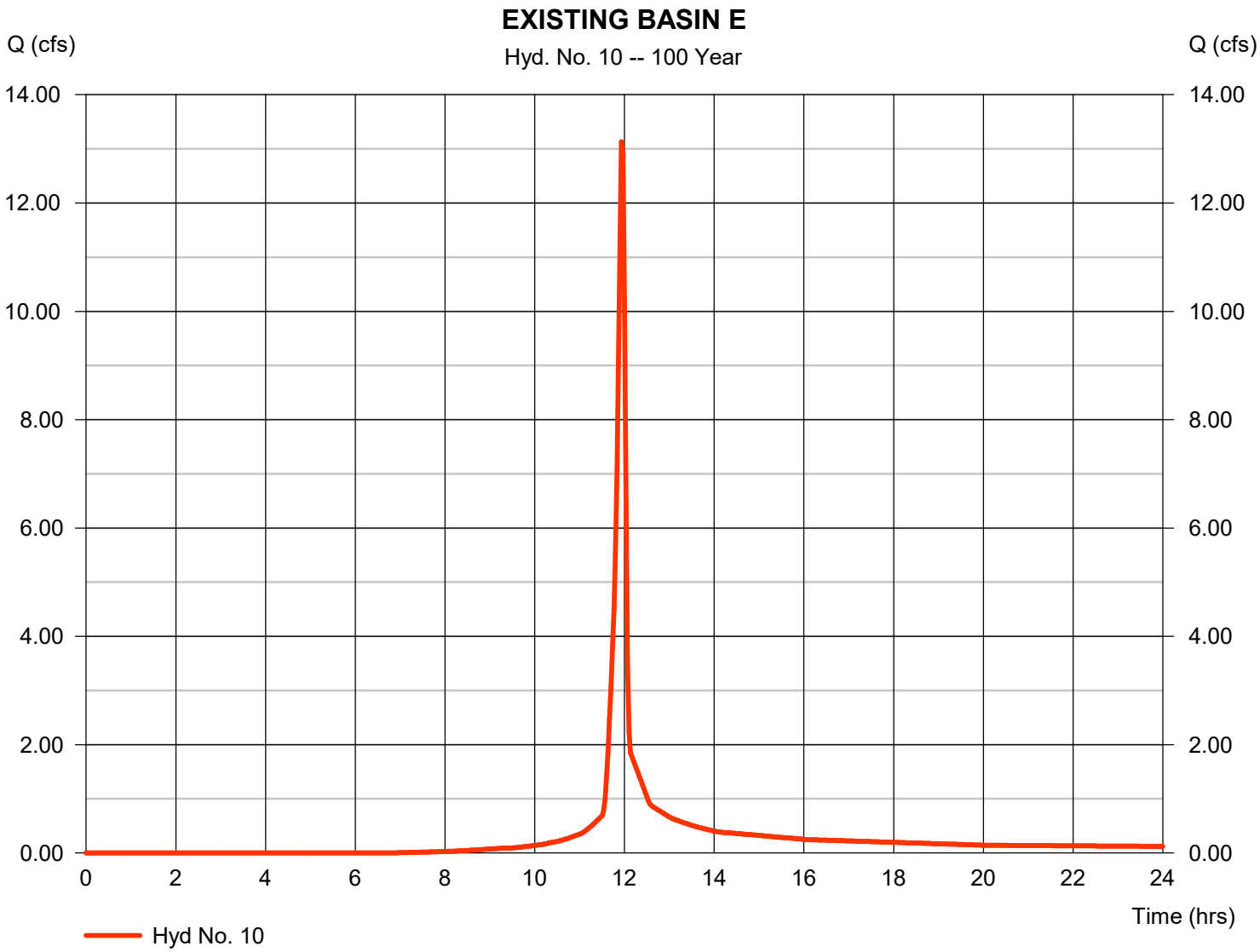
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 10

EXISTING BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 13.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 26,791 cuft
Drainage area	= 1.850 ac	Curve number	= 75
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 6.20 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



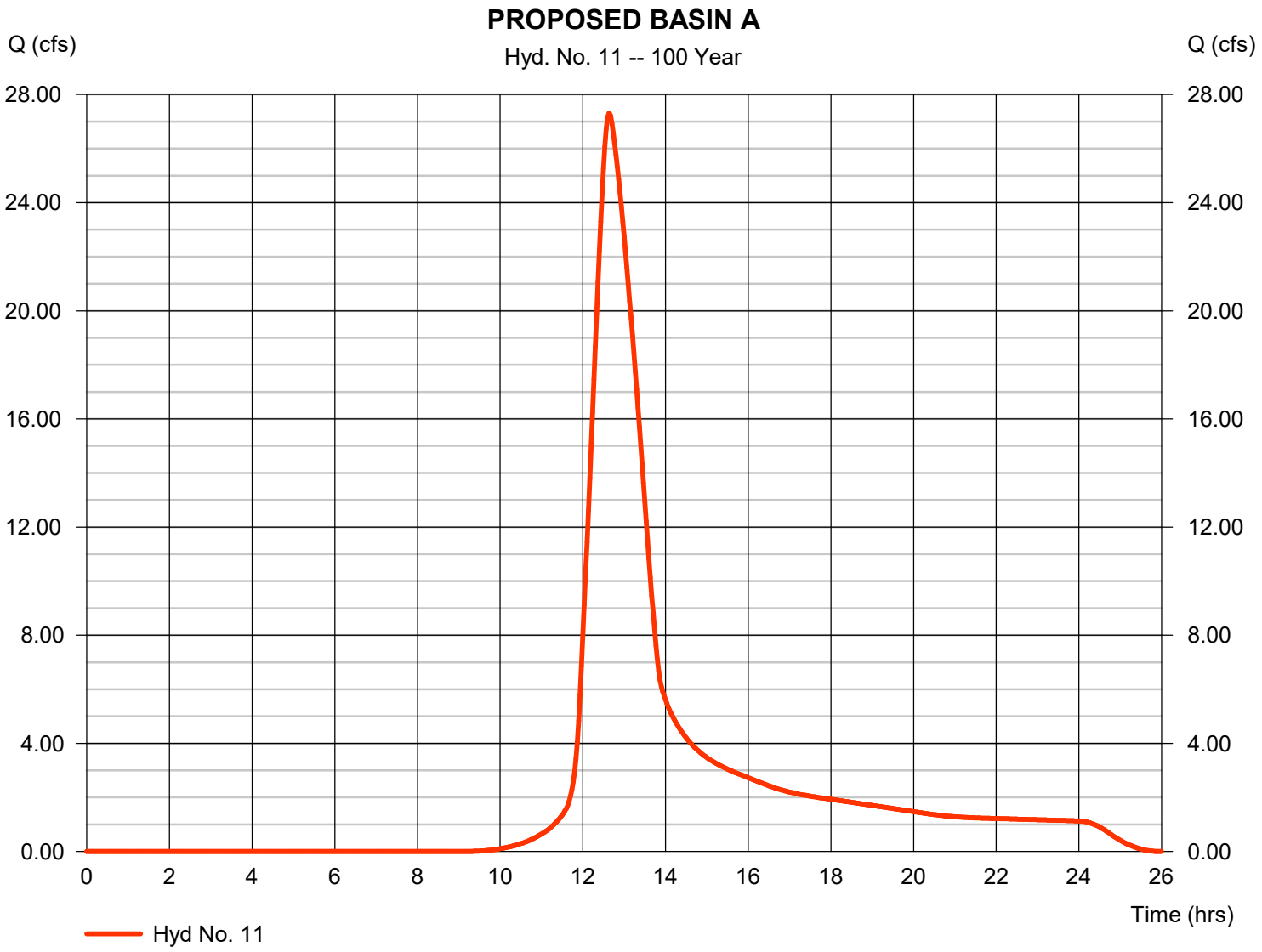
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 11

PROPOSED BASIN A

Hydrograph type	= SCS Runoff	Peak discharge	= 27.32 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 209,072 cuft
Drainage area	= 17.360 ac	Curve number	= 66
Basin Slope	= 1.8 %	Hydraulic length	= 2500 ft
Tc method	= LAG	Time of conc. (Tc)	= 72.80 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



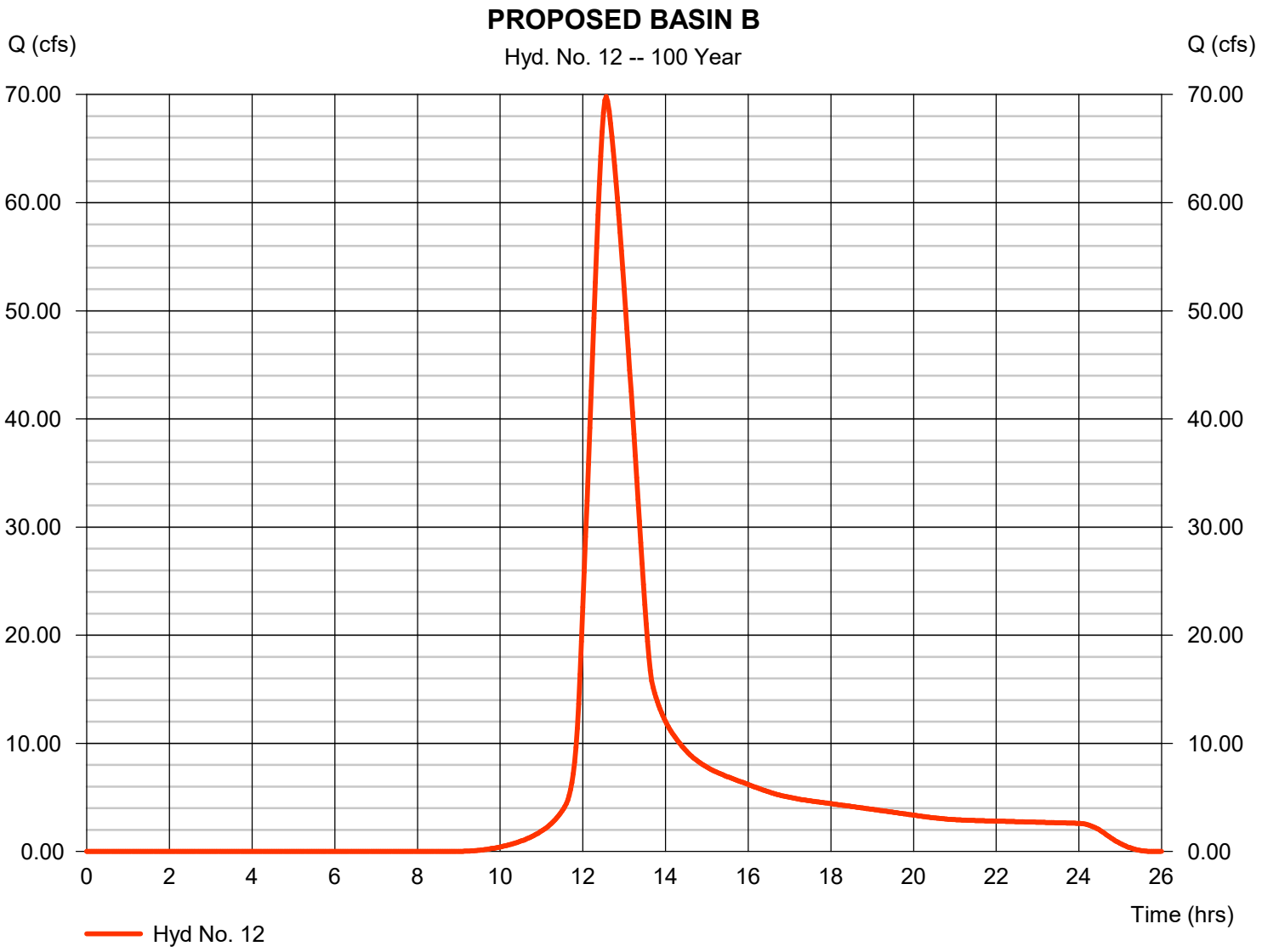
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 12

PROPOSED BASIN B

Hydrograph type	= SCS Runoff	Peak discharge	= 69.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.57 hrs
Time interval	= 2 min	Hyd. volume	= 490,893 cuft
Drainage area	= 39.990 ac	Curve number	= 67
Basin Slope	= 1.1 %	Hydraulic length	= 1712 ft
Tc method	= LAG	Time of conc. (Tc)	= 66.50 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



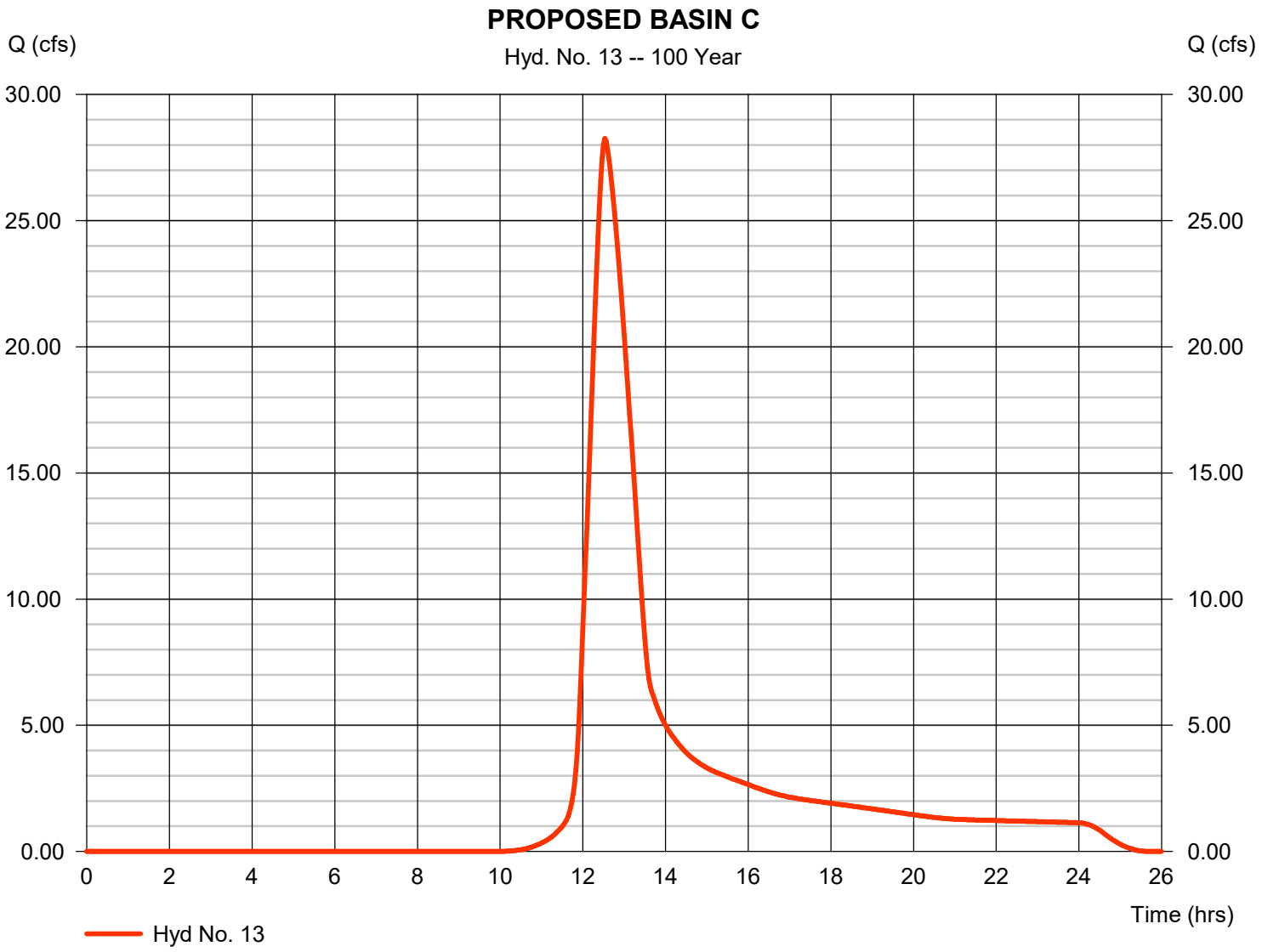
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 13

PROPOSED BASIN C

Hydrograph type	= SCS Runoff	Peak discharge	= 28.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 197,963 cuft
Drainage area	= 18.750 ac	Curve number	= 62
Basin Slope	= 1.8 %	Hydraulic length	= 1825 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.40 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



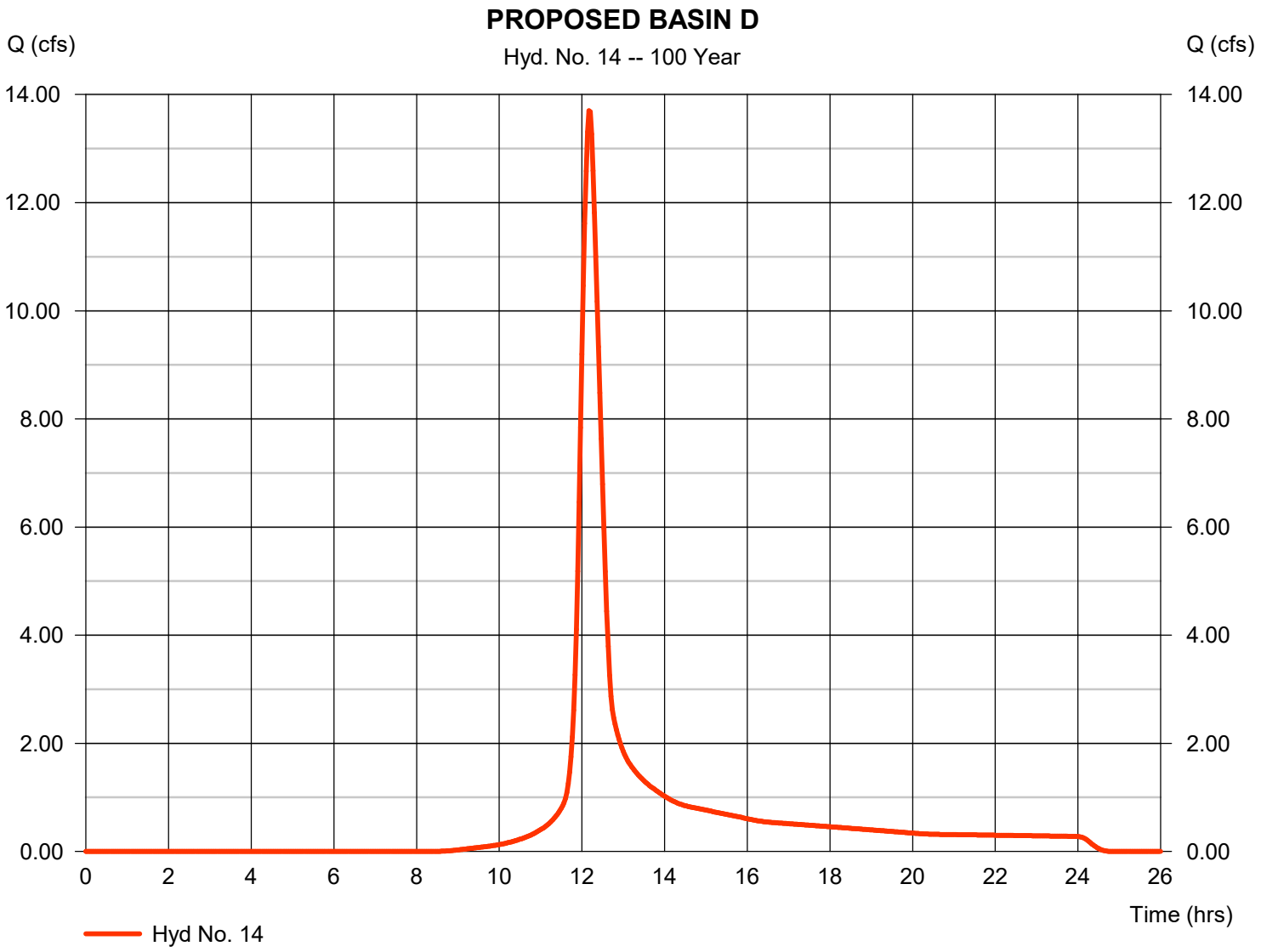
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 14

PROPOSED BASIN D

Hydrograph type	= SCS Runoff	Peak discharge	= 13.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 55,078 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 2.4 %	Hydraulic length	= 970 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.60 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



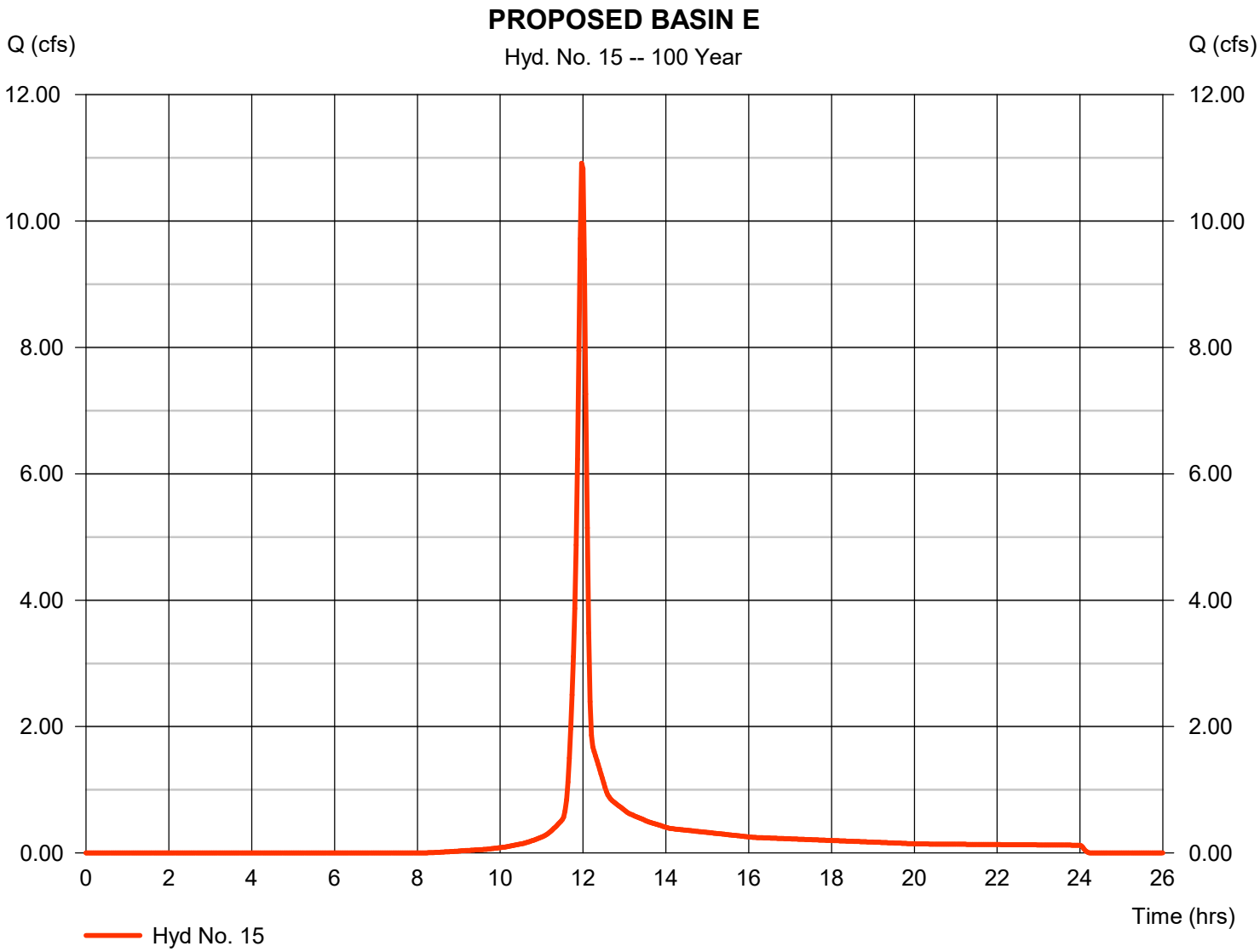
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 15

PROPOSED BASIN E

Hydrograph type	= SCS Runoff	Peak discharge	= 10.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 24,971 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 2.1 %	Hydraulic length	= 175 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.20 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

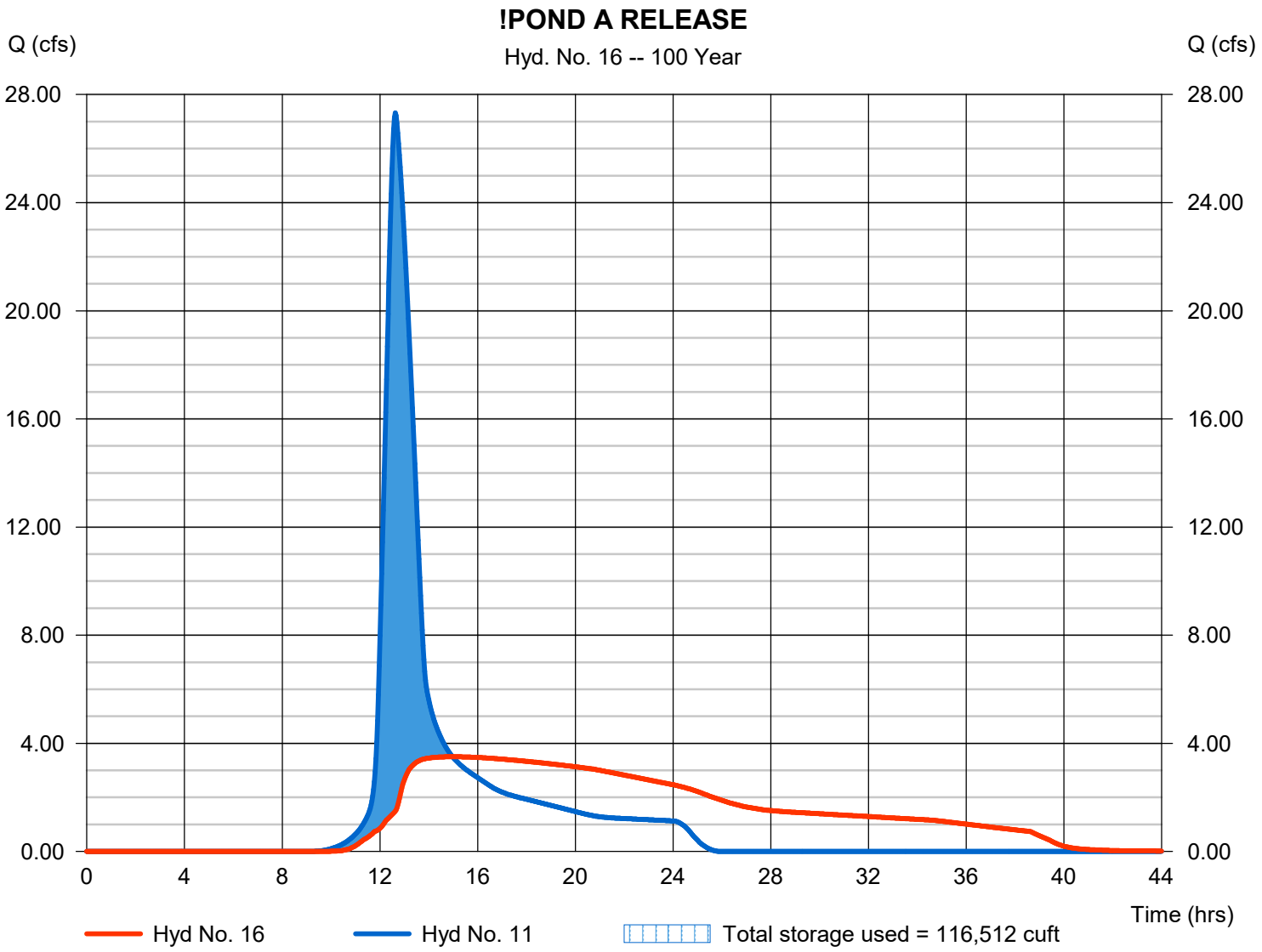
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 16

!POND A RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 3.502 cfs
Storm frequency	= 100 yrs	Time to peak	= 14.97 hrs
Time interval	= 2 min	Hyd. volume	= 209,059 cuft
Inflow hyd. No.	= 11 - PROPOSED BASIN A	Max. Elevation	= 935.42 ft
Reservoir name	= POND A	Max. Storage	= 116,512 cuft

Storage Indication method used.



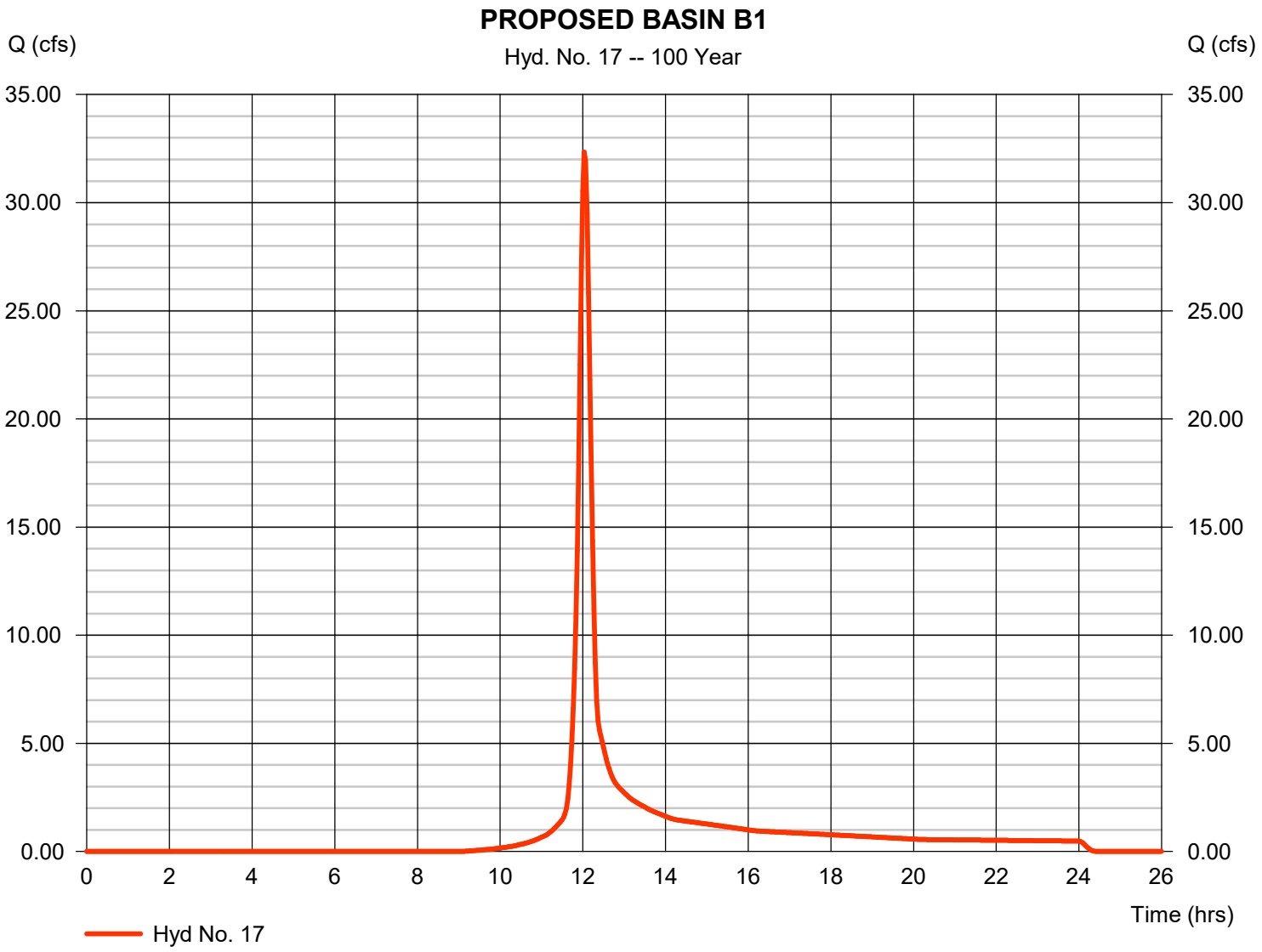
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 17

PROPOSED BASIN B1

Hydrograph type	= SCS Runoff	Peak discharge	= 32.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 91,072 cuft
Drainage area	= 7.800 ac	Curve number	= 66
Basin Slope	= 6.5 %	Hydraulic length	= 760 ft
Tc method	= LAG	Time of conc. (Tc)	= 14.80 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



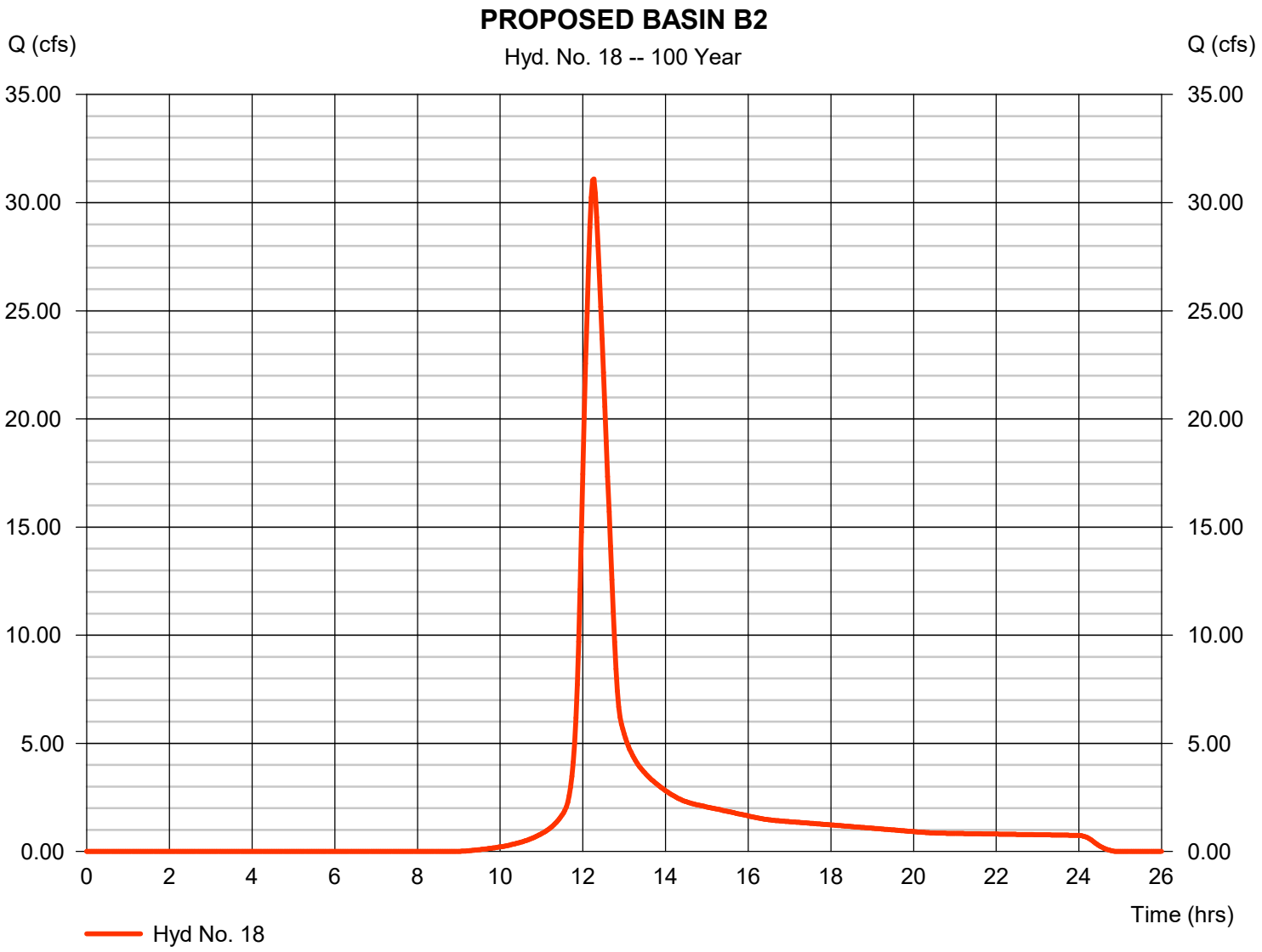
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 18

PROPOSED BASIN B2

Hydrograph type	= SCS Runoff	Peak discharge	= 31.10 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 142,394 cuft
Drainage area	= 11.660 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 1500 ft
Tc method	= LAG	Time of conc. (Tc)	= 34.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



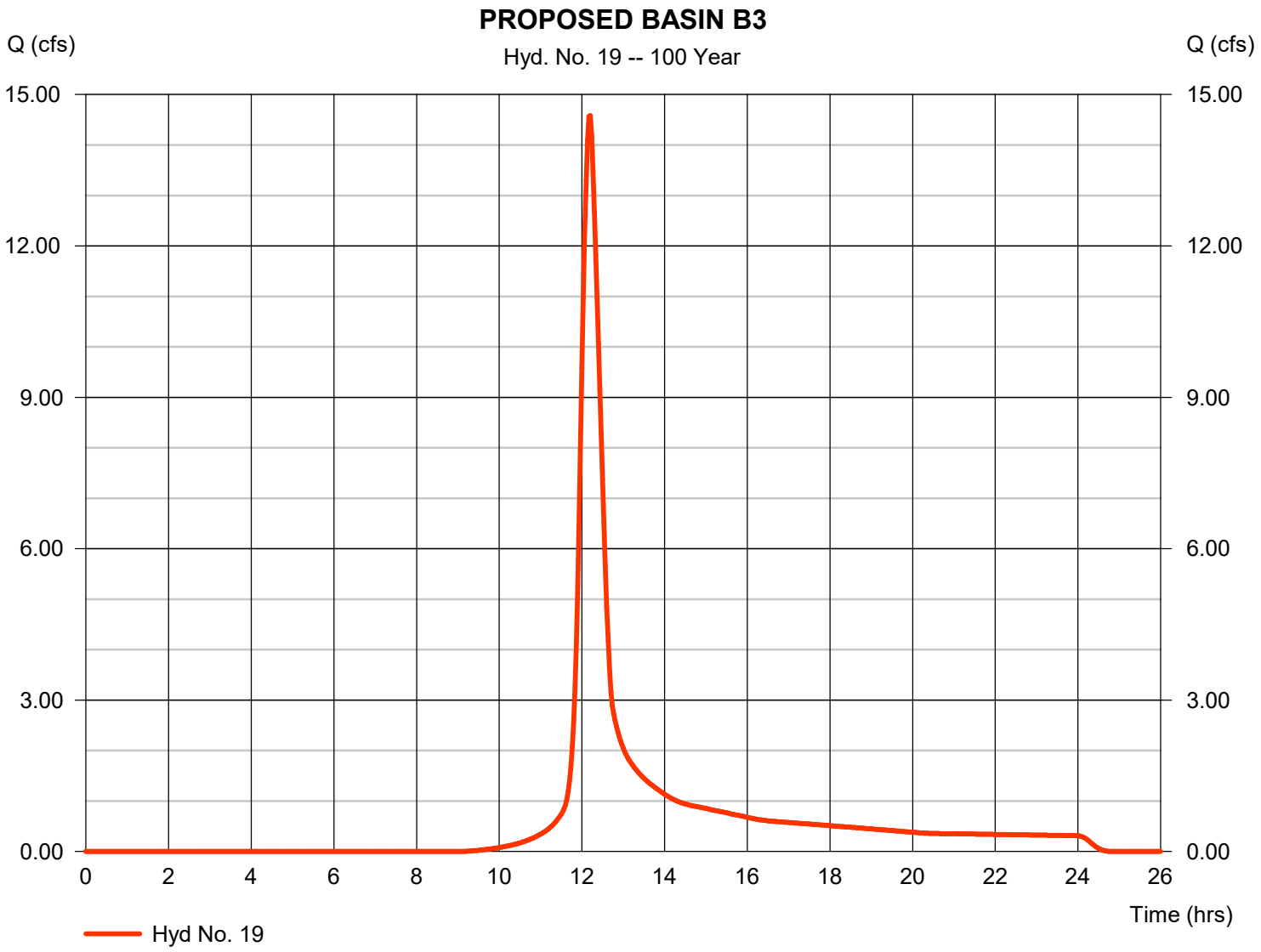
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 19

PROPOSED BASIN B3

Hydrograph type	= SCS Runoff	Peak discharge	= 14.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 59,038 cuft
Drainage area	= 4.930 ac	Curve number	= 66
Basin Slope	= 2.7 %	Hydraulic length	= 950 ft
Tc method	= LAG	Time of conc. (Tc)	= 27.30 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



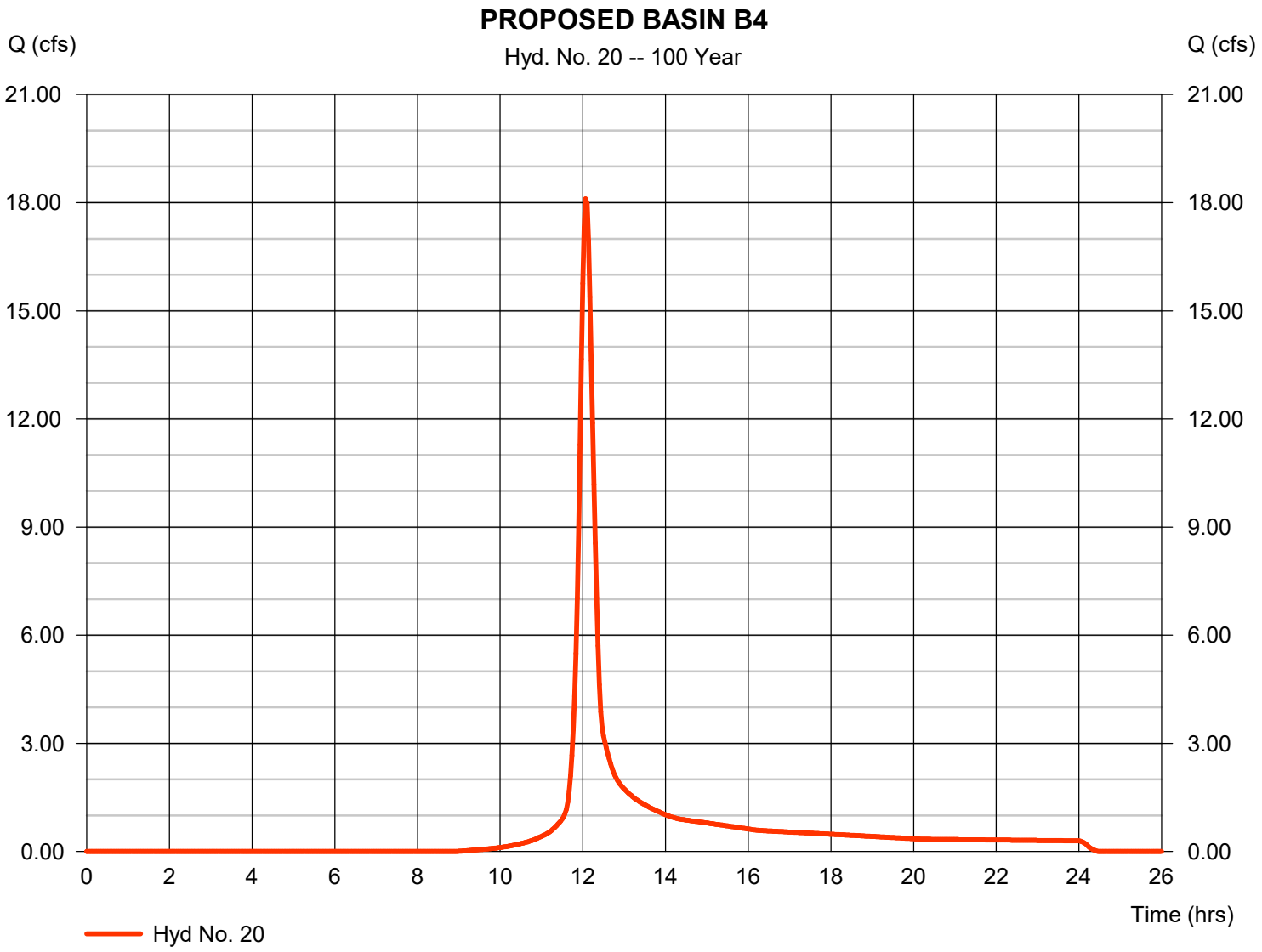
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 20

PROPOSED BASIN B4

Hydrograph type	= SCS Runoff	Peak discharge	= 18.11 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 56,945 cuft
Drainage area	= 4.610 ac	Curve number	= 67
Basin Slope	= 4.1 %	Hydraulic length	= 780 ft
Tc method	= LAG	Time of conc. (Tc)	= 18.60 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



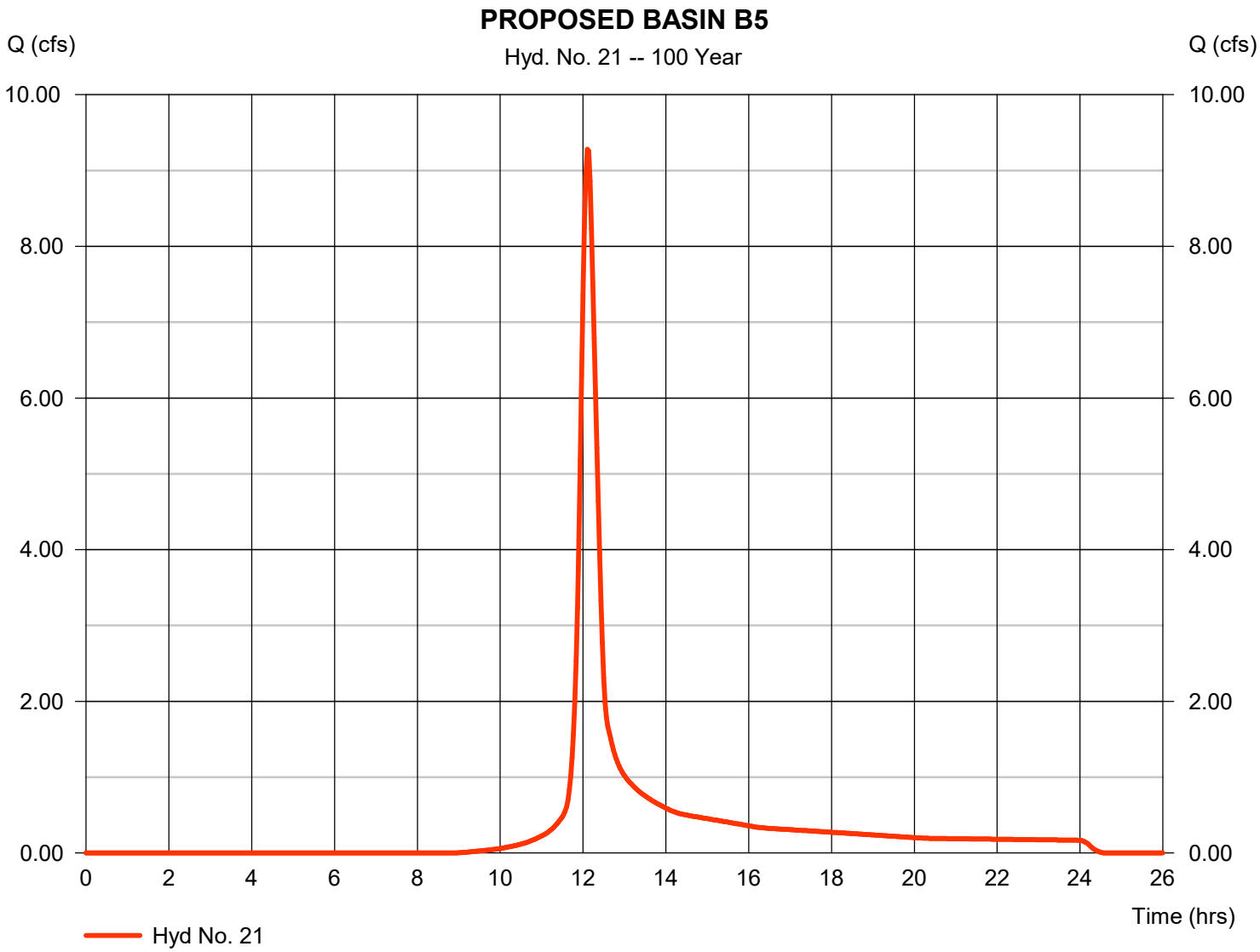
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 21

PROPOSED BASIN B5

Hydrograph type	= SCS Runoff	Peak discharge	= 9.280 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 32,313 cuft
Drainage area	= 2.570 ac	Curve number	= 67
Basin Slope	= 2.5 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 23.10 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



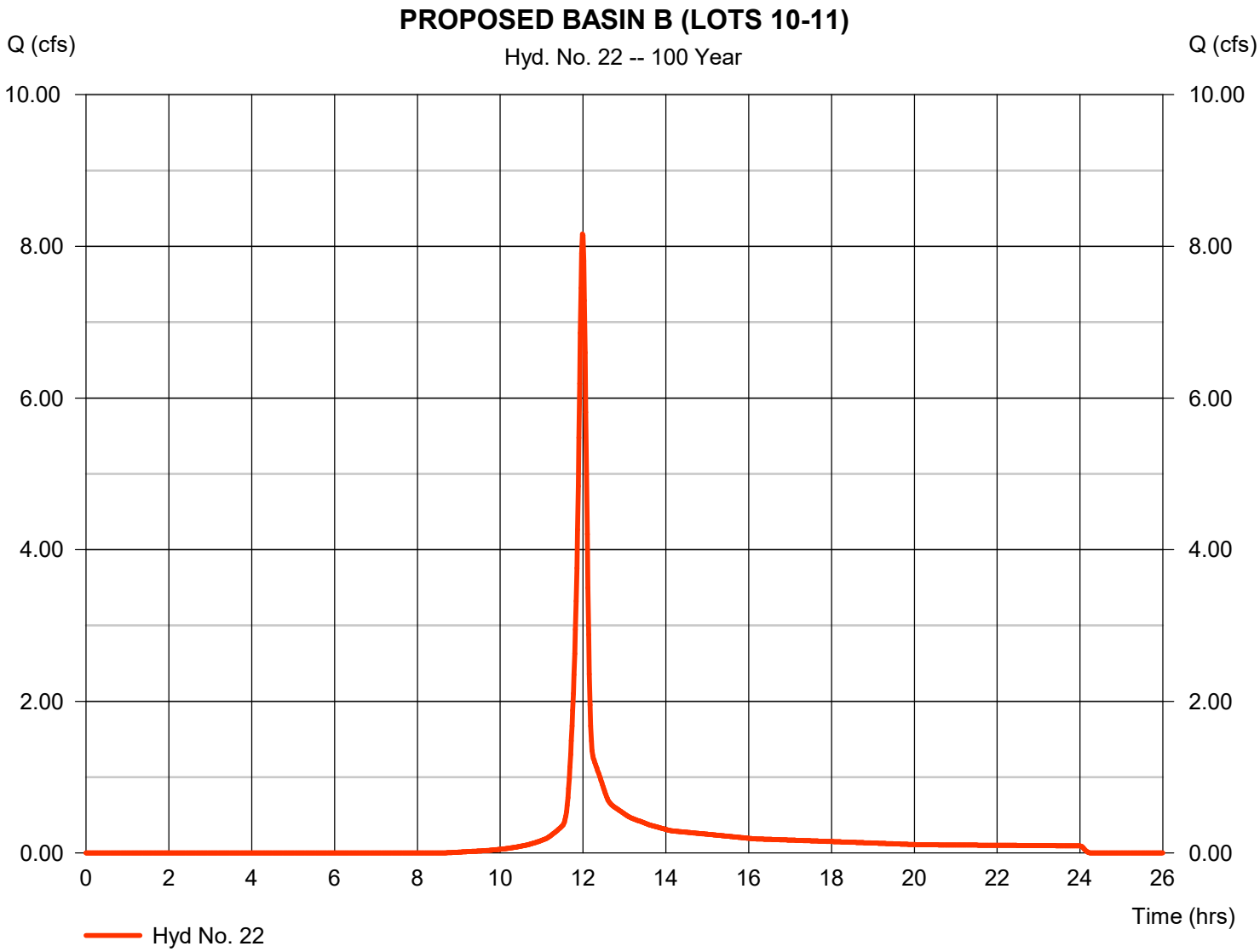
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 22

PROPOSED BASIN B (LOTS 10-11)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.162 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 18,462 cuft
Drainage area	= 1.450 ac	Curve number	= 68
Basin Slope	= 2.0 %	Hydraulic length	= 100 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



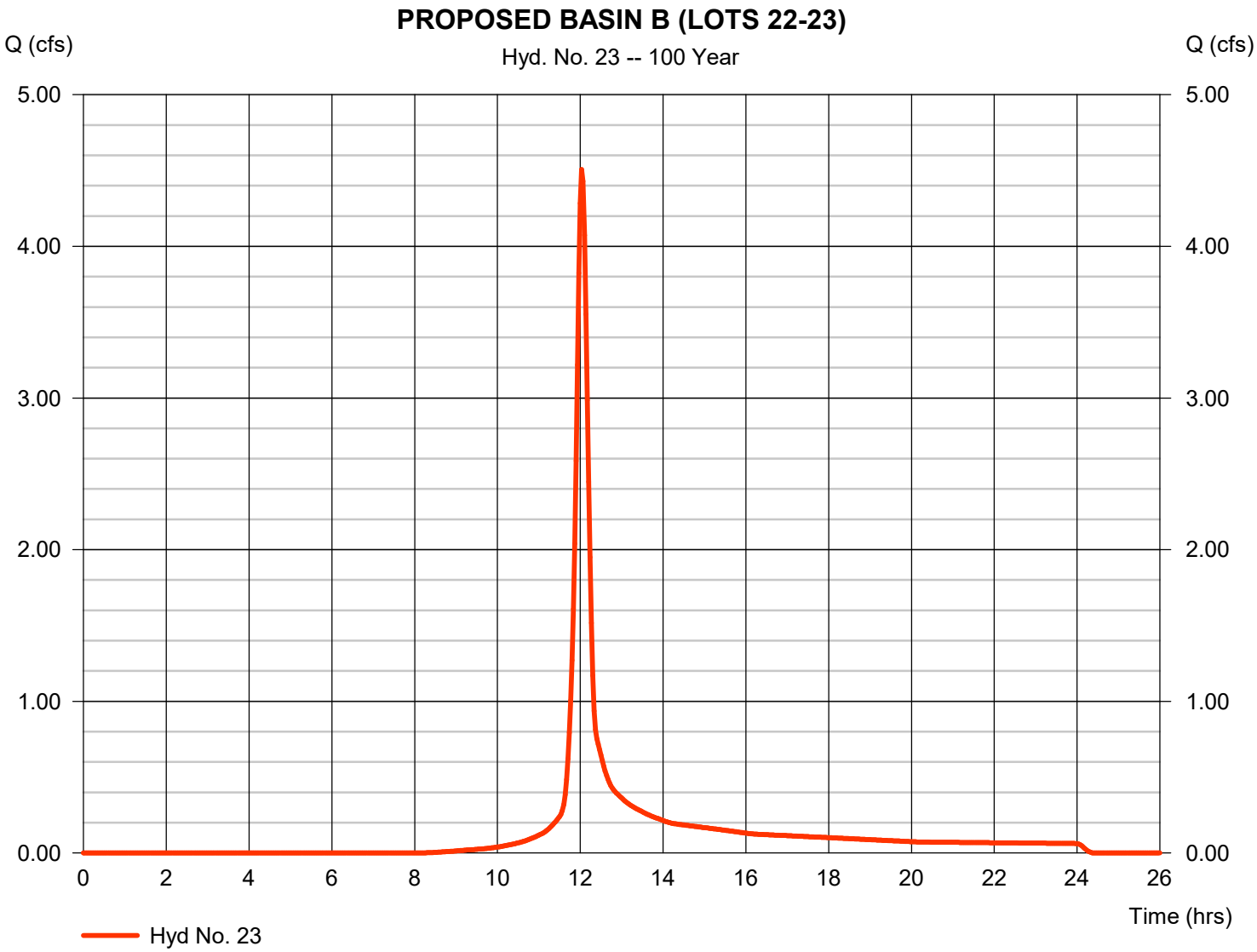
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 23

PROPOSED BASIN B (LOTS 22-23)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.506 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 12,634 cuft
Drainage area	= 0.960 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



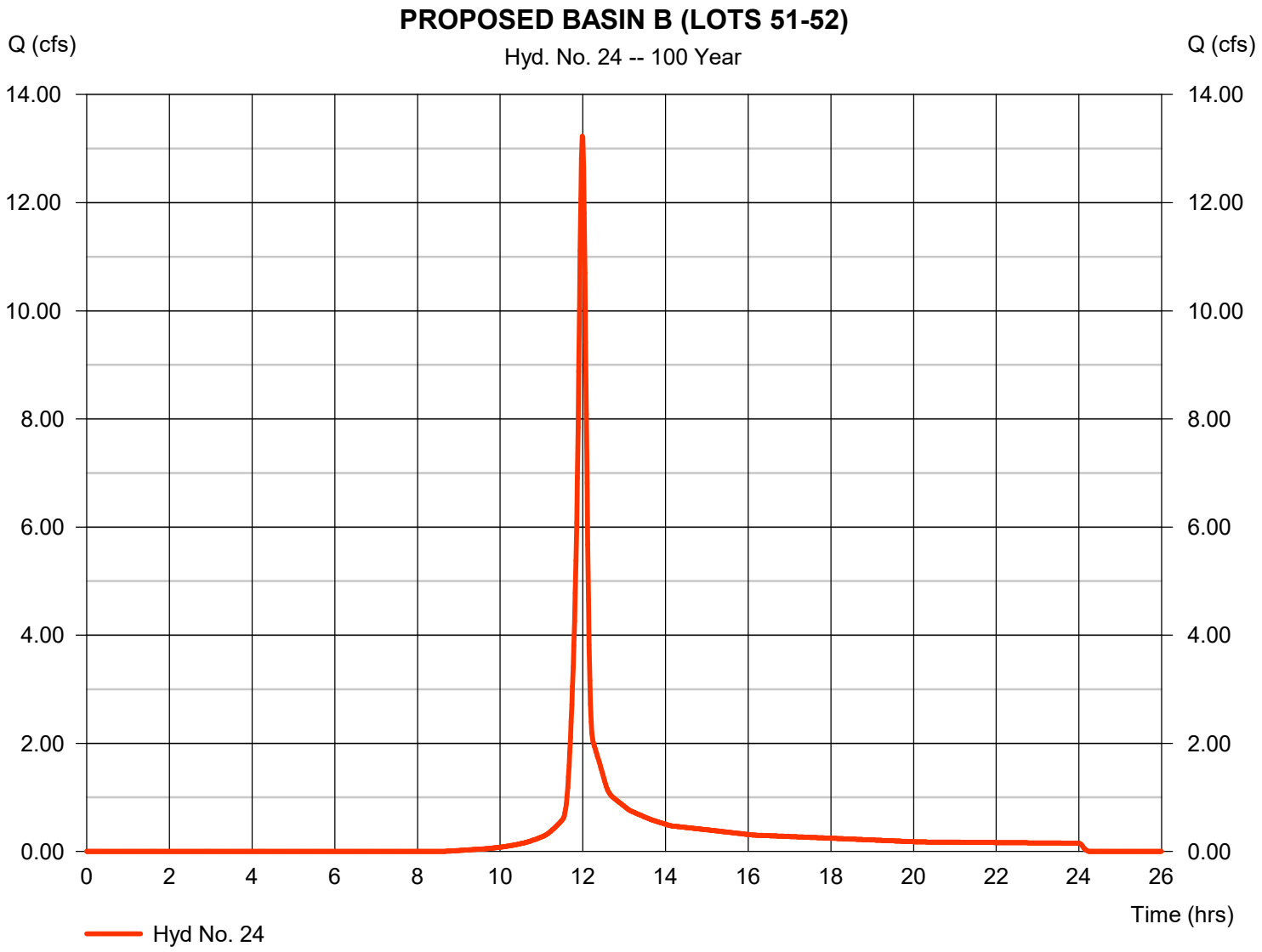
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 24

PROPOSED BASIN B (LOTS 51-52)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 29,921 cuft
Drainage area	= 2.350 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



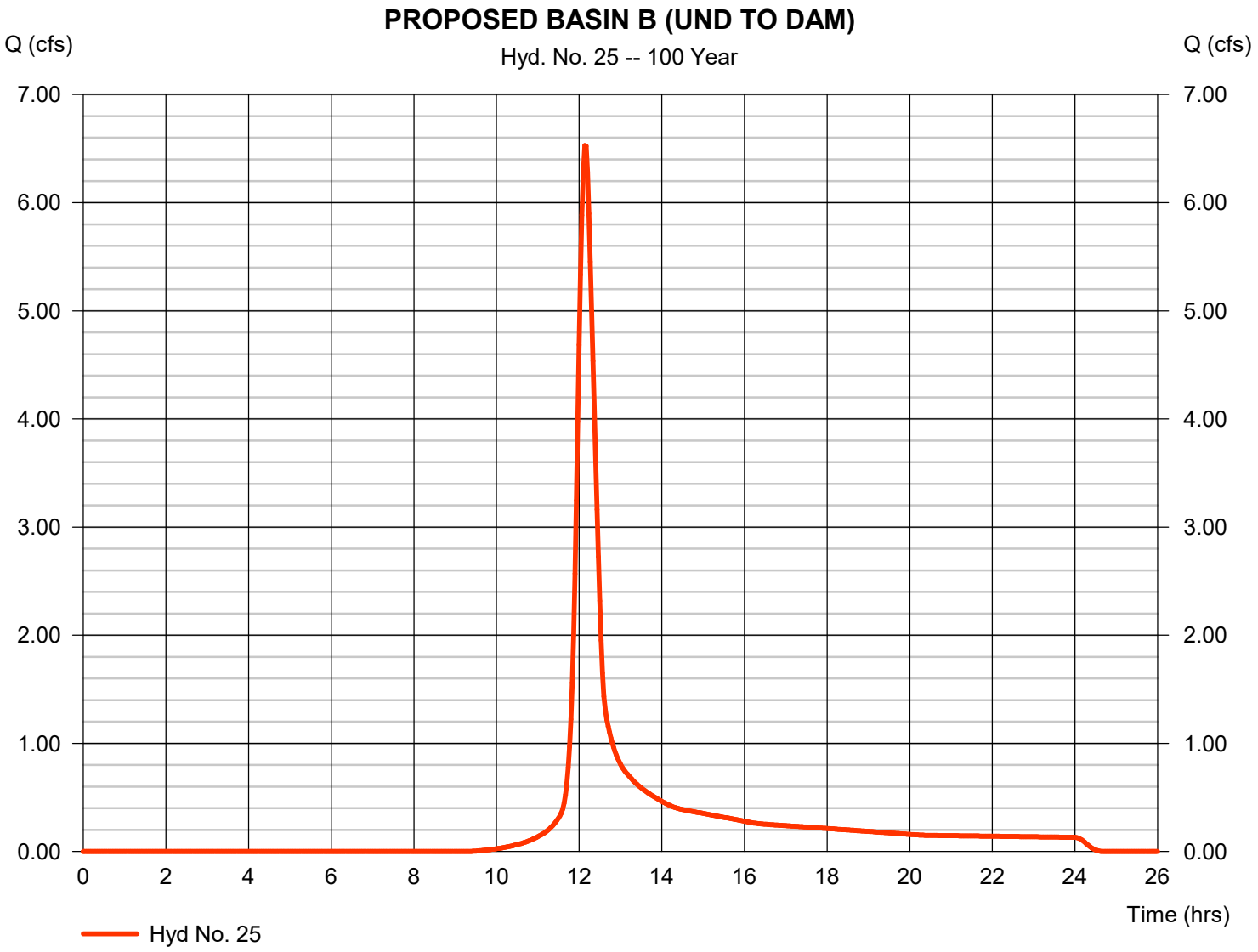
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 25

PROPOSED BASIN B (UND TO DAM)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.529 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 24,322 cuft
Drainage area	= 2.130 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

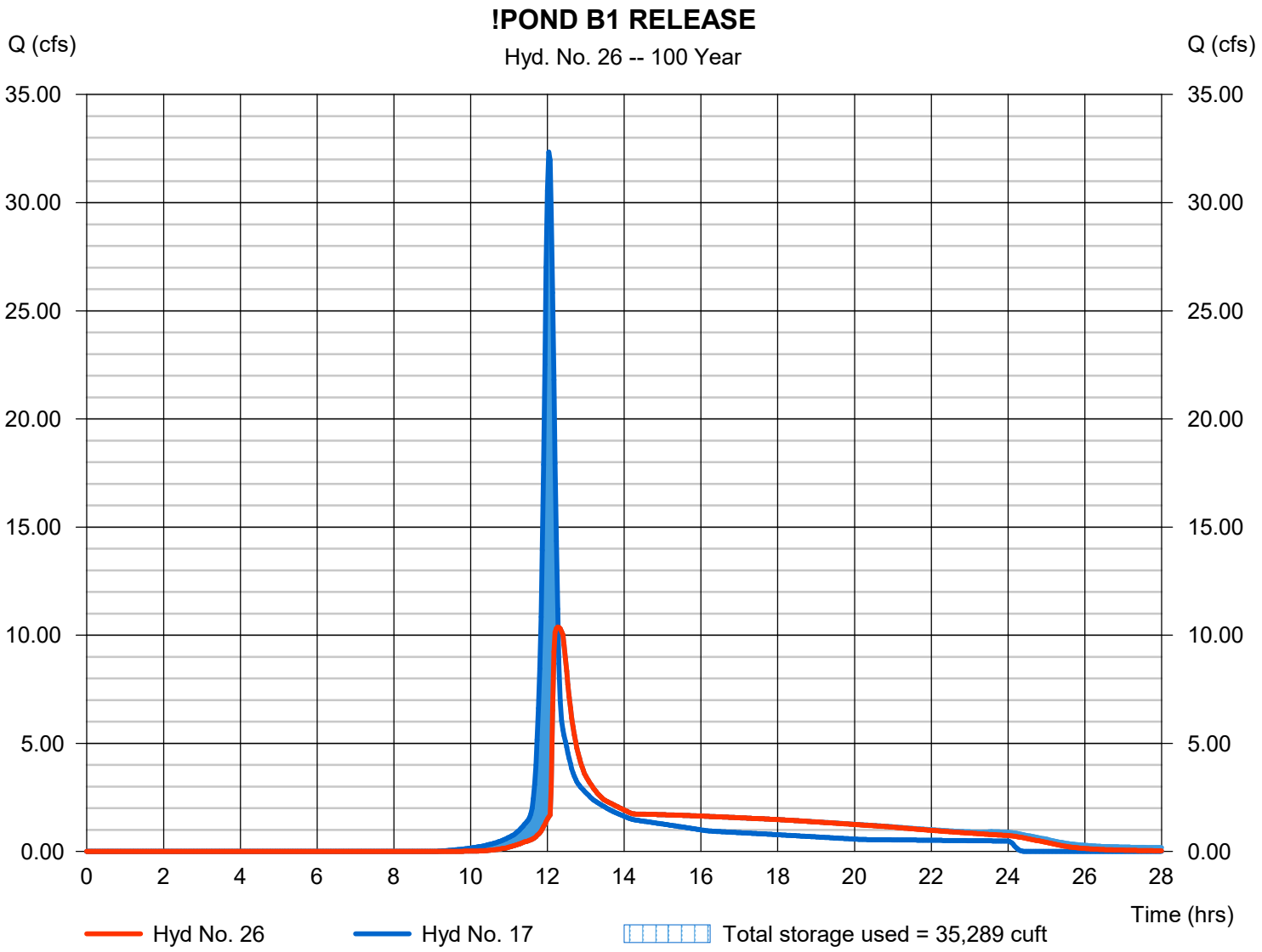
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 26

!POND B1 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 10.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 86,153 cuft
Inflow hyd. No.	= 17 - PROPOSED BASIN B1	Max. Elevation	= 938.74 ft
Reservoir name	= POND B1	Max. Storage	= 35,289 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

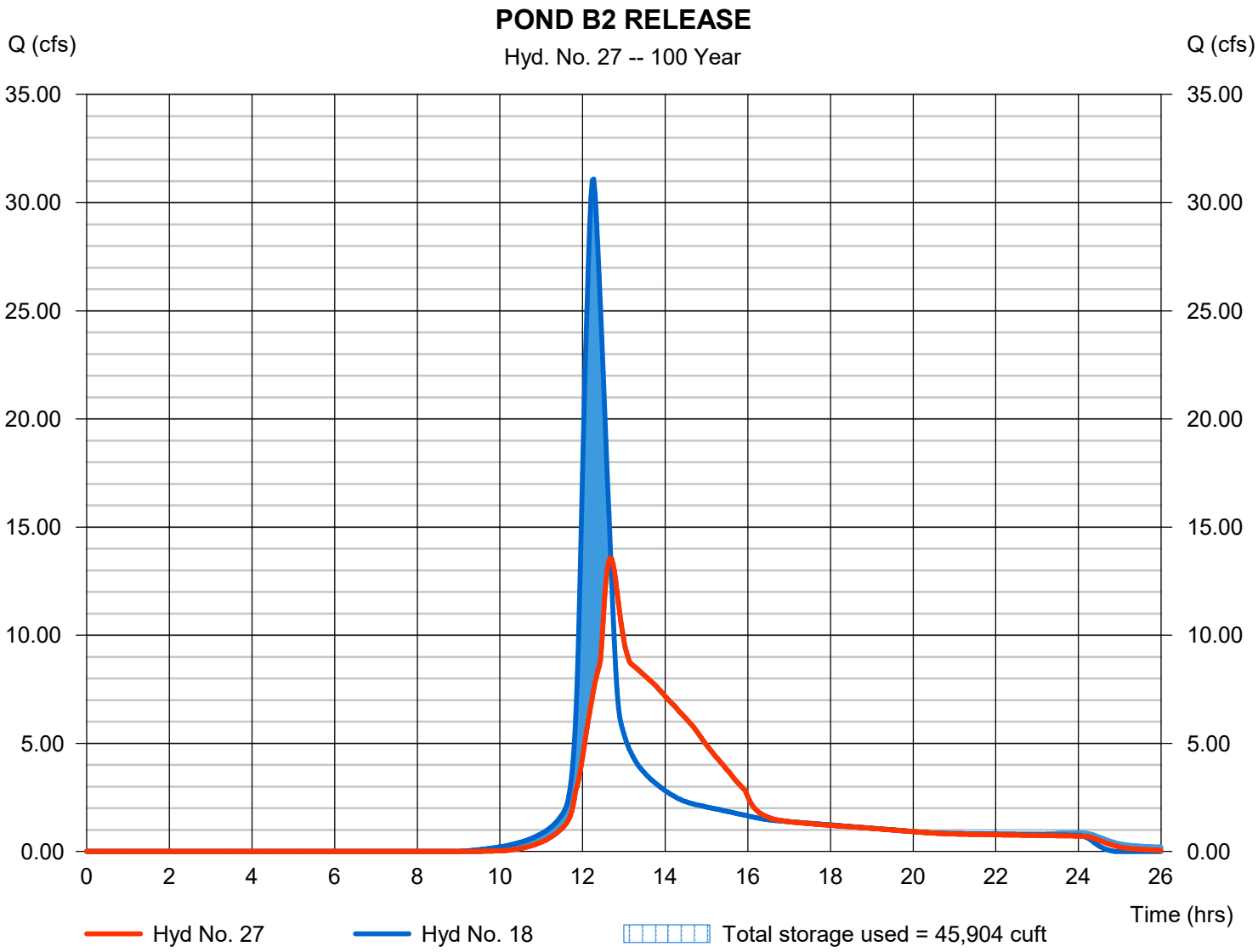
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 27

POND B2 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 13.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 137,801 cuft
Inflow hyd. No.	= 18 - PROPOSED BASIN B2	Max. Elevation	= 941.89 ft
Reservoir name	= POND B2	Max. Storage	= 45,904 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



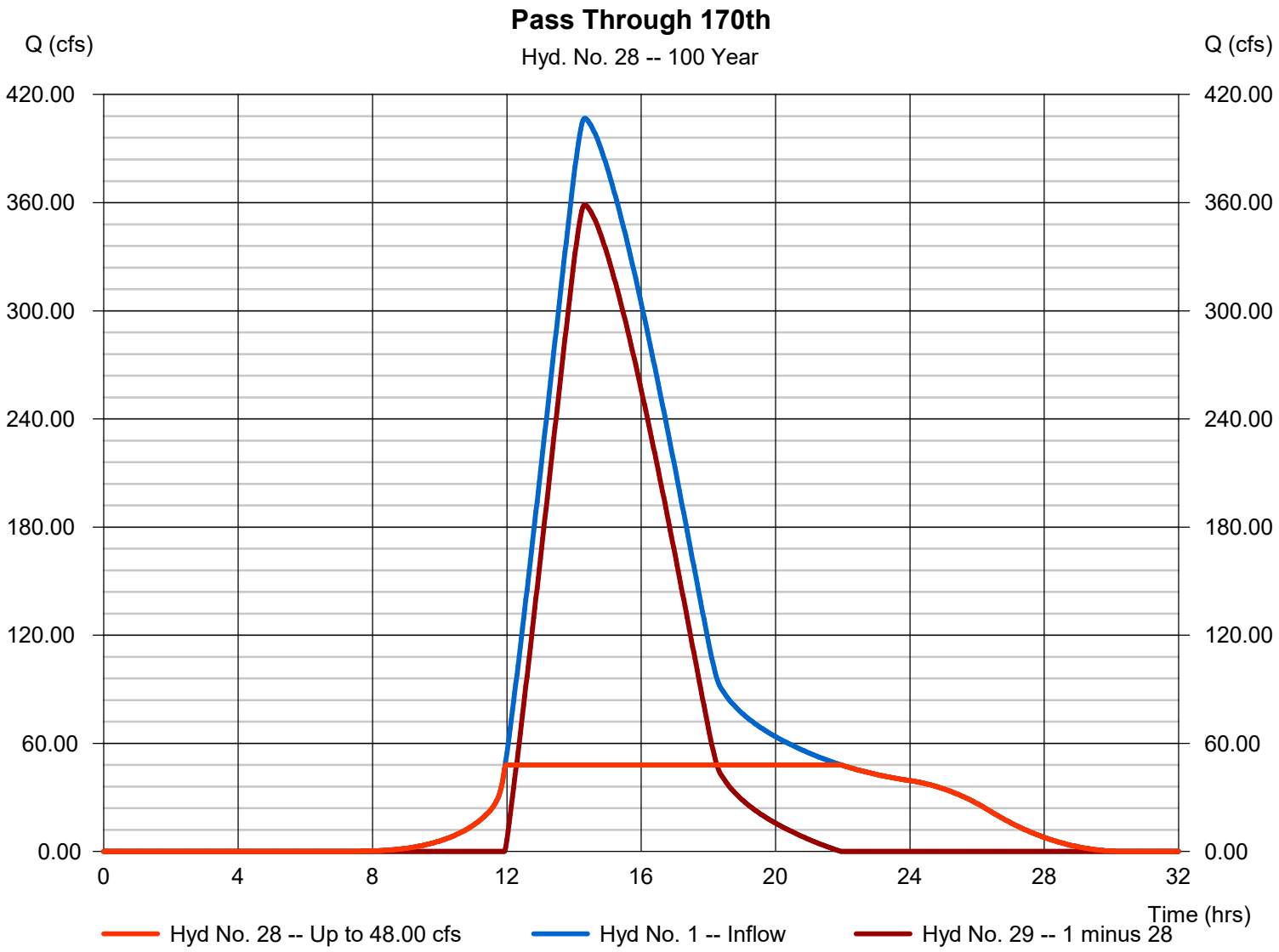
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 28

Pass Through 170th

Hydrograph type	= Diversion1	Peak discharge	= 48.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 2,566,277 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 29
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



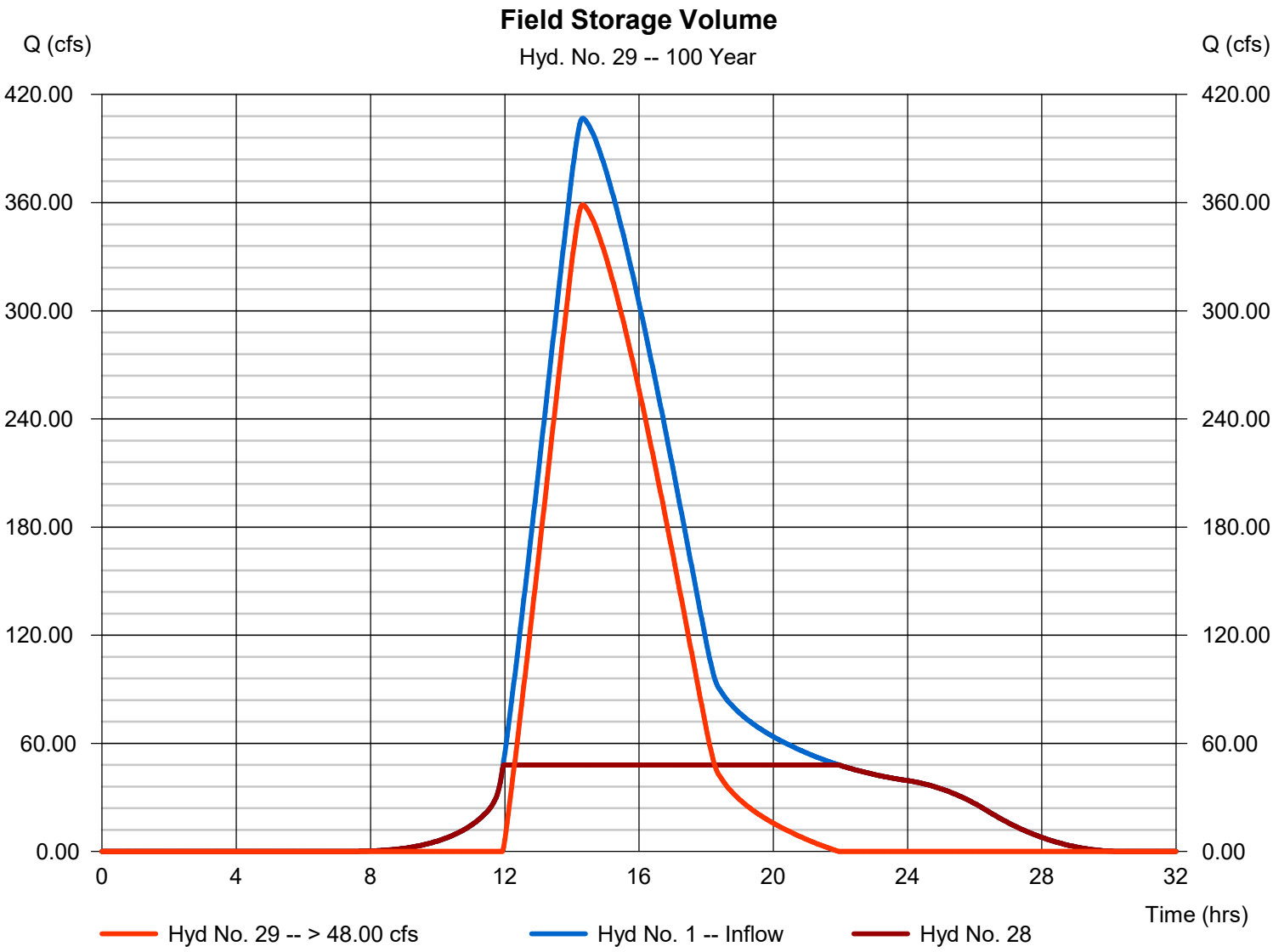
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 29

Field Storage Volume

Hydrograph type	= Diversion2	Peak discharge	= 358.78 cfs
Storm frequency	= 100 yrs	Time to peak	= 14.33 hrs
Time interval	= 2 min	Hyd. volume	= 4,956,494 cuft
Inflow hydrograph	= 1 - Off-Site Basin B (upper)	2nd diverted hyd.	= 28
Diversion method	= Constant Q	Constant Q	= 48.00 cfs



Hydrograph Report

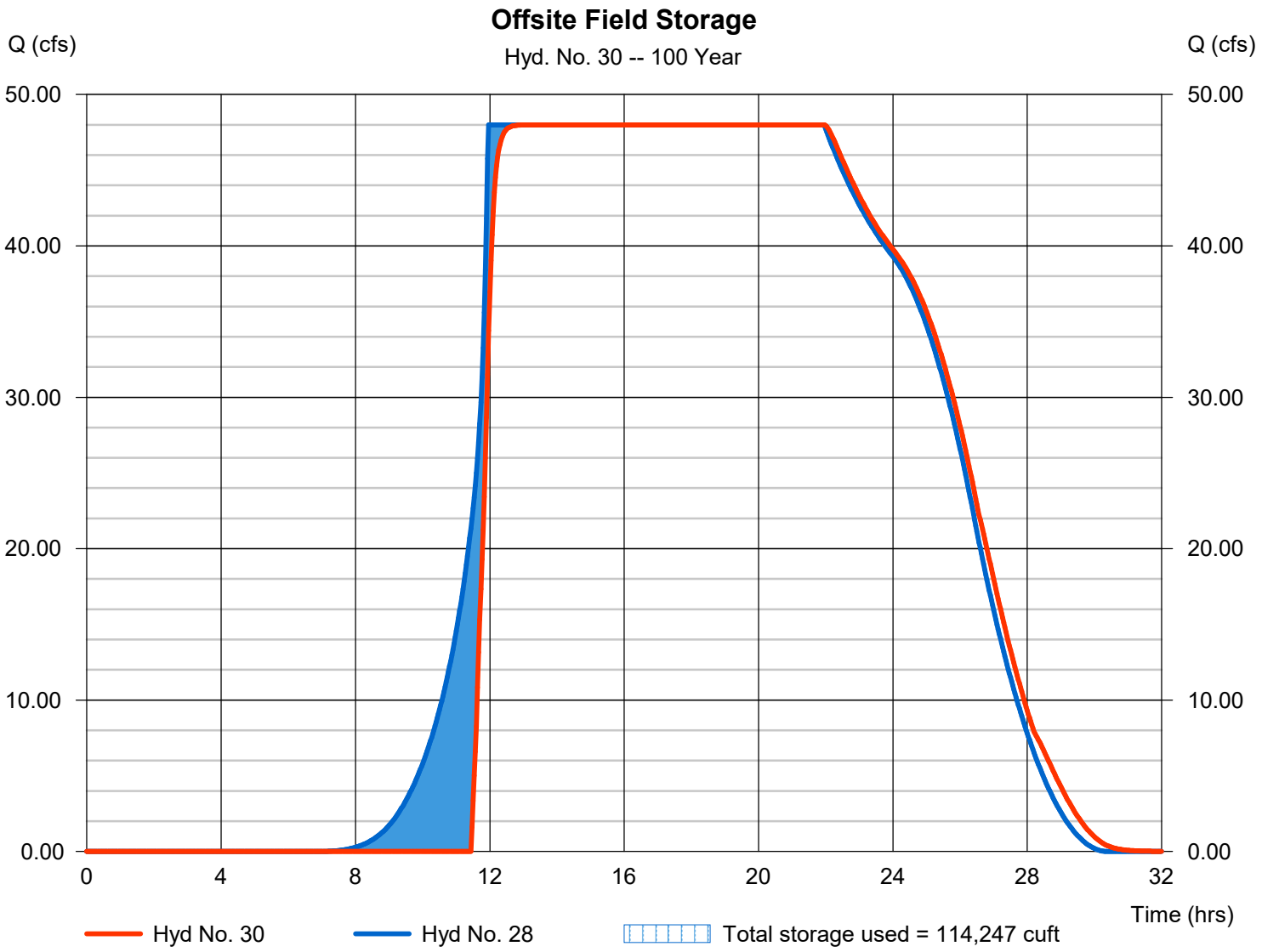
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 30

Offsite Field Storage

Hydrograph type	= Reservoir	Peak discharge	= 48.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.73 hrs
Time interval	= 2 min	Hyd. volume	= 2,487,752 cuft
Inflow hyd. No.	= 28 - Pass Through 170th	Max. Elevation	= 957.83 ft
Reservoir name	= Offsite Field Storage UPPER	Max. Storage	= 114,247 cuft

Storage Indication method used.



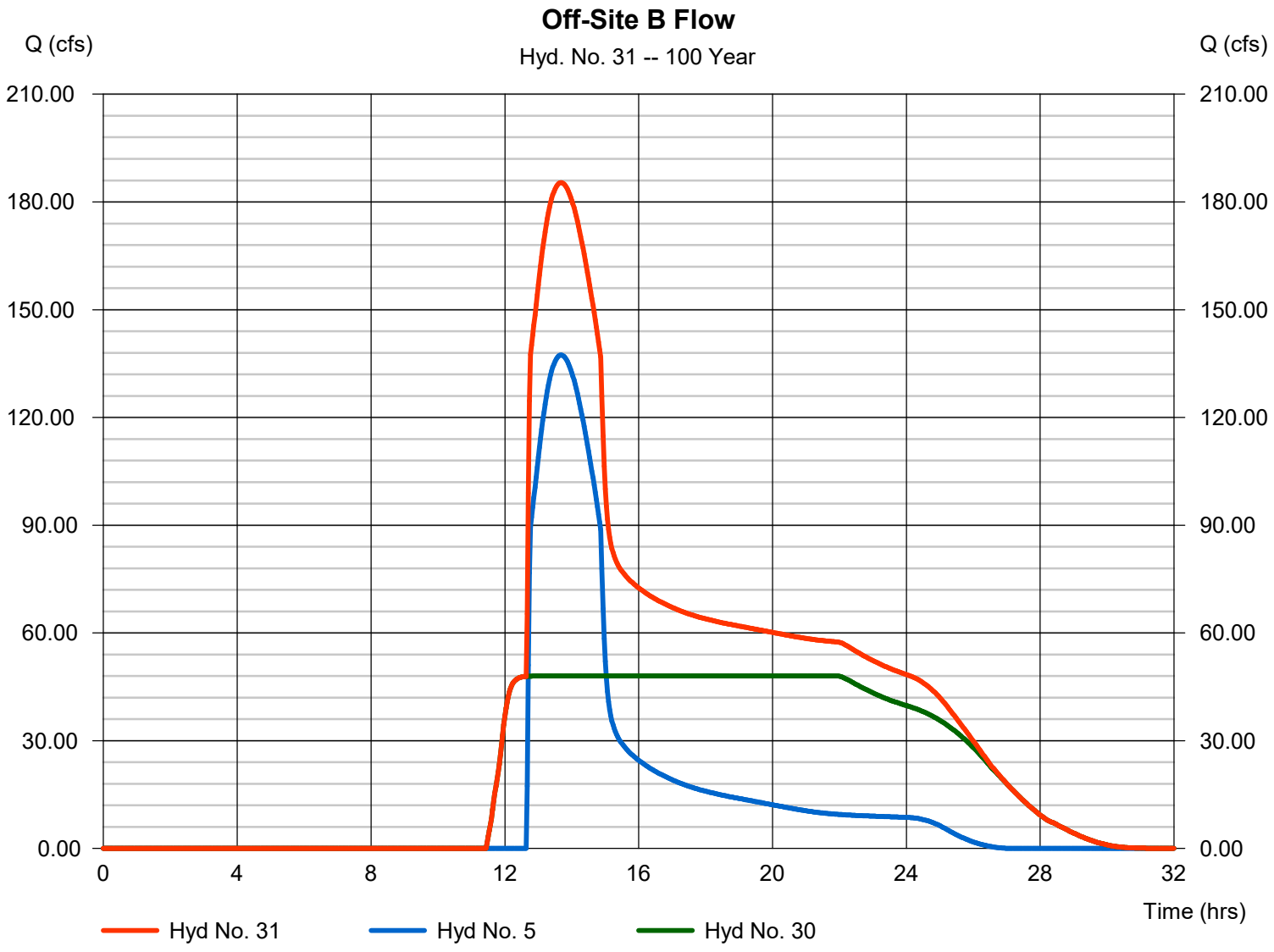
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 31

Off-Site B Flow

Hydrograph type	= Combine	Peak discharge	= 185.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.67 hrs
Time interval	= 2 min	Hyd. volume	= 3,988,059 cuft
Inflow hyds.	= 5, 30	Contrib. drain. area	= 0.000 ac



Hydrograph Report

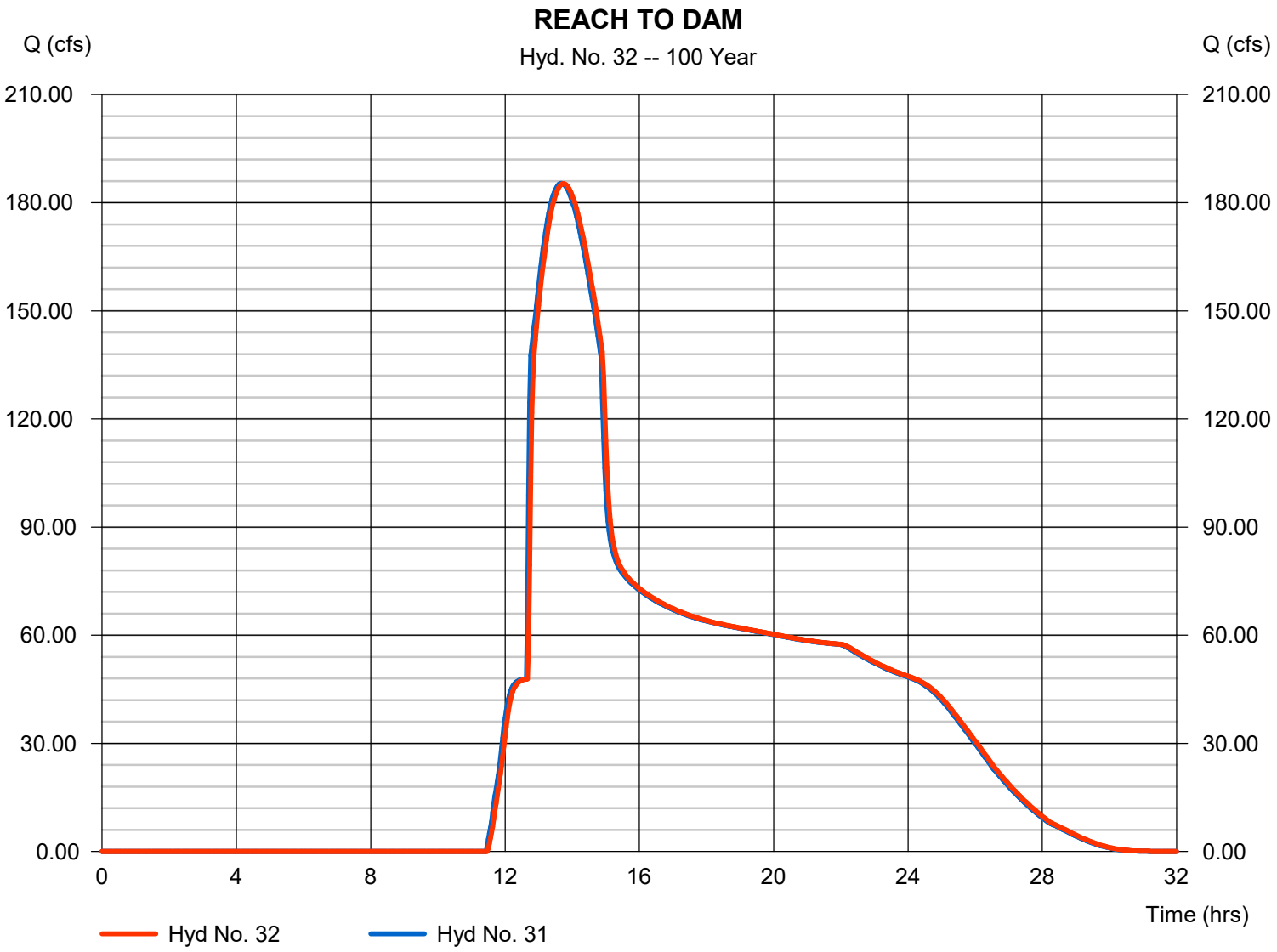
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 32

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 185.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.73 hrs
Time interval	= 2 min	Hyd. volume	= 3,988,046 cuft
Inflow hyd. No.	= 31 - Off-Site B Flow	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 4.23 ft/s	Routing coeff.	= 0.5344

Modified Att-Kin routing method used.



Hydrograph Report

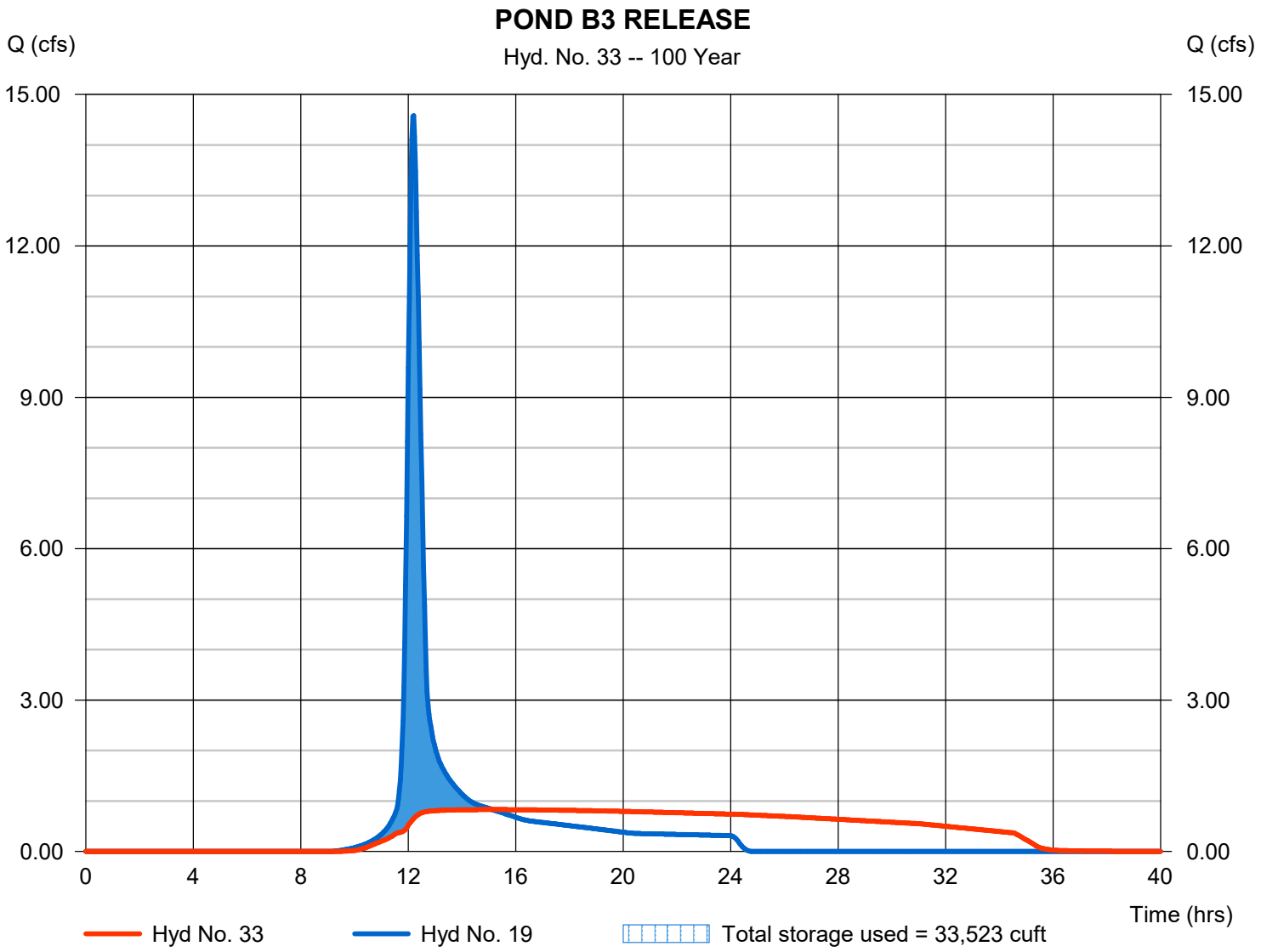
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 33

POND B3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 0.829 cfs
Storm frequency	= 100 yrs	Time to peak	= 15.13 hrs
Time interval	= 2 min	Hyd. volume	= 59,034 cuft
Inflow hyd. No.	= 19 - PROPOSED BASIN B3	Max. Elevation	= 941.26 ft
Reservoir name	= POND B3	Max. Storage	= 33,523 cuft

Storage Indication method used.



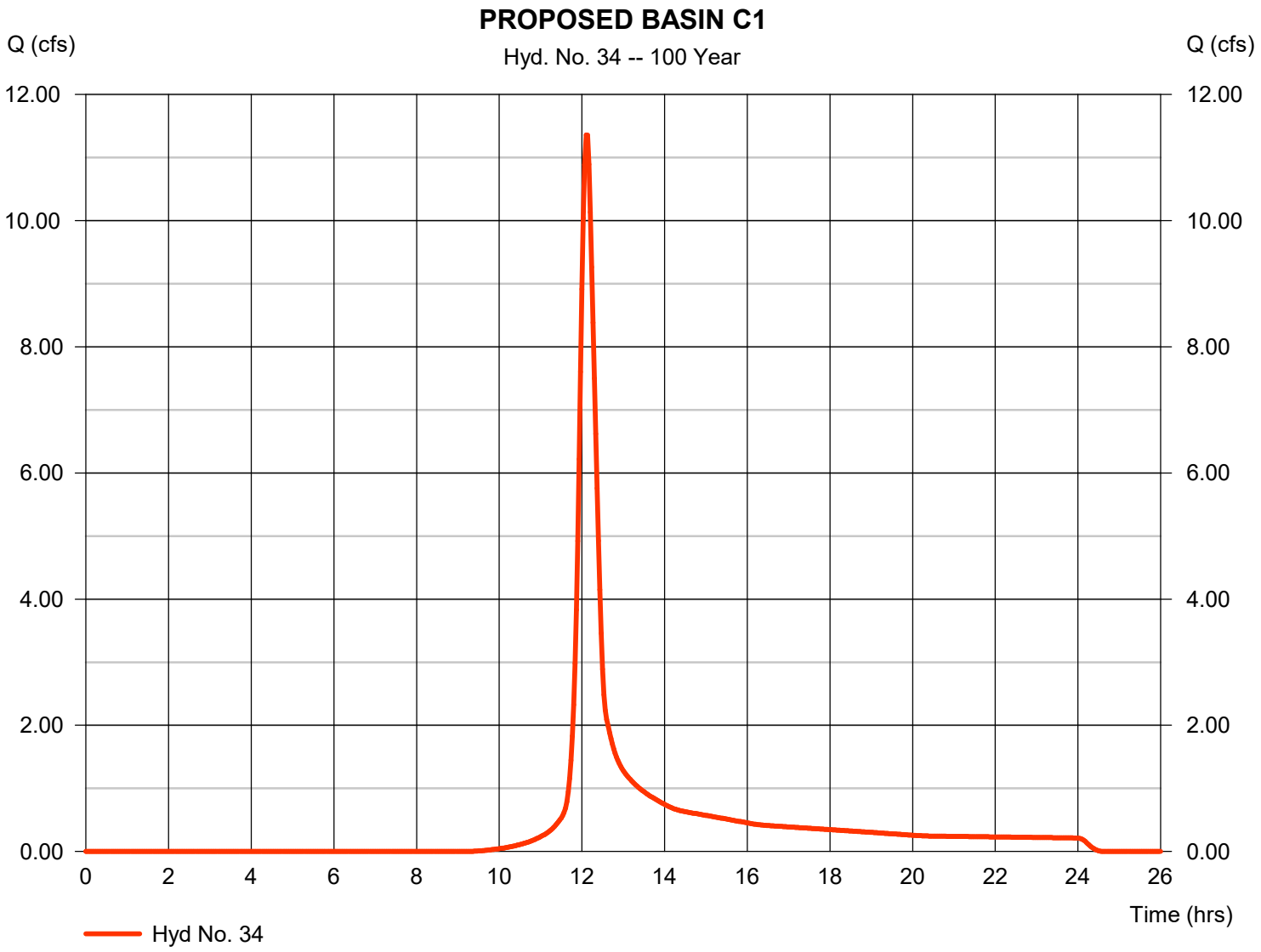
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 34

PROPOSED BASIN C1

Hydrograph type	= SCS Runoff	Peak discharge	= 11.36 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 39,791 cuft
Drainage area	= 3.370 ac	Curve number	= 65
Basin Slope	= 2.3 %	Hydraulic length	= 630 ft
Tc method	= LAG	Time of conc. (Tc)	= 22.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



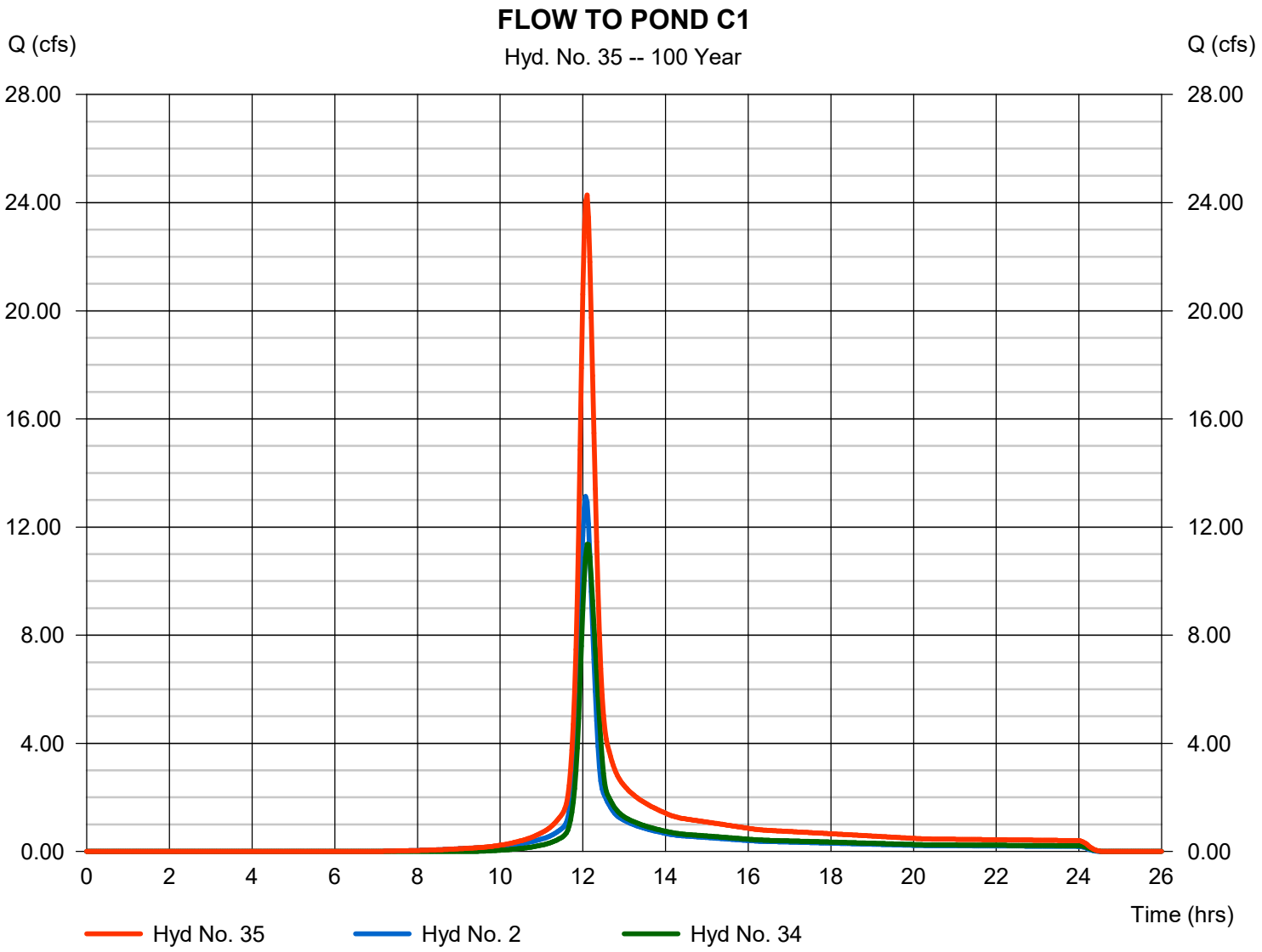
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 35

FLOW TO POND C1

Hydrograph type	= Combine	Peak discharge	= 24.28 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 80,879 cuft
Inflow hyds.	= 2, 34	Contrib. drain. area	= 6.030 ac



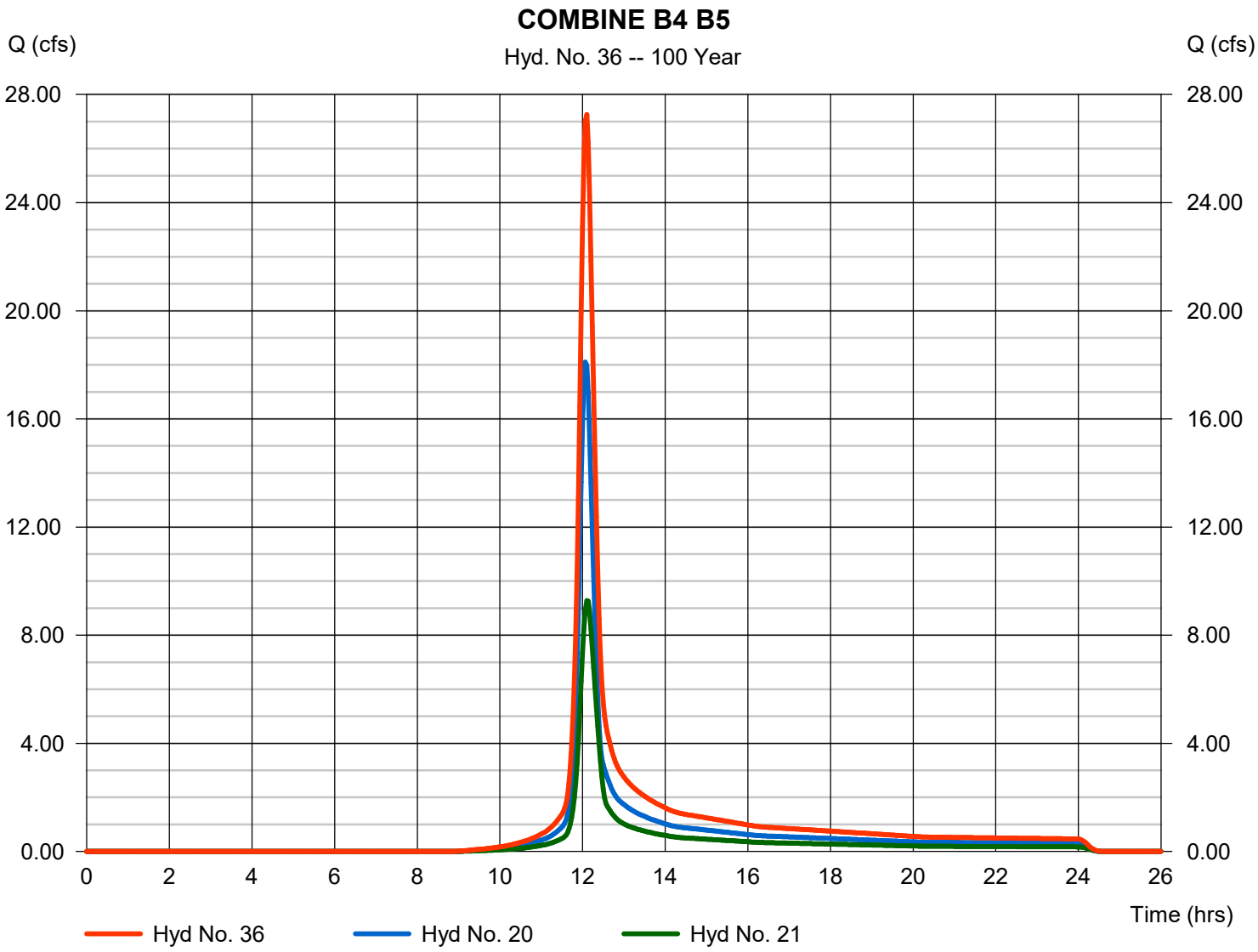
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 36

COMBINE B4 B5

Hydrograph type	= Combine	Peak discharge	= 27.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 89,258 cuft
Inflow hyds.	= 20, 21	Contrib. drain. area	= 7.180 ac



Hydrograph Report

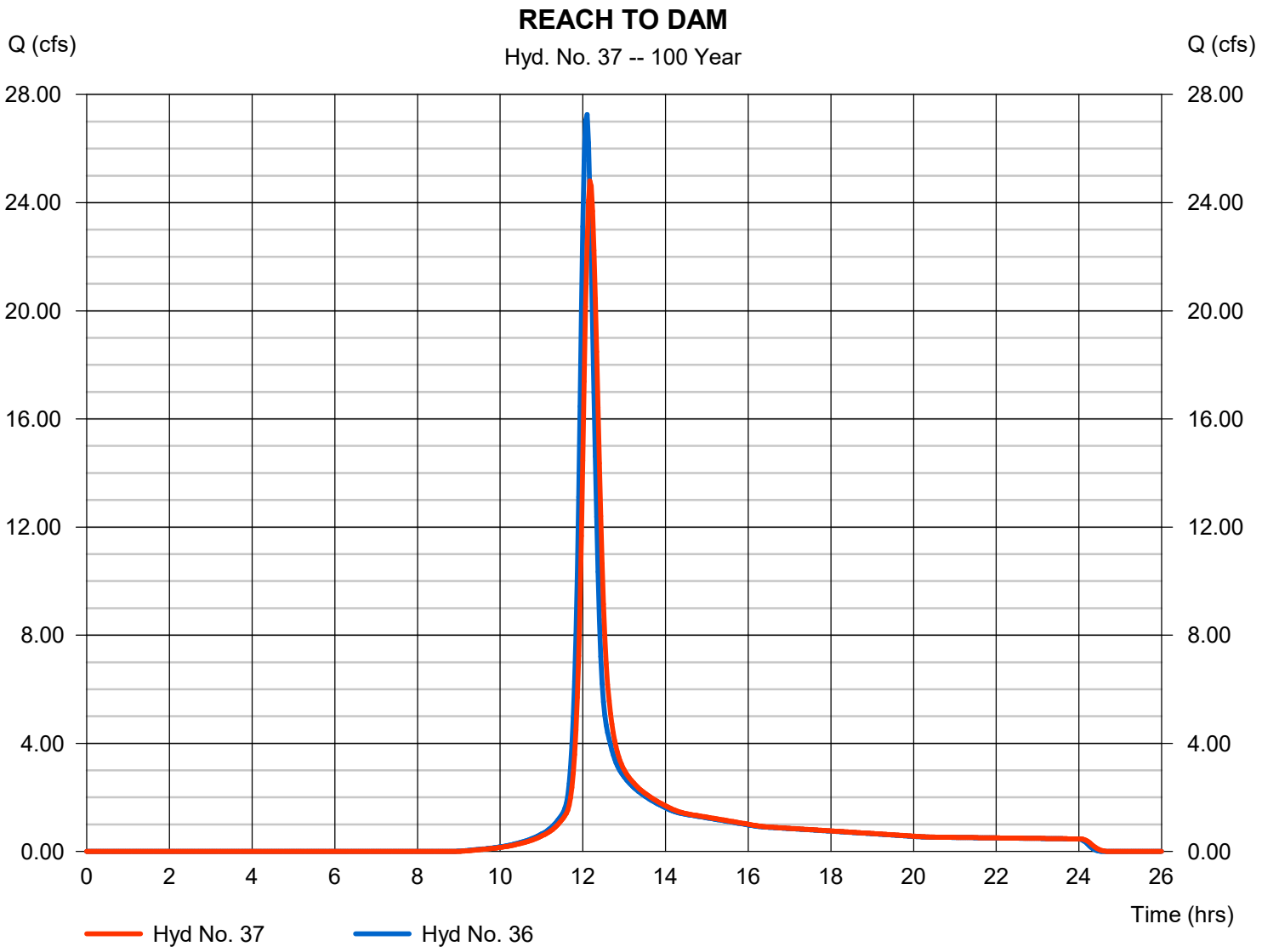
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 37

REACH TO DAM

Hydrograph type	= Reach	Peak discharge	= 24.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 89,255 cuft
Inflow hyd. No.	= 36 - COMBINE B4 B5	Section type	= Trapezoidal
Reach length	= 1000.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 2.36 ft/s	Routing coeff.	= 0.3381

Modified Att-Kin routing method used.



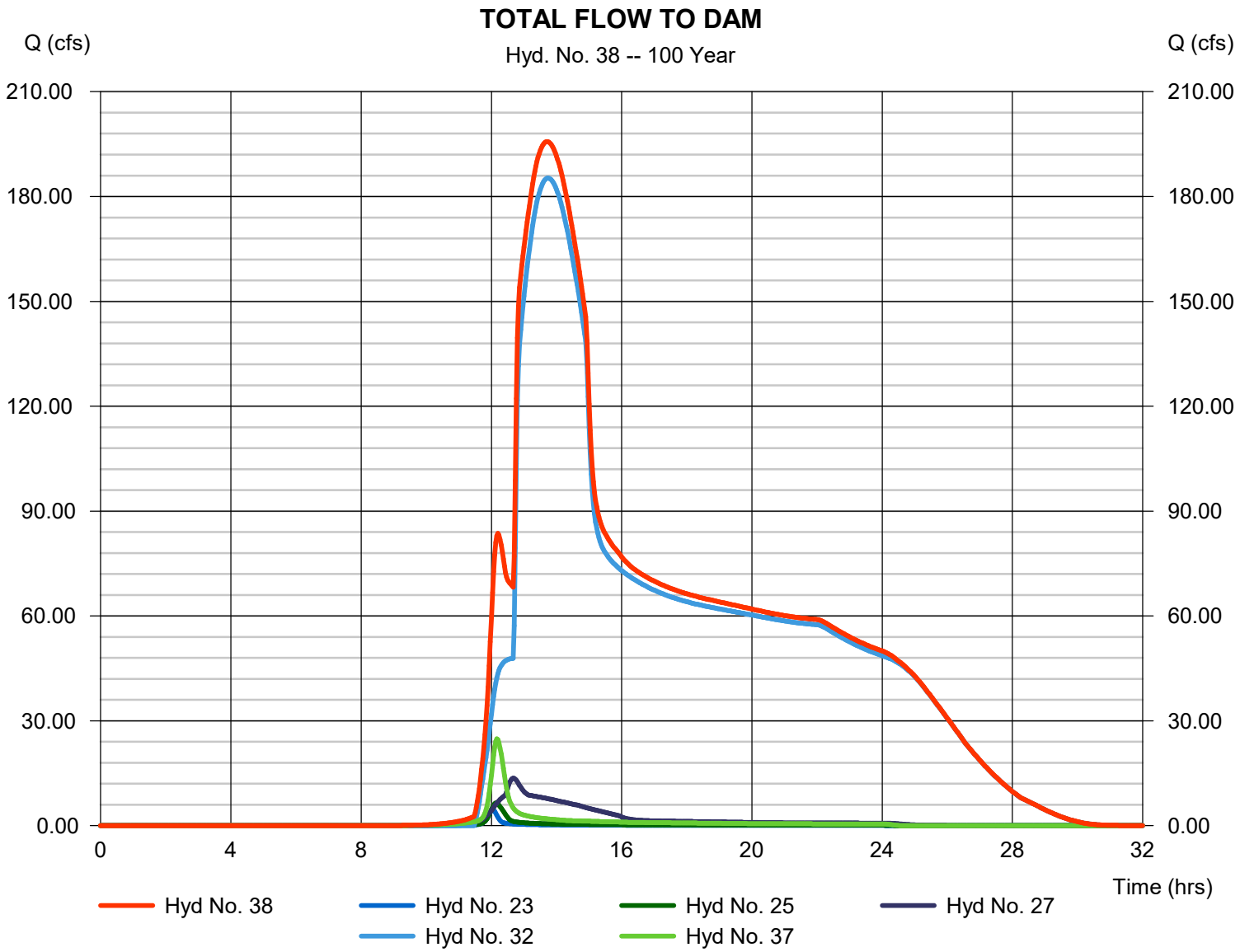
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 38

TOTAL FLOW TO DAM

Hydrograph type	= Combine	Peak discharge	= 195.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.70 hrs
Time interval	= 2 min	Hyd. volume	= 4,252,055 cuft
Inflow hyds.	= 23, 25, 27, 32, 37	Contrib. drain. area	= 3.090 ac



Hydrograph Report

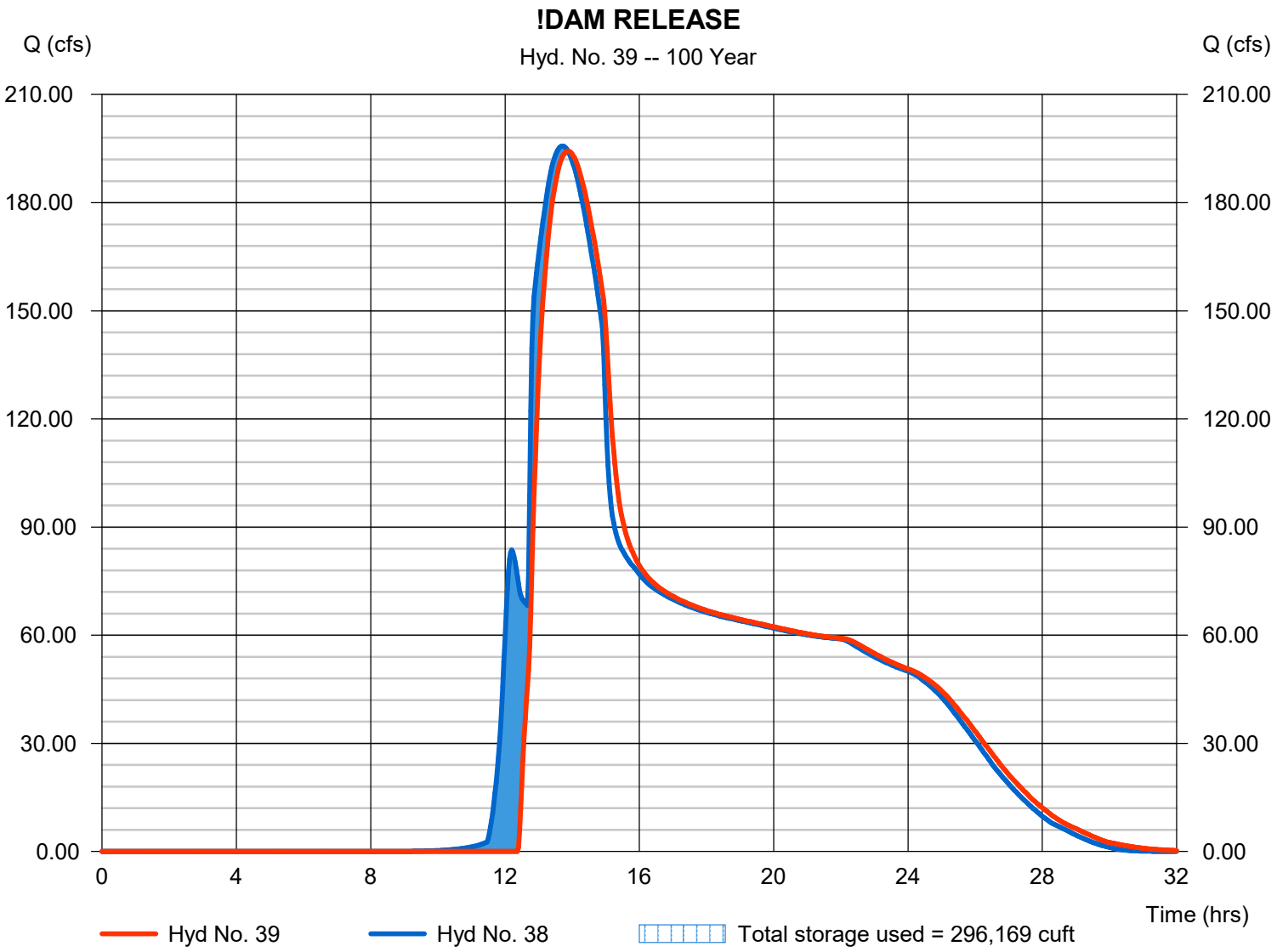
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 39

!DAM RELEASE

Hydrograph type	=	Reservoir	Peak discharge	=	194.31 cfs
Storm frequency	=	100 yrs	Time to peak	=	13.87 hrs
Time interval	=	2 min	Hyd. volume	=	4,093,896 cuft
Inflow hyd. No.	=	38 - TOTAL FLOW TO DAM	Max. Elevation	=	943.76 ft
Reservoir name	=	EXISTING DAM	Max. Storage	=	296,169 cuft

Storage Indication method used.



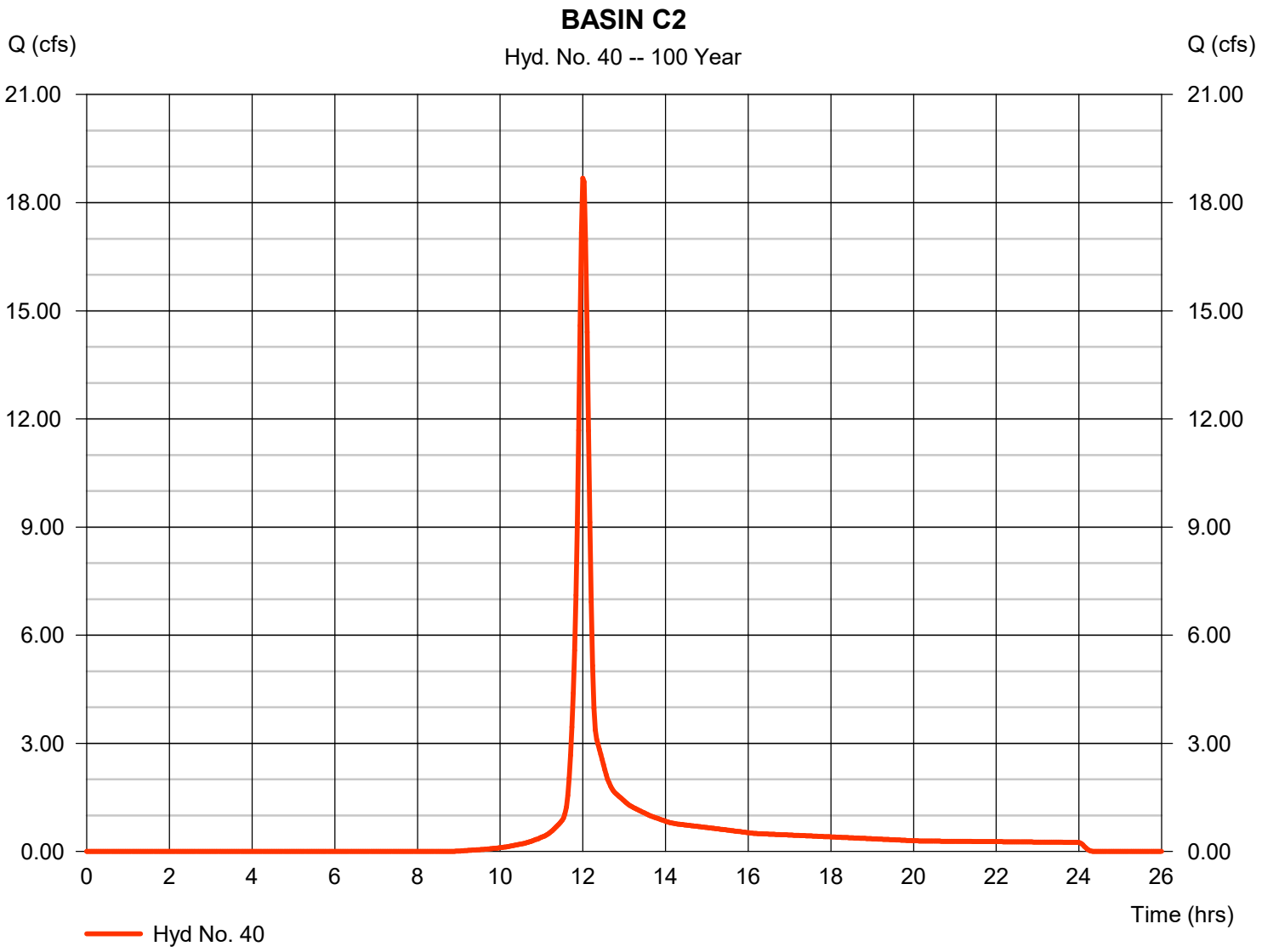
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 40

BASIN C2

Hydrograph type	= SCS Runoff	Peak discharge	= 18.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 48,534 cuft
Drainage area	= 3.810 ac	Curve number	= 67
Basin Slope	= 3.5 %	Hydraulic length	= 457 ft
Tc method	= LAG	Time of conc. (Tc)	= 13.10 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



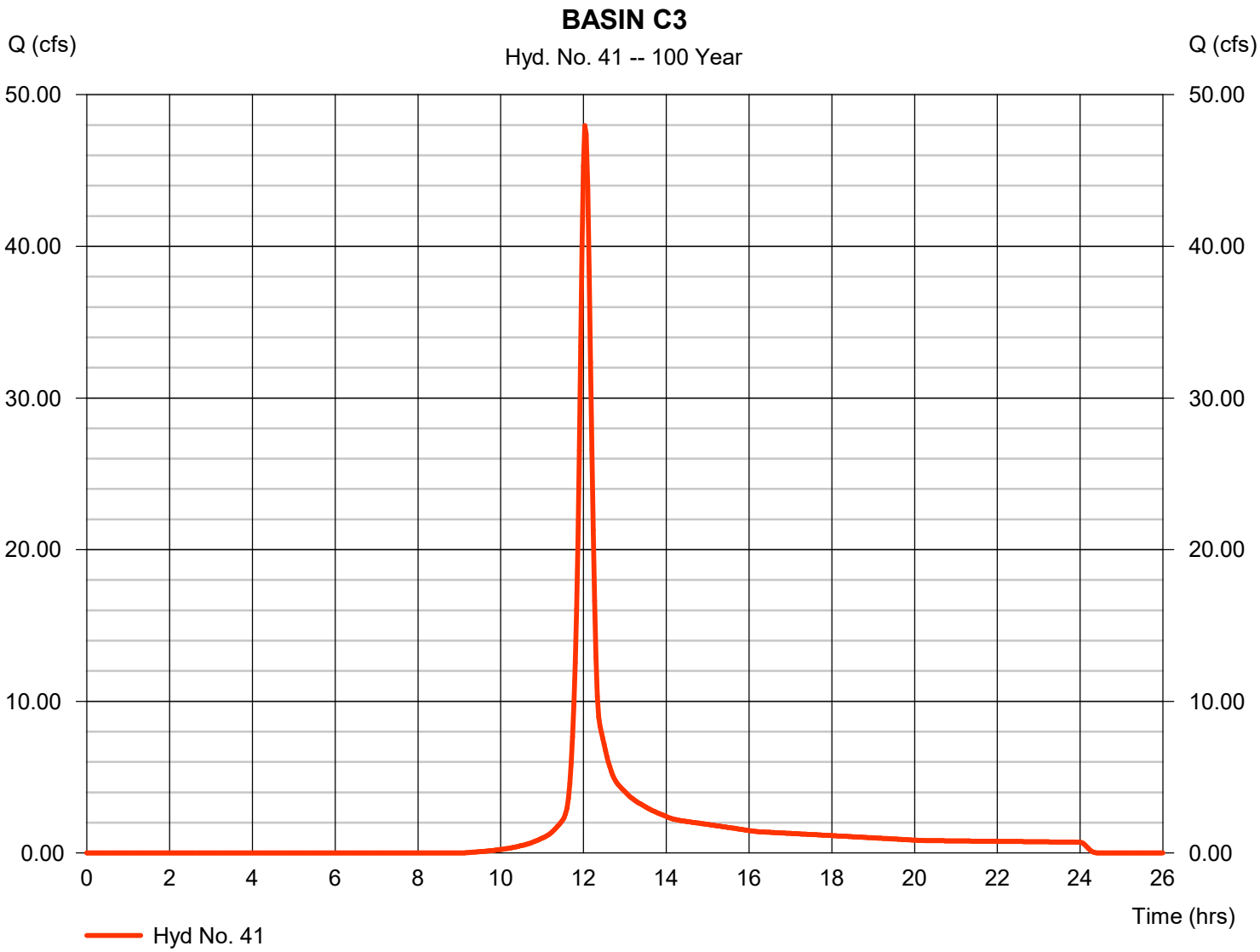
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 41

BASIN C3

Hydrograph type	= SCS Runoff	Peak discharge	= 47.97 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 135,090 cuft
Drainage area	= 11.570 ac	Curve number	= 66
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



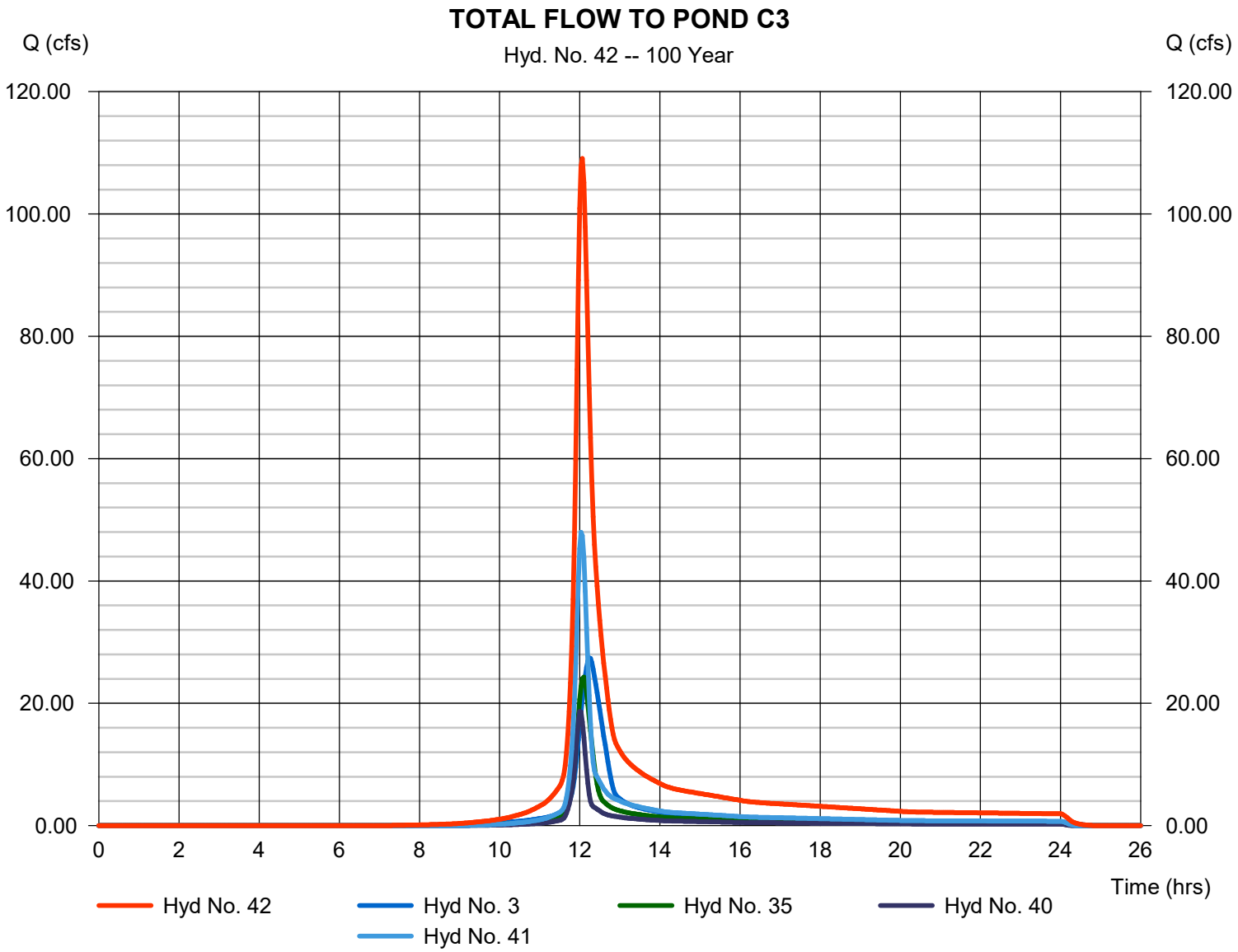
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 42

TOTAL FLOW TO POND C3

Hydrograph type	= Combine	Peak discharge	= 109.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 388,812 cuft
Inflow hyds.	= 3, 35, 40, 41	Contrib. drain. area	= 23.520 ac



Hydrograph Report

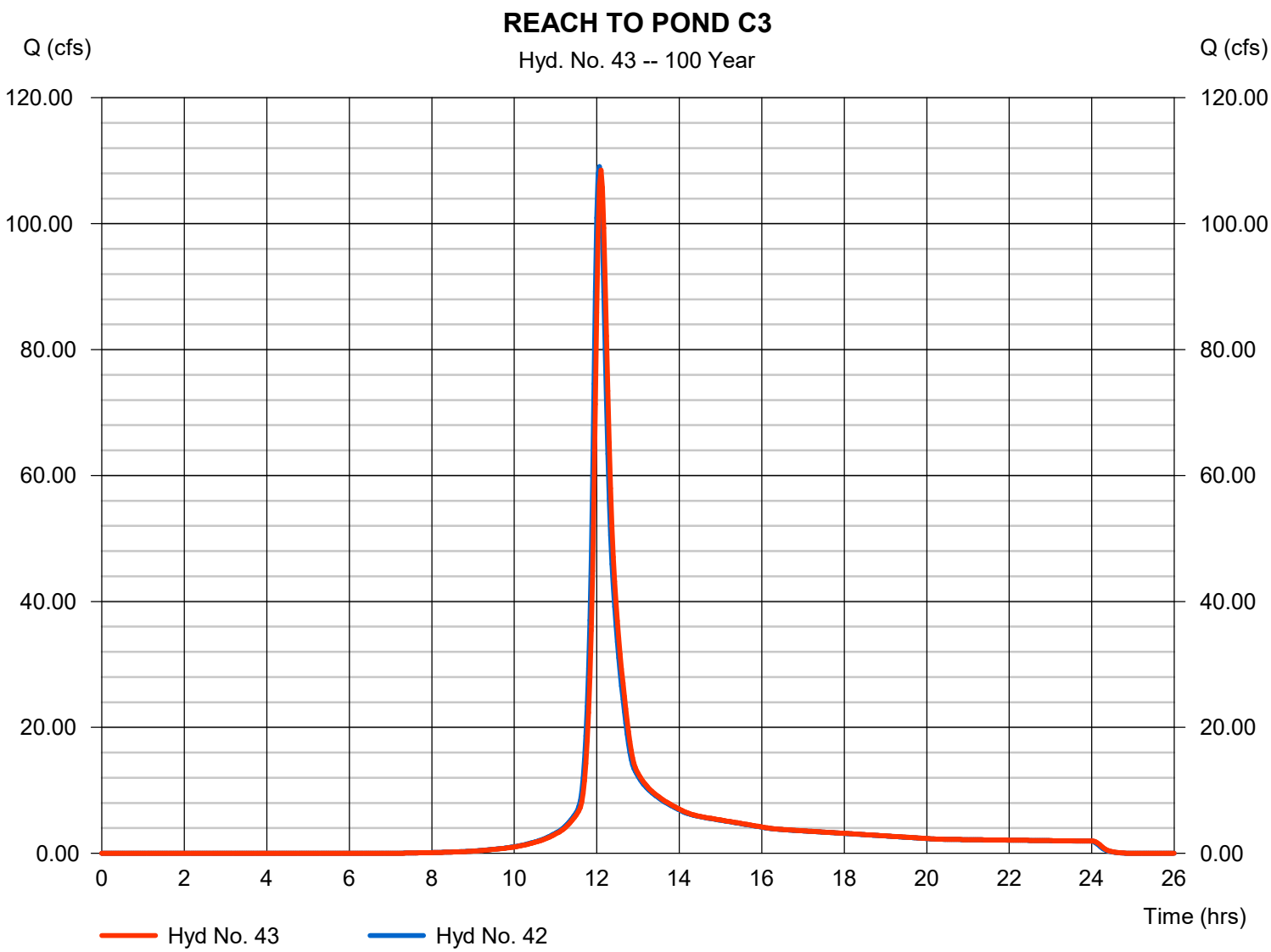
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 43

REACH TO POND C3

Hydrograph type	= Reach	Peak discharge	= 108.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 388,810 cuft
Inflow hyd. No.	= 42 - TOTAL FLOW TO POND C3	Section type	= Trapezoidal
Reach length	= 450.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.025	Bottom width	= 20.0 ft
Side slope	= 4.0:1	Max. depth	= 5.0 ft
Rating curve x	= 0.808	Rating curve m	= 1.438
Ave. velocity	= 3.60 ft/s	Routing coeff.	= 0.8162

Modified Att-Kin routing method used.



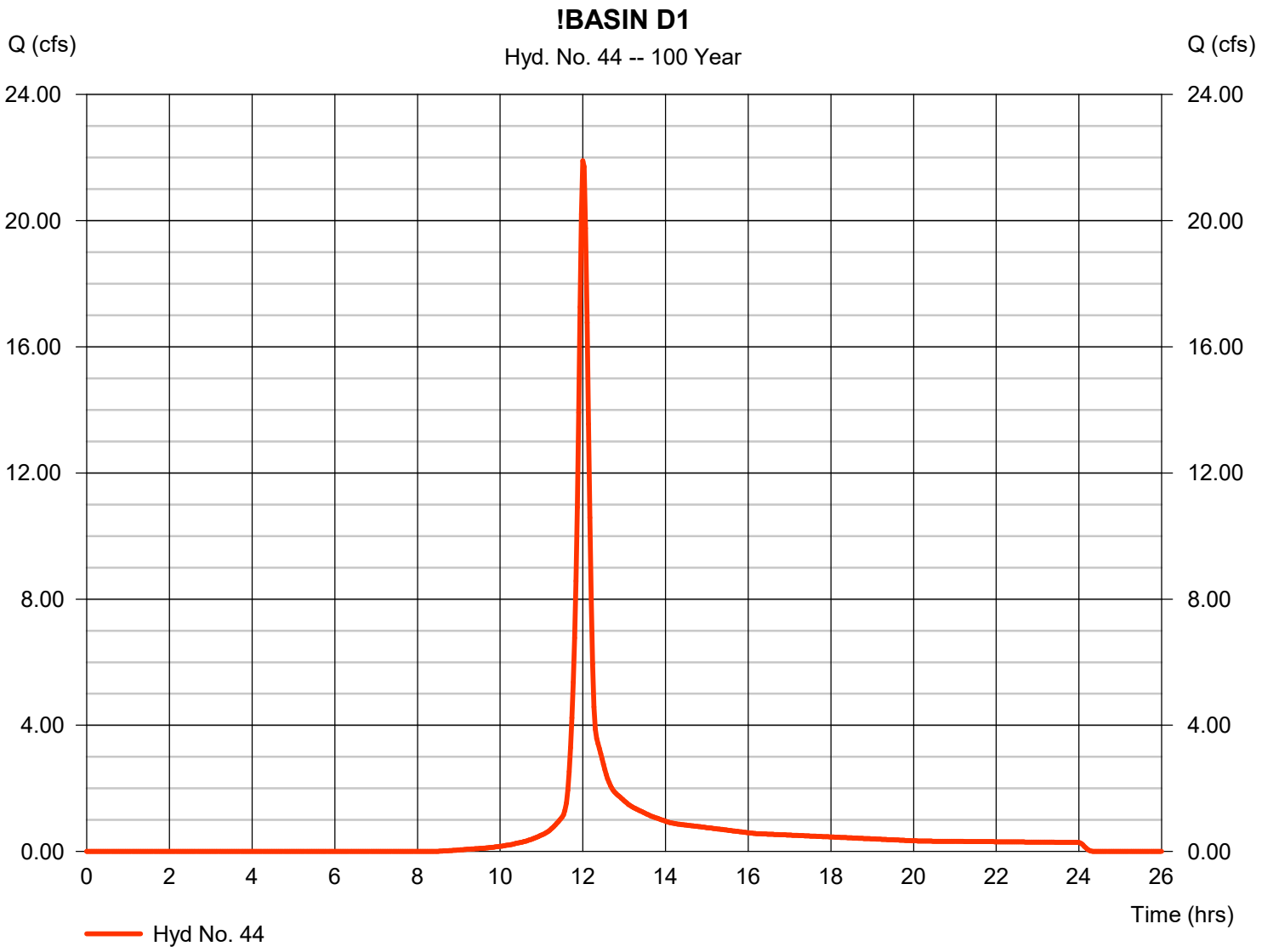
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 44

!BASIN D1

Hydrograph type	= SCS Runoff	Peak discharge	= 21.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 56,799 cuft
Drainage area	= 4.200 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



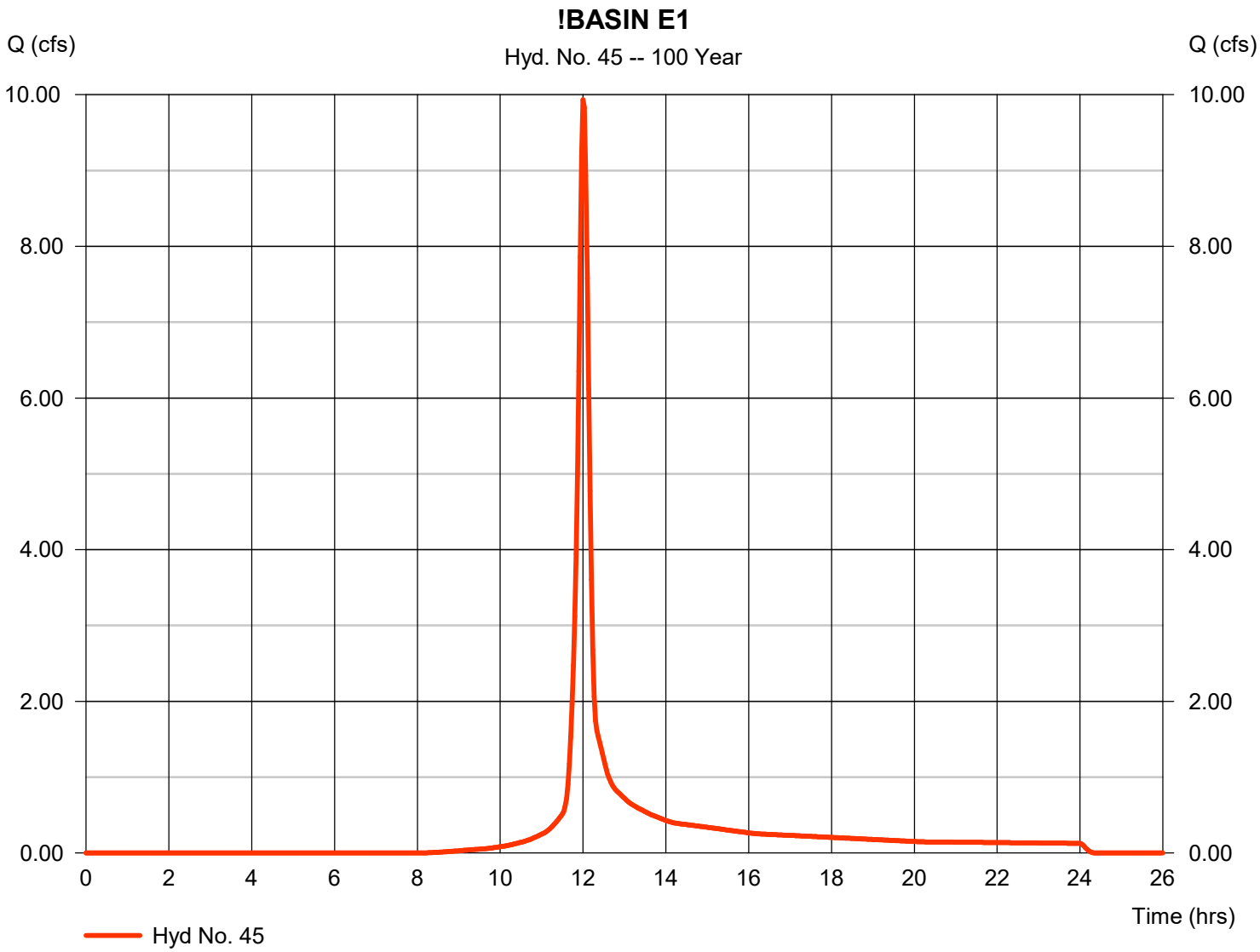
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 45

!BASIN E1

Hydrograph type	= SCS Runoff	Peak discharge	= 9.933 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 25,751 cuft
Drainage area	= 1.850 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

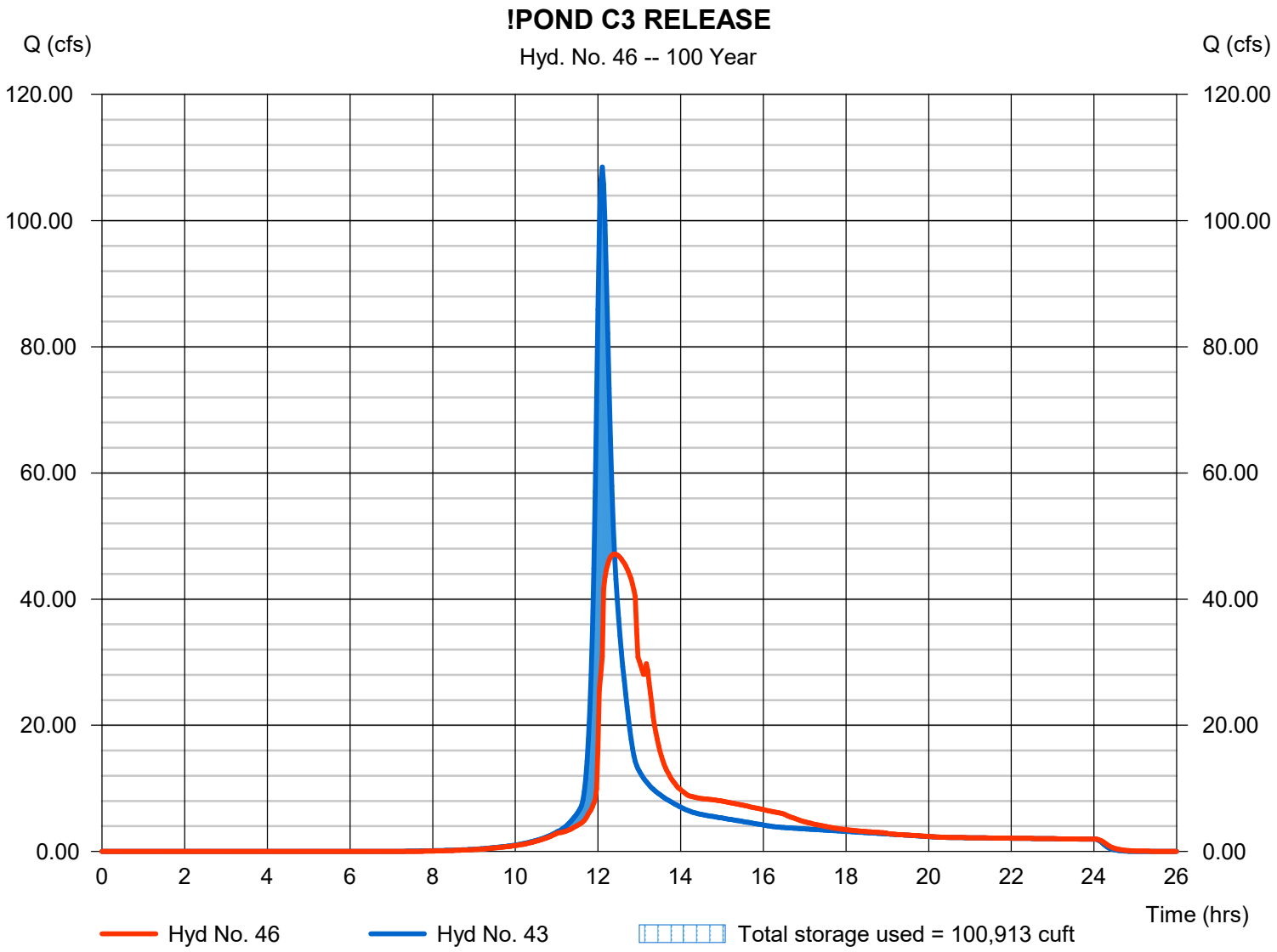
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 46

!POND C3 RELEASE

Hydrograph type	= Reservoir	Peak discharge	= 47.14 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.40 hrs
Time interval	= 2 min	Hyd. volume	= 388,808 cuft
Inflow hyd. No.	= 43 - REACH TO POND C3	Max. Elevation	= 941.49 ft
Reservoir name	= POND C3	Max. Storage	= 100,913 cuft

Storage Indication method used.



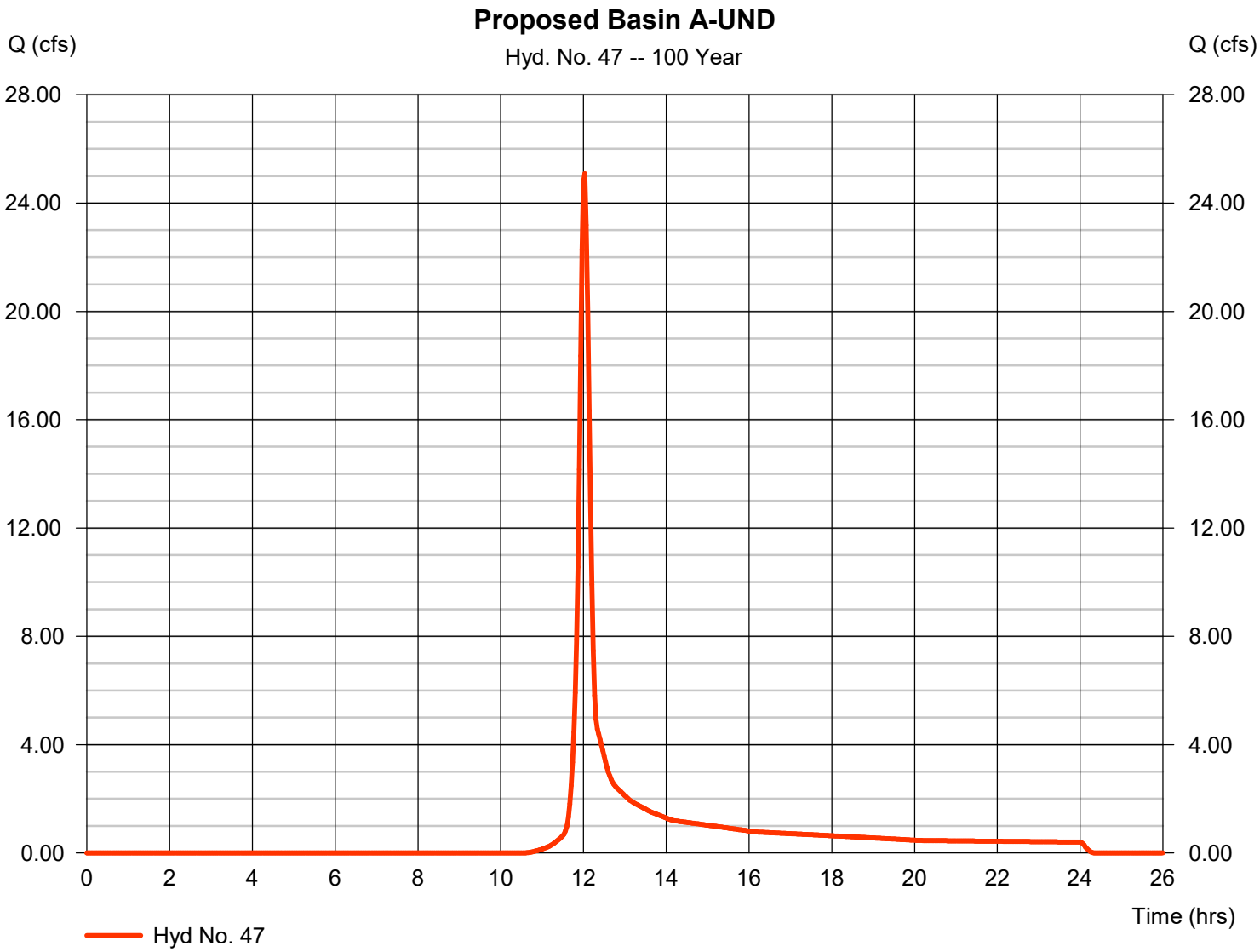
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 47

Proposed Basin A-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 25.09 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 66,490 cuft
Drainage area	= 7.130 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



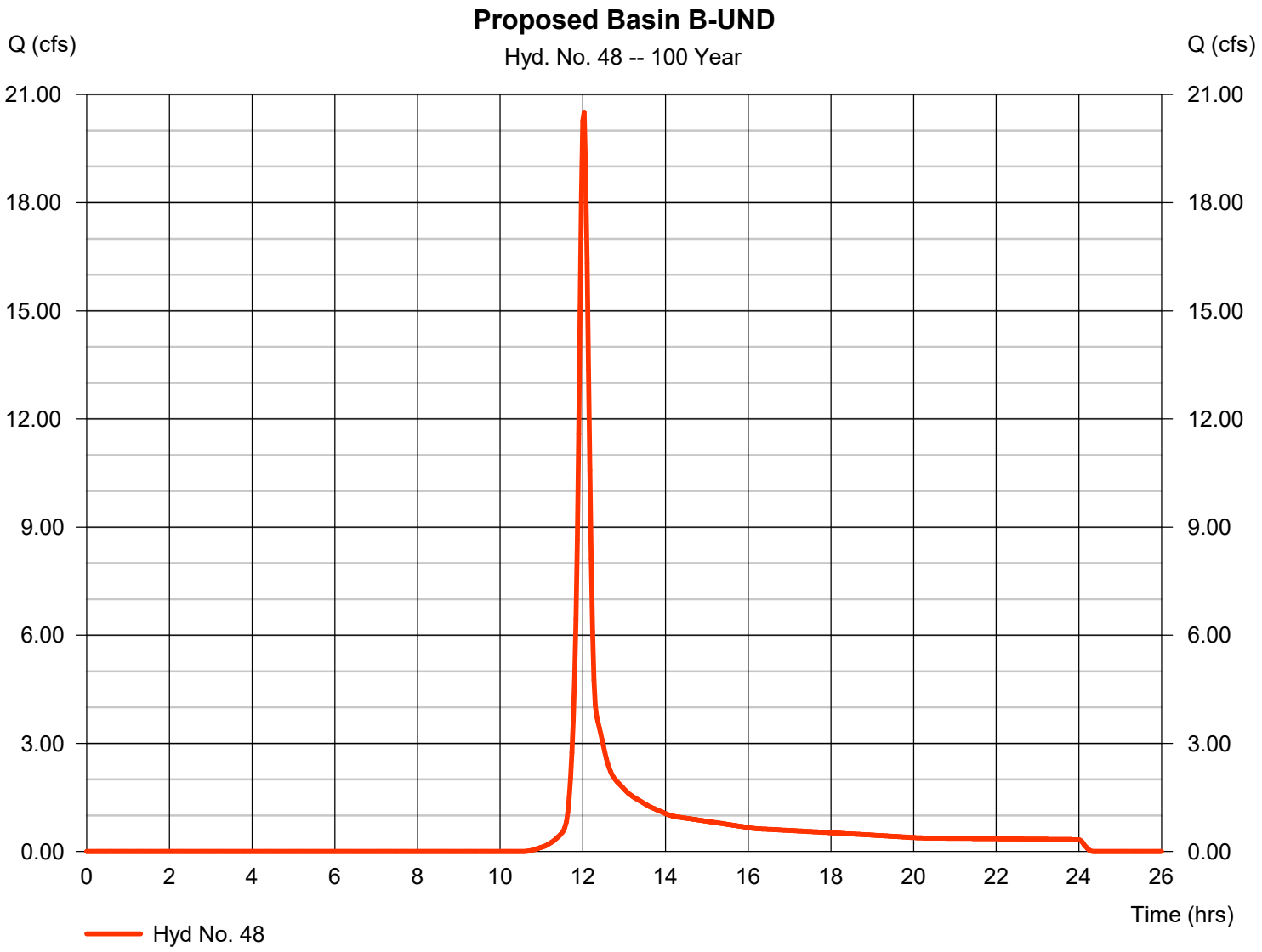
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 48

Proposed Basin B-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 20.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 54,367 cuft
Drainage area	= 5.830 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



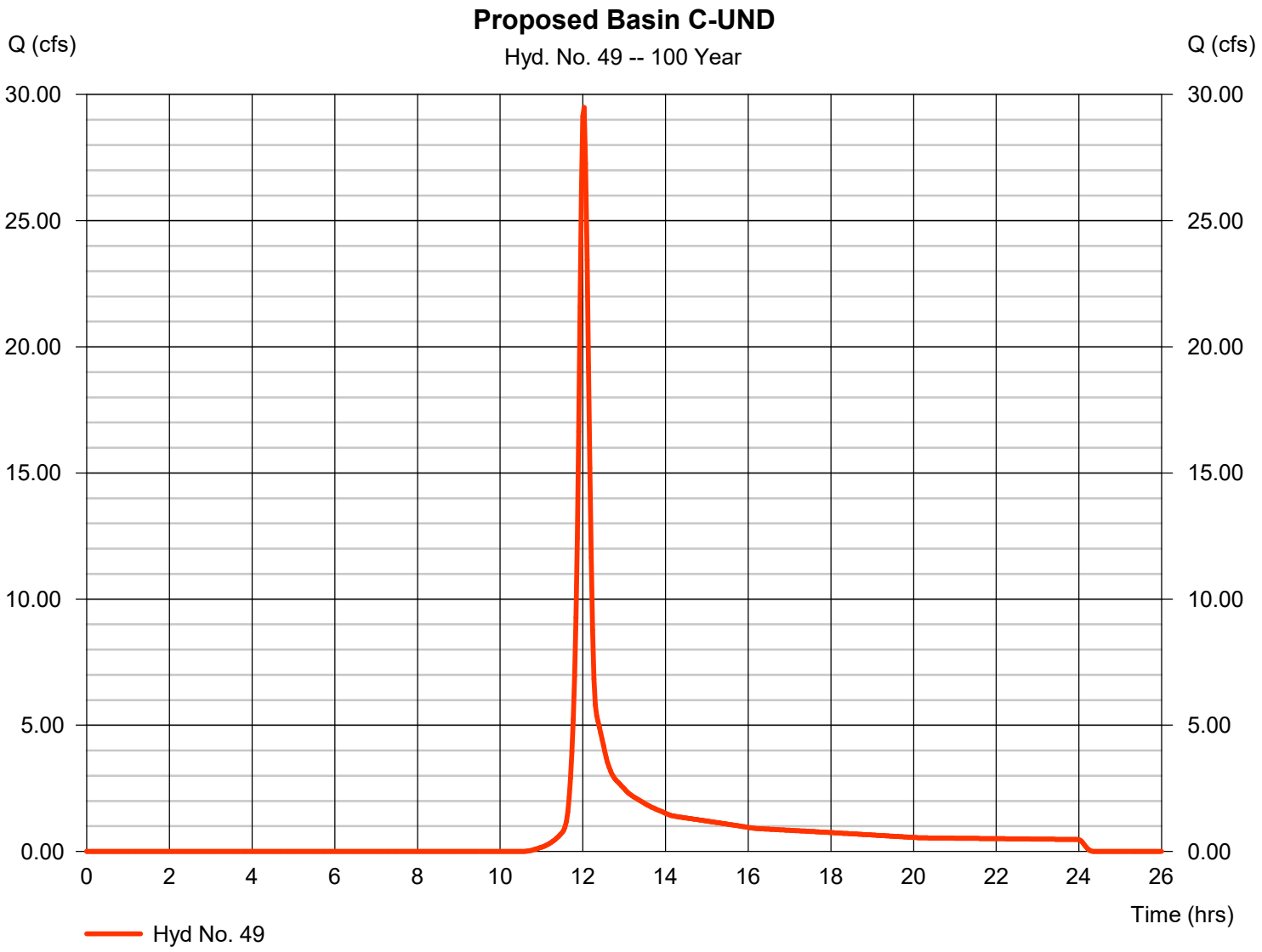
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 49

Proposed Basin C-UND

Hydrograph type	= SCS Runoff	Peak discharge	= 29.49 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 78,147 cuft
Drainage area	= 8.380 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.12 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

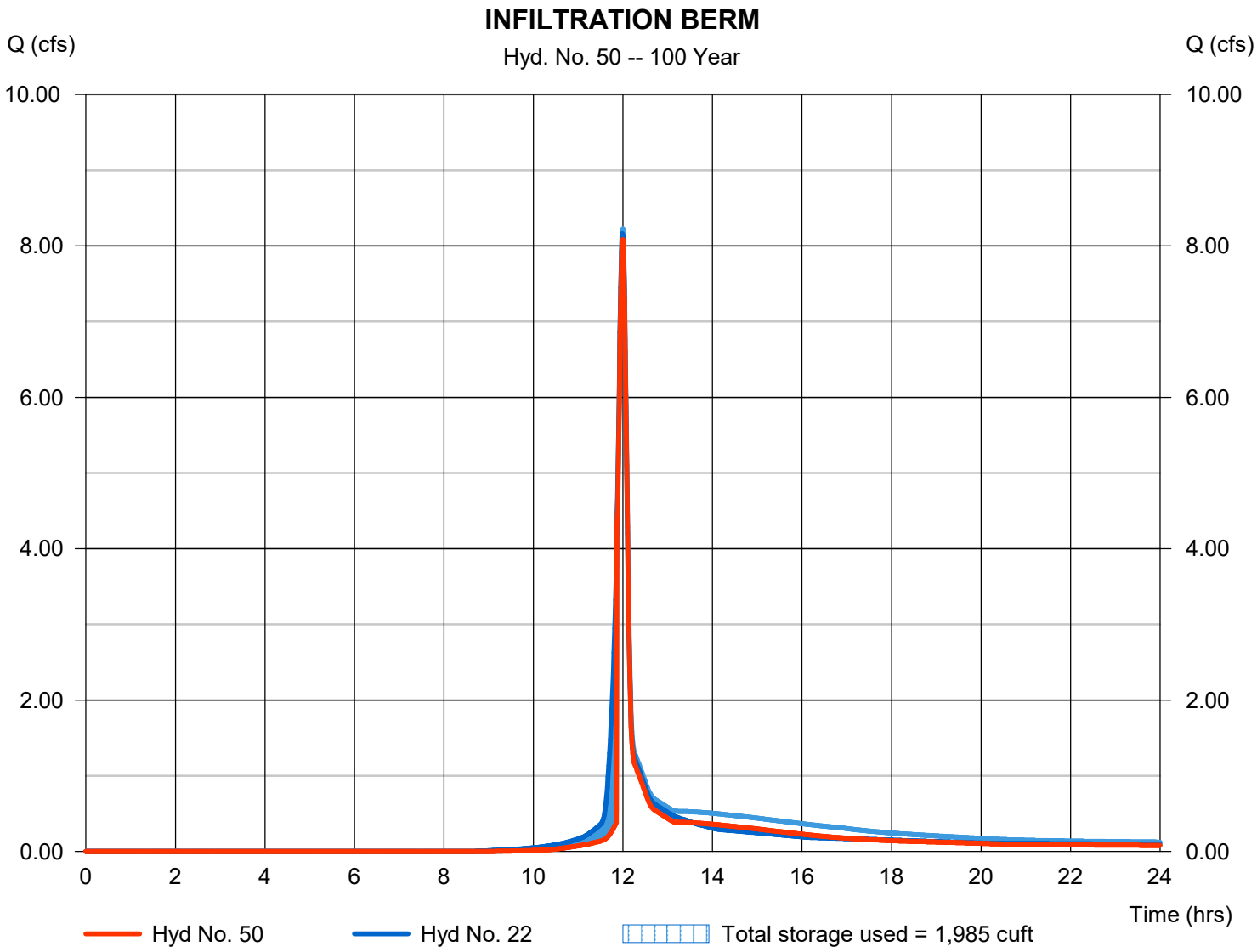
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 50

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 8.081 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 16,431 cuft
Inflow hyd. No.	= 22 - PROPOSED BASIN B (LOTS 10-11)	Max. Elevation	= 946.56 ft
Reservoir name	= LOT 10 11	Max. Storage	= 1,985 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

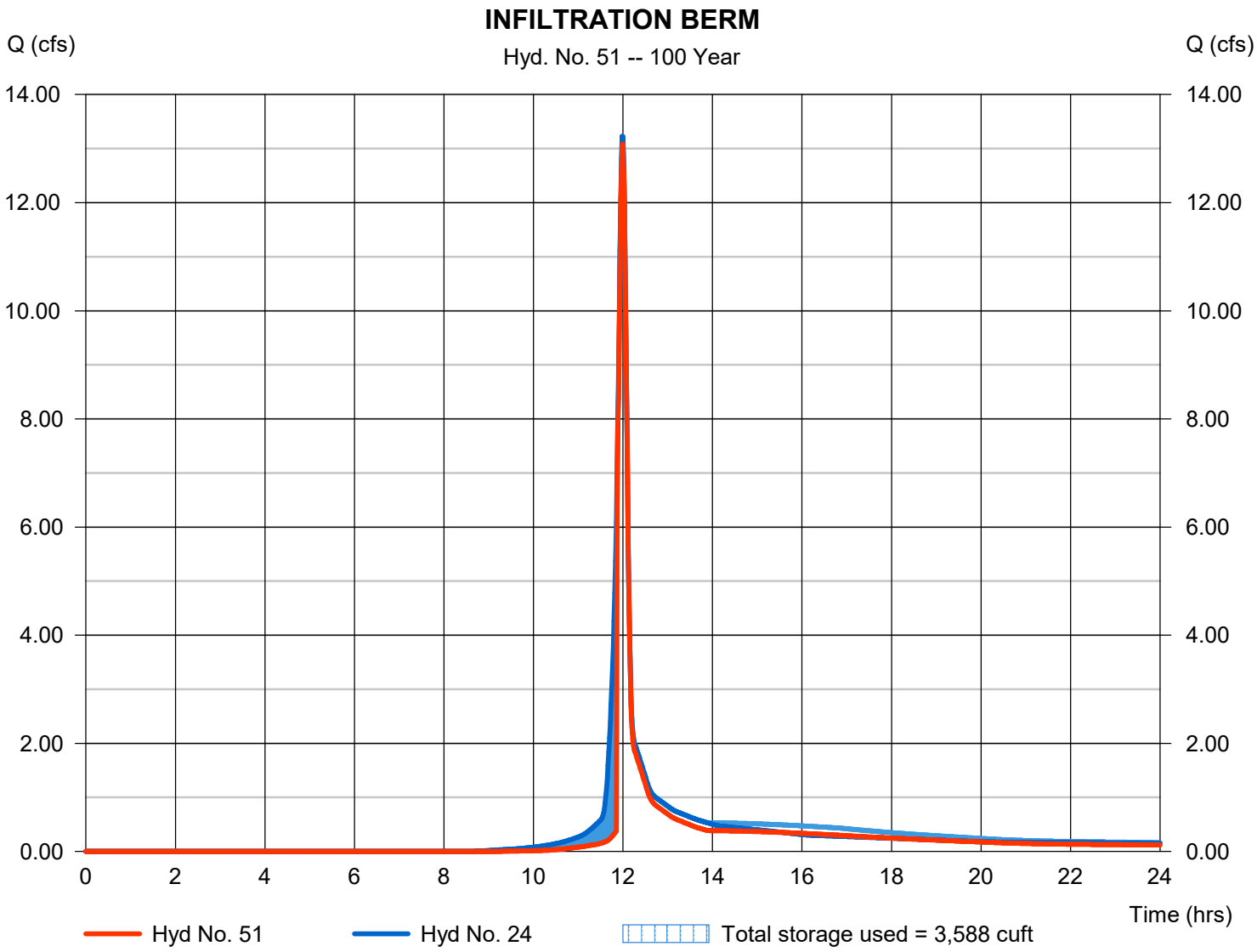
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 03 / 13 / 2020

Hyd. No. 51

INFILTRATION BERM

Hydrograph type	= Reservoir	Peak discharge	= 13.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 25,027 cuft
Inflow hyd. No.	= 24 - PROPOSED BASIN B (LOTS 51-52)	Max. Elevation	= 941.55 ft
Reservoir name	= LOT 51 52	Max. Storage	= 3,588 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	24.1705	5.1000	0.7018	--------
2	28.3435	5.1000	0.7022	--------
3	0.0000	0.0000	0.0000	--------
5	35.4692	5.3000	0.7016	--------
10	37.2537	4.6000	0.6755	--------
25	41.3346	4.1000	0.6540	--------
50	42.6141	3.5000	0.6290	--------
100	45.5234	3.3000	0.6151	--------

File name: Region 8.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.77	3.60	2.94	2.52	2.22	1.99	1.81	1.67	1.55	1.45	1.36	1.29
2	5.59	4.21	3.45	2.95	2.60	2.33	2.12	1.95	1.81	1.70	1.60	1.51
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.91	5.23	4.29	3.68	3.24	2.91	2.65	2.44	2.27	2.12	2.00	1.89
10	8.08	6.09	4.99	4.28	3.78	3.40	3.10	2.86	2.67	2.50	2.35	2.23
25	9.75	7.32	6.00	5.16	4.56	4.11	3.76	3.47	3.24	3.04	2.87	2.72
50	11.09	8.29	6.80	5.85	5.18	4.68	4.29	3.97	3.71	3.49	3.30	3.13
100	12.39	9.27	7.62	6.56	5.82	5.27	4.84	4.48	4.19	3.95	3.73	3.55

Tc = time in minutes. Values may exceed 60.

Precip. file name: S:\ELT\Hydraflow Rainfall Data\Region 8\Region 8.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.67	3.08	1.25	3.81	4.46	5.44	6.26	7.12
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.69	0.00	2.11	3.90	2.99	6.00	3.83

SECTION 9
Supplemental SWMP Documents

Contents

- Soil Management Plan
- Maintenance Plan

MAINTENANCE PLAN

The Contractor is required to maintain all temporary erosion control measures in proper working order, including cleaning, repairing, and replacing them as needed throughout construction. Once the project is completed and all permanent cover is established the erosion control measures will be removed. Onsite storm sewers and ponds will require periodic maintenance by the owner. Until the properties are developed it will be the responsibility of the developer to maintain all BMPs. Once construction is complete, it will be the responsibility of the HOA to maintain the detention areas.

Maintenance practices followed by the Contractor during construction of the project are as follows:

1. All control measures shall be inspected every 7 calendar days. Contractor is to verify that all erosion control measures are in proper working order.
2. Inspection reports shall be completed in accordance of the General Permit No. 2.
3. The Contractor/Owner or representative thereof will be responsible for conducting inspections to insure the SWPPP document is be complied with. They will also ensure that water quality and erosion control measures put in place are in proper working order. This person must also have an acceptable level of knowledge regarding equipment and materials used to manage sediment control.

Permanent maintenance conducted post construction by the owner shall include the following:

1. Visual inspection of the site to ensure that no erosion is occurring.
2. Visual inspections of onsite storm sewer during rainfall event to insure they are properly working.
3. Removal of any sediment that has collected in designated storm water detention/ retention areas and remove any debris that may have blocked the outlet orifices.
4. Repair or replacing any damaged structures designed to control storm water runoff, and provided water quality measures for the site.
5. Regularly mow lawn area. No mowing of the native areas.
6. Clear detention facilities of any volunteer trees.
7. Complete annual inspections of detention facilities, and maintain reports for 3 years.

SOIL MANAGEMENT PLAN

EXISTING SITE CONDITIONS

Existing site conditions consist of open lawn. The Soil survey for this site shows that the following soils are present on site:

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
27B	Terril loam, 2 to 6 percent slopes	B	15.2	9.1%
34C	Estherville sandy loam, 2 to 6 percent slopes	A	0.2	0.1%
135	Coland clay loam, 0 to 2 percent slopes, occasionally flooded	C/D	32.3	19.3%
175	Dickinson fine sandy loam, 0 to 2 percent slopes	A	3.0	1.8%
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	A	6.7	4.0%
1585	Spillville-Coland complex, channeled, 0 to 2 percent slopes	B/D	4.7	2.8%
L55	Nicollet loam, 1 to 3 percent slopes	B/D	0.2	0.1%
L62D2	Storden loam, Bemis moraine, 10 to 15 percent slopes, moderately eroded	B	5.8	3.5%
L62E2	Storden loam, Bemis moraine, 10 to 22 percent slopes, moderately eroded	B	42.2	25.3%
L62F	Belview loam, Bemis moraine, 15 to 30 percent slopes	B	7.5	4.5%
L107	Webster clay loam, Bemis moraine, 0 to 2 percent slopes	C/D	13.4	8.1%
L138B	Clarion loam, Bemis moraine, 2 to 6 percent slopes	B	11.7	7.0%
L138C	Clarion loam, Bemis moraine, 6 to 10 percent slopes	B	8.8	5.3%
L138C2	Clarion loam, Bemis moraine, 6 to 10 percent slopes, moderately eroded	B	14.9	8.9%
W	Water		0.2	0.1%
Totals for Area of Interest			**166.9**	**100.0%**

SOIL MANGMENT PLAN

Areas of soil and vegetation disturbances have been outlined in the construction plans. Topsoil stockpile locations and areas of staging have been established to minimize activities detrimental to soil health. Topsoil will be stripped from the site prior to grading and stockpiled on site. The Contractor will follow the best management practices during construction to maintain soil health. In order to improve on site conditions, the contractor will strip the available topsoil from the site and haul it to the stockpile. Once construction is complete topsoil will be hauled back to the site and respread throughout the site. The topsoil will be backfilled loose without compaction.

SOIL QUALITY RESORATION

Soil quality restoration (SQR) will be completed per method 4. The top 8 inches of the surface will be tilled to achieve the desired 40 percent void space in the soil on all lots. No compost will be added as the organic matter is assumed to be 4% per SUDAS. Note that the minimum allowed per ISWMM is 2%.

Site SQR = 289,269 cu-ft (assumed 4%SOM)

Extended Detention also provided in various detention basins.

TOTAL Site WQv = **289,269 cu-ft** vs. Required 85,734 cu-ft

SITE VEGITATION AND COVER

All disturbed areas outside of the residential lots will be seeded with a native grass seed mixture. The ROW will be seeded with Type-2, and the lots will be seeded with a temporary mix consisting of rye grass. Erosion control measures will be left in place until the seed is well established. Seed rates are as follows from tables 9010.06 and 9010.04 from the 2014 SUDAS Standard Specifications.

Table 9010.04: Native Grasses

Common Name	Scientific Name
Big bluestem*	Andropogon gerardii
Blue grama	Bouteloua gracilis
Blue-joint grass	Calamagrostis Canadensis
Bottlebrush sedge	Carex hystericina
Buffalograss*	Buchloe dactyloides
Common rush	Juncus effusus
Fowl bluegrass	Poa palustris
Fowl manna grass	Glyceria striata
Fox sedge	Carex vulpinoidea
Green bulrush	Scirpus atrovirens
Hairy wood chess	Bromus purgans
Indiangrass*	Sorghastrum nutans
Intermediate wheatgrass	Agropyron intermedium
Little bluestem*	Andropogon scoparius
Prairie dropseed	Sporobolus heterolepis
Reed manna grass	Glyceria grandis
Rice cutgrass	Leersia oryzoides
Rye grass, annual	Lolium italicum
Sand bluestem*	Andropogon gerardii, var. paucipilus
Sand dropseed	Sporobolus cryptandrus
Sand lovegrass	Eragrostis trichodes
Sideoats grama*	Bouteloua curtipendula
Slender wheatgrass	Agropyron trachycaulum, var. unilaterale
Spike rush	Eleocharis palustris
Softstem bulrush	Schoenoplectus tabernaemontani
Switchgrass*	Panicum virgatum
Tussock sedge	Carex stricta
Virginia wild-rye	Elymus virginicus
Weeping lovegrass	Eragrostis curvula
Western wheatgrass*	Agropyron smithii
Wool grass	Scirpus cyperinus

Table 9010.06: Type 1 Seed Mixture[1]

Common Name	Application Rate lb/acre
Kentucky bluegrass cultivar[2]	65
Kentucky bluegrass cultivar[2]	65
Kentucky bluegrass cultivar[2]	65
Creeping red fescue	25
Fine-leafed perennial ryegrass[3]	20
Fine-leafed perennial ryegrass[3]	20
Annual ryegrass	40

[1] A commercial mixture may be used if it contains a high percentage of similar bluegrasses; it may or may not contain Creeping Red Fescue.
[2] Choose three different cultivars of Kentucky Bluegrass.
[3] Choose two different cultivars of Fine-Leafed Perennial Ryegrass, at 20 pounds/acre each.

Intensive Phase I Archaeological Investigation of Areas Deemed to Have Prehistoric Burial Potential at the Proposed Story County Dotson Farms Residential Subdivision, Section 7, T84N, R24W, Franklin Township, Story County, Iowa

CRM Report 102 – March 26, 2020

Prepared For:
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Prepared By:
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(Principal Investigator)
and
Kurtis Kettler
(Graphics)

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, subsection 20 of the Iowa Code.

IMPACT7G

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Abstract

This report presents the results of a Phase I archaeological survey conducted for Quarry Estates, LLC of Ames, Iowa by Impact7G, Inc. of Clive, Iowa. This survey was conducted to determine if prehistoric burial locations occur in areas identified by the Office of the State Archaeologist as having potential for prehistoric burials at the proposed Story County Dotson Farms Residential Subdivision north of Ames, Iowa. The project area encompasses approximately 5.4 ha (13.3 ac) in Section 7, T84N, R24W, Franklin Township, Story County, Iowa. The project area is positioned on upland and glacial outwash landforms in the Des Moines Lobe physiographic region.

No previously recorded archaeological sites occur in the project area and the area has not been previously surveyed. Historic maps and aerial photographs identified no potential historic resources within the project area. Soil survey data suggest that the project area occurs on upland and glacial outwash landforms. Available county histories identify no significant individuals or activities associated with the project area. Additional data sources provided by the Office of the State Archaeologist identified no known historic Native American locations in the Historic Indian Location Database or otherwise "notable locations" within the project area.

Field survey was conducted by Branden K. Scott (principal investigator) and field technician Eric Lindeen on March 20, 2020. Three soil profiles were recorded within the project area. Soil profiles indicated that plowing and erosion have truncated the B horizon in upland locations. While archaeological sites could occur, disruptions to the soil profiles indicate that they are unlikely to be significant. The project area occurred on upland landforms covered with grass and within an agricultural field. Pedestrian survey was conducted across the project area and no prehistoric earthworks were identified. Pedestrian survey was conducted at 15 m (49.2 ft) intervals in the agricultural field. No archaeological sites were identified during pedestrian survey of the agricultural field. To locate archaeological sites in grass-covered areas, Impact7G, Inc. conducted shovel testing of upland shoulder and summit locations. Shovel tests followed the contours of the upland summits and shoulders and tests were spaced at 10 m (32.8 ft) intervals ($n = 64$). Backslopes were not subjected to shovel testing because these areas have low potential for archaeological sites and burials. Shovel tests were excavated in 10 cm levels and all sediment was screened through ¼" wire hardware cloth. Tests were excavated at least 15 cm into the underlying B horizon. One prehistoric site was identified. This investigation encountered no evidence of burials.

Archaeological site 13SR370 is an indeterminate prehistoric open habitation located on the summit of the northernmost ridge within the project area. Only one piece of prehistoric flaking debris was encountered, and it derived from plowzone contexts. The upland ridge had an Ap-Bt soil profile, indicating that plowing and erosion have affected this landform. Because artifacts were sparse and only found in plowzone contexts, this site is recommended not eligible of the National Register of Historic Places. No further archaeological work is recommended for site 13SR370.

Impact7G, Inc. recommends no additional archaeological work for the project area.

Introduction

This report presents the results of a Phase I archaeological survey conducted for Quarry Estates, LLC of Ames, Iowa by Impact7G, Inc. (Impact7G) of Clive, Iowa. This survey was conducted to determine if prehistoric burial locations occur in areas identified by the Office of the State Archaeologist (OSA) as having potential for prehistoric burials at the proposed Story County Dotson Farms Residential Subdivision north of Ames, Iowa. The project area encompasses approximately 5.4 ha (13.3 ac) in Section 7, T84N, R24W, Franklin Township, Story County, Iowa. The project area is positioned on upland and glacial outwash landforms in the Des Moines Lobe physiographic region (Prior 1991; Figure 1). Methods employed during this investigation are consistent with the National Historic Preservation Act (Advisory Council on Historic Preservation 1984, 1999), the Secretary of the Interior's Standards for the Identification of Historic Properties (National Park Service 1983), and guidelines for archaeological investigations in Iowa (Association of Iowa Archaeologists 2018). Furthermore, this investigation is consistent with Story County Land Development Regulations for land suitability/environmentally sensitive areas (Chapter 86.15.4(6). Notes, photographs, and all other records associated with this project are housed at Impact7G.

No previously recorded archaeological sites occur in the project area and the area has not been previously surveyed. Historic maps and aerial photographs identified no potential historic resources within the project area. Soil survey data suggest that the project area occurs on upland and glacial outwash landforms. Available county histories identify no significant individuals or activities associated with the project area. Additional data sources provided by the OSA identified no known historic Native American locations in the Historic Indian Location Database (HILD) or otherwise "notable locations" within the project area.

Field survey was conducted by Branden K. Scott (principal investigator) and Eric Lindeen on March 20, 2020. Recorded soil profiles (n = 3) indicated that plowing and erosion have truncated the B horizon throughout upland locations within the project area. The project area occurred in grass-covered areas and within an agricultural field. Pedestrian survey was conducted across the project area and no prehistoric earthworks were identified. Pedestrian survey was conducted at 15 m (49.2 ft) intervals in the agricultural field. No archaeological sites were identified during pedestrian survey of the field. To locate archaeological sites in grass-covered areas, Impact7G conducted shovel testing of upland shoulder and summit locations. Shovel tests followed the contours of the upland summits and shoulders and tests were spaced at 10 m (32.8 ft) intervals (n = 64). Backslopes were not subjected to shovel testing because these areas have low potential for archaeological sites and burials. Shovel tests were excavated in 10 cm levels and all sediment was screened through ¼" wire hardware cloth. Tests were excavated at least 15 cm into the underlying B horizon. One prehistoric site was identified. This investigation encountered no evidence of burials. Archaeological site 13SR370 is an indeterminate prehistoric open habitation located on the summit of the northernmost ridge within the project area. Only one piece of prehistoric flaking debris was encountered, and it derived from plowzone contexts. The upland ridge had an Ap-Bt soil profile, indicating that plowing and erosion have affected this landform. Because artifacts were sparse and only found in plowzone contexts, this site is recommended not eligible of the National Register of Historic Places (NRHP). No further archaeological work is recommended for site 13SR370. Furthermore, no additional archaeological work is recommended for the project area.

Information contained in this report relating to the nature and location of archaeological sites is considered private, 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, subsection 20 of the Iowa Code.

Project Area Location

The project area occurs in northwest Story County in the Des Moines Lobe physiographic region (Prior 1991; Figure 1). The project area is positioned in the NW ¼, and the SW ¼, NW ¼, NE ¼, Section 7, T84N, R24W, Franklin Township, Story County, Iowa (Figure 2). The project area consists of four distinct areas that were identified by the OSA as locations with prehistoric burial potential. The entirety of the residential development was not included in this assessment. The project area occurs south of 170th Street and east of 500th Avenue (Figure 3). The project area encompasses 5.4 ha (13.3 ac) positioned primarily on higher topographic locations overlooking Squaw Creek to the west. Project plans indicate that a housing development will occur at this location. Because the project area occurs on upland and glacial outwash landforms, archaeological deposits at any vertical provenience might be affected by this undertaking.

Research Design

The purpose of an intensive Phase I archaeological investigation is to identify, delineate, and describe specific archaeological resources within a defined project area to ensure NRHP-eligible sites are not adversely affected by a specific undertaking. In Iowa, the Association of Iowa Archaeologists (2018) have outlined best-practices for research and this investigation adheres to those standards. According to the Secretary of the Interior's Guidelines for Identification:

> Intensive survey is most useful when it is necessary to know precisely what historic properties exist in a given area or when information sufficient for later evaluation and treatment decisions is needed on historic properties. Intensive survey describes the distribution of properties in an area; determines the number, location, and condition of properties; determines the types of properties actually present within the area; permits classification of individual properties; and records the physical extent of specific properties (National Park Service 1983).

Impact7G utilizes a mixture of historic documentation, site records data, and geologic/topographic information to predict potential for archaeological resources. These predictions are then tested by mixed geomorphological and archaeological field investigations. Impact7G focuses on the geologic environment containing archaeological resources to locate and evaluate archaeological properties and we cater field investigations to local geomorphological conditions. Local geomorphology and site formation processes are responsible for burial, preservation, and destruction of archaeological resources and these same processes affect our ability to locate sites. Geologic environments also weigh heavily on human settlement decisions and they affect locations/types of plant and animal communities. Utilizing geomorphological data can aid in predicting site locations in relation to area landforms, as has been demonstrated throughout Iowa alluvial environments (e.g., Bettis and Benn 1984; Bettis et al. 1992; Bettis and Thompson 1981; Bettis et al. 1996) and upland landscapes (e.g., LANDMASS site suitability model). Focusing on local geologic conditions can lead to identification of post-settlement alluvium (PSA), disturbances, manipulated landscapes, and buried surfaces. An understanding of local geology also provides an archaeologist the ability to make informed decisions regarding where and how deep to conduct subsurface testing. Geological data greatly weigh on a site's context/artifact associations and utilizing these data can aid in determining NRHP eligibility at the intensive Phase I level.

Environmental and Geomorphological Context

Physiographic Region

The project area is positioned in Prior's (1991) Des Moines Lobe physiographic region (Figure 1). The Des Moines Lobe represents Iowa's youngest glacial landscape. This region was formed when the Wisconsinan Laurentide ice sheet extended into Iowa approximately 14,000 years ago (Kemmis et al. 1981). Upland terrain in the region is dominated by glacially deposited materials known as the "Dows Formation" (Hoyer 1980; Kemmis et al. 1981; Ruhe 1969). The Dows Formation consists of four members: the Alden Member represented by ground moraine till, the Morgan Member represented by end/lateral moraines, the Pilot Knob Member associated with kames and eskers, and the Lake Mills Member which is associated with glacial lakes. Major glacial ice advances/retreats are marked by the Bemis, Altamont, and Algona moraines. The Des Moines Lobe has limited topographic relief and stream valleys have not incised as deeply as elsewhere in Iowa. The landscape has a ridge and swale topography that has created a hummocky surface with elevational highs and linked drainage-depression systems. Glacial features common to the region include kettle lakes, kames, eskers, moraines, depressions, and drained glacial lakes.

Another notable landform within the Des Moines Lobe is the Noah Creek Formation. This formation represents coarse-grained sand and gravels associated with outwash plains and outwash terraces (Bettis et al. 1996). These outwash deposits date to between 14,000 and 11,000 before present (BP). Noah Creek Formation terraces are also referred to as "Wisconsinan outwash terraces".

Upland Landscapes in Iowa

"Uplands" refers to hills and bluffs throughout Iowa. Iowa's upland landscape did not result from tectonic uplift. Instead, the uplands were formed through a mixture of glacial till deposition and stream valley incision. Ruhe (1969) identified five upland components: summit, shoulder, backslope, footslope, and toeslope. Upland summit, shoulder, and backslope components tend to be erosional. In plowed landscapes, archaeological sites are usually visible on the surface of these upland components and summit and shoulder locations often have potential for archaeological sites. Van Nest (1993, 2002) has demonstrated that intact archaeological materials can be shallowly buried in these types of upland components. Backslopes often lack significant archaeological sites because degree of slope tends to limit extended settlement and erosion often affects artifact context and associations. Footslope and toeslope components tend to be comprised of materials derived from higher upland positions, making these locations depositional in nature. Intact archaeological sites can be found in these locations. Historic Euro-American sites can occur on any upland component. Most uplands in Iowa have been subjected to historic agricultural pressures, which has lowered the potential for intact archaeological materials.

Regional Topography and Geomorphology

The topographic map depicts the project area on high upland summits along the eastern valley wall of Squaw Creek (Figure 2). Backslopes adjoining the project area are relatively steep, offering the upland summit locations extended views of the stream valley. This type of landscape would be ideal for prehistoric settlement as well as potential locations for burials. Squaw Creek is positioned 485 m (1,591 ft) west of the project area. Squaw Creek flows southeast for approximately 14 km (8.7 mi) before draining into the South Skunk River on the south side of Ames. The project area resides between 293 and 299 m (960–980 ft) above mean sea level.

The LiDAR image shows the project area on elevated upland landforms and a possible higher outwash terrace overlooking the Squaw Creek floodplain (Figure 4). Steep backslopes border the project area, accentuating the elevational difference between the floodplain and the surrounding uplands. Agricultural terracing is visible in the southern portion of the project area. Given the surrounding slopes and erosion control measures, the project area likely has significant erosion of upland landforms.

Soil Survey Data

Soil survey data were obtained from the web application provided by the Natural Resources Conservation Service (2020), the paper soil survey compiled by DeWitt (1984), and information provided by Artz (2005). Described soils within the project area are detailed below and on Figure 5.

Table 1. Soil Survey Data

Symbol	Soil Series	Member/Landform	Description
L62D2	Storden loam, Bemis moraine, 10–16% slopes, moderately eroded	Alden	This is a strongly sloping, well drained soil found on convex sideslopes in the uplands. This soil formed in calcareous loamy glacial till under tall prairie grasses. Permeability is moderate and the available water capacity is high. The typical profile is Ap-Bk1-Bk2-C.
L62E2	Storden loam, Bemis moraine, 10–22% slopes, moderately eroded	Alden	This is a moderately steep, well drained soil found on convex sideslopes that border streams and upland drainageways. This soil formed in calcareous loamy glacial till under tall prairie grasses. Permeability is moderate and the available water capacity is high. The typical profile is Ap-Bk1-Bk2-C.
L138B	Clarion loam, Bemis moraine, 2–6% slopes	Alden	This is a gently sloping, well drained soil found on convex knolls on uplands. This soil formed in glacial till under tall prairie grasses. Permeability is moderate and the available water capacity is high. The typical profile is Ap-A1-A2-Bw1-Bw2-C1-C2.
L138C	Clarion loam, Bemis moraine, 6–10% slopes	Alden	This is a moderately sloping, well drained soil found on knolls on uplands and on convex sideslopes that border streams. This soil formed in glacial till under tall prairie grasses. Permeability is moderate and the available water capacity is high. The typical profile is Ap-A1-A2-Bw1-Bw2-C1-C2.
175	Dickinson fine sandy loam, 0–2% slopes	Noah Creek	This is a nearly level, somewhat excessively drained soil found on convex areas on stream terraces and uplands. This soil formed in glacial or alluvial deposits reworked by wind under tall prairie grasses. Permeability is moderately rapid to rapid and the available water capacity is low. The typical profile is Ap-A1-A2-Bw1-Bw2-BC-C.
175B	Dickinson fine sandy loam, 2–5% slopes	Noah Creek	This is a gently sloping, somewhat excessively drained soil found on convex mounds and dunes on stream terraces and uplands. This soil formed in glacial or alluvial deposits reworked by wind under tall prairie grasses. Permeability is moderately rapid to rapid and the available water capacity is low. The typical profile is Ap-A1-A2-Bw1-Bw2-BC-C.

The project area occurs on upland and glacial outwash landforms. Most of these areas represent summit locations and the edges of backslopes. Glacial outwash is confined to the southern project location. All the documented soil types are well drained and would make suitable locations for prehistoric occupations. Because there are no Holocene alluvial landforms in the project area, archaeological sites (if present) should occur in near surface contexts.

Use of soil survey data requires geomorphological field investigations for corroboration. While useful at a pre-field stage to identify landforms that might contain significant archaeological sites, soil types can be plotted incorrectly, or local conditions can create profiles that deviate from the "typical profile" outlined by the soil survey.

Historic and Current Land Uses

The earliest maps indicate the project area was covered with prairie grasses. Later aerial photographs and maps indicate that this location was under agricultural production. The project area is currently under grass with some agricultural cultivation.

Historic and Cultural Context

Iowa's prehistoric past is divided into four basic cultural periods, which divide further into regional traditions and phases. Taxonomic classifications are commonly defined by shared characteristics in material culture, space, time, and settlement-subsistence patterns. These cultural periods are used throughout the Midwest, Plains, and Eastern North America. Additionally, two historic-era periods are defined in Iowa. Ages are approximations because archaeologists are constantly refining temporal sequences and cultural periods/traditions do not mark rigid taxonomic groups.

Table 2. Archaeological Periods of Iowa

Cultural Period	Tradition	Radiocarbon Age BP*	Calendar Age
Paleoindian	Early Paleoindian Late Paleoindian	12,950–12,450 BP 12,450–10,450 BP	11,000–10,500 BC 10,500–8500 BC
Archaic	Early Archaic Middle Archaic Late Archaic	10,450–7450 BP 7450–4950 BP 4950–2750 BP	8500–5500 BC 5500–3000 BC 3000–800 BC
Woodland	Early Woodland Middle Woodland Late Woodland	2750–2150 BP 2150–1550 BP 1550–750 BP	800–200 BC 200 BC–400 AD 400–1200 AD
Late Prehistoric	Great Oasis Mill Creek Glenwood/Central Plains Oneota	1000–850 BP 950–750 BP 800–660 BP 900–250 BP	900–1100 AD 1000–1200 AD 1150–1290 AD 1050–1700 AD
Historic Native American/Contact	---	300–100 BP	1650–1850 AD
Historic Euro-American	---	100 BP–post Present	1850 AD–Present

* BP is "Before Present". Present is defined as 1950 AD based on the discovery of ^{14}C dating.

Site Records Data

Site records data provided by I-Sites Pro through the OSA was utilized to determine the presence of previously recorded archaeological sites, previous survey areas, notable locations, previously recorded architectural properties, NRHP-listed sites and districts, and documented historic Native American locations.

Current records available on I-Sites indicate that there are 10 previously recorded archaeological sites within a 1.6 km (1 mi) radius of the project area. These sites are summarized below.

Table 3. Previous Archaeological Surveys Near the Project Area

Site Number	Affiliation	Site Type	Landform	SHPO NRHP Eligibility	Reference
13BN281	Archaic, Woodland	Scatter	Outwash	No data	Ballard 1985a
13BN282	Prehistoric	Open habitation	Upland	No data	Ballard 1985b
13BN283	Prehistoric, Euro-American	Scatter, townsite	Mixed	No data	Ballard 1985c; Peterson 2004

Table 3. Previous Archaeological Surveys Near the Project Area					
Site Number	**Affiliation**	**Site Type**	**Landform**	**SHPO NRHP Eligibility**	**Reference**
13BN400	Euro-American	Farm/residence	Upland	No data	Marcucci 1999, Jonathan R. Sellars 2006a
13BN401	Prehistoric	Isolated find	Upland	No data	Marcucci 1999
13BN441	Prehistoric	Scatter	Upland	No data	Jonathan R. Sellars 2006b
13BN442	Prehistoric	Scatter/resource procurement	Upland	No data	Jonathan R. Sellars 2006c
13BN444	Prehistoric	Scatter/resource procurement	Upland	No data	Jonathan R. Sellars 2006d
13SR214	Euro-American	Scatter	Upland/outwash	Not evaluated	Morrow 2005
13SR215	Prehistoric	Isolated find	Upland	Not eligible	Morrow 2005

Five surveys are logged in I-Sites within a 1.6 km (1.0 mi) radius of the project area (Figure 2). The current project area has not been previously surveyed. Details about these surveys are presented below.

Table 4. Previous Archaeological Surveys Near the Project Area			
R&C Number	**Purpose of Survey**	**Landforms Encountered**	**Reference**
19881285005	Road improvement and bridge replacement	Mixed	Collins 1994; Hirst 1988
19960600058	Rural waterline	Mixed	Stemper 2002
19990608012	Bridge replacement	Mixed	Marcucci 1999
20060185009	Rural waterline	Mixed	Morrow 2005
20181185023	Water treatment plant	Upland	Stroh-Messerole and Whittaker 2018

No historic Native American (HILD database) or "notable locations" are documented on I-Sites databases within the project area. Additionally, there are no previously recorded architectural properties or NRHP-listed properties within the project area.

Buried Site Potential

The project area is positioned on upland landforms and glacial outwash terraces. Deeply buried archaeological sites are not anticipated at this location.

Historic Maps and Aerial Photographs

The 1847 General Land Office map depicts no historic resources in the project area (Figure 6). Additionally, no streams are depicted through the project area. Andreas (1875) depicts no historic resources or streams in the project area (Figure 7). Huebinger (1902) and Nevada Representative (1908) depicts no historic resources or streams in the project area (Figures 8 and 9). The Nevada Representative (1919), the Ames Daily Tribune (1926), and Hixson (1930) show no historic resources in the project area, but a couple of small streams are depicted close to the area to the north and west (Figures 10–12).

An attempt was made to locate former landowners in the available county history (Payne 1911). Landowners include S. G. Wheeler, Schuyler J. Wheeler, and Elisha F. Rainbolt. These landowners are not mentioned in the county history. No significant events are known to have occurred in the project area.

Aerial photographs from 1939, 1953, 1965, and 1971 were used to determine the historic nature of the project area (Figures 13–16). No buildings are indicated in the project area on these aerial photographs. The project area was a mix of cultivated agricultural land and pastures during the historic period.

Field Methods and Investigations

Geomorphological Methods and Results

The geomorphological investigation sought to map landforms within the project area, determine if buried soils exist, identify deflated prehistoric earthworks, and identify locations of past disturbances. Surface investigations were used to identify initial landform types within the project area. A ¾" soil probe was used to document profiles (*n* = 3; Figure 3). The results of soil profiles are presented below.

Profile Designation: Soil Profile 1; Archaeological Site 13SR370
Landscape Position: Upland summit
Method: Shovel test
Slope: 3–5%
Vegetation: Grass and snow, <25% GSV
Recorder: B. Scott, 3/20/2020
Comments: The B horizon has been truncated by plowing at this location. Intact archaeological sites are unlikely to occur.

Depth (cm)	Soil Horizon	Description
0–18	Ap	Brown (10YR 4/3) silt loam; massive structure; friable; abrupt boundary.
18–40+	Bt	Yellowish brown (10YR 5/4) sandy clay loam; moderate, fine subangular blocky structure; friable; frequent rock. End.

Profile Designation: Soil Profile 2
Landscape Position: Upland summit/sand dune
Method: Shovel test
Slope: 1–3%
Vegetation: Grass, <25% GSV
Recorder: B. Scott, 3/20/2020
Comments: This upland summit is covered with dune sands that likely originated during the late Pleistocene. Plowing and erosion have thinned dune sands, and some natural, glacial rock is present in the sands, likely the result of frost heaving.

Depth (cm)	Soil Horizon	Description
0–21	Ap	Very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) sand loam; massive structure; friable; abrupt boundary.
21–40+	Bw	Dark yellowish brown (10YR 4/4) loamy sand; weak, fine subangular blocky structure; friable. End.

Profile Designation: Soil Profile 3
Landscape Position: Upland summit/sand dune
Method: Shovel test
Slope: 0–2%
Vegetation: Grass, <25% GSV
Recorder: B. Scott, 3/20/2020
Comments: Plowing and/or landscape manipulation from agricultural terracing has truncated the B horizon at this location. Dune sand at this location likely originated during the late Pleistocene. Sand deposits are

thicker here than were observed in Soil Profile 2 and no rock was observed in any of the shovel tests on this ridge.

Depth (cm)	Soil Horizon	Description
0–10	Ap	Very dark grayish brown (10YR 3/2) loamy sand; massive structure; friable; abrupt boundary.
10–30+	Bw	Strong brown (7.5YR 4/6) medium-fine sand; weak, very fine subangular blocky structure; friable to loose. End.

Soil profiles in the uplands indicate that plowing has truncated the underlying B horizon. If present, archaeological sites should be visible in near surface contexts. No indication of prehistoric mound fill was observed in any of the profiles or shovel tests. The two prominent ridges that border the Squaw Creek valley have dune sands deposited across them. These sands were likely transported to the upland locations at the end of the Pleistocene when the Des Moines Lobe retreated from this area. Archaeological sites are unlikely to be buried below these sands.

Survey Methods

Weather conditions were cloudy with scattered rain. Temperatures during the survey were around -1.1 °C (30 °F). Most of the project area was found in grass-covered areas with thin amounts of snow blanketing the project area during the morning hours (<25% GSV; Figures 3 and 17–21). A small portion of the project area occurred in an agricultural field (80–90% GSV; Figures 3 and 22). Pedestrian survey was conducted in the agricultural field with transects spaced at 15 m (49.2 ft) intervals. In areas of reduced surface visibility, subsurface shovel testing was employed (n = 64; Figure 3). Shovel tests were spaced at 10 m (32.8 ft) intervals and they concentrated on the summit and shoulder positions of the upland landforms. Tests were excavated in 10 cm levels and all sediment was screened through ¼" wire hardware cloth. Testing ceased at least 15 cm into the underlying B horizon.

Constraints to Investigation and Deviations from Best-Practice Guidelines

Lack of reasonable GSV (<25%) is always a limiting factor in landscapes where archaeological materials might be visible in surface contexts. Much of the project area was covered with grass that limited surface visibility. Impact7G utilized systematic subsurface shovel testing to mitigate this limiting factor. This investigation did not deviate from Association of Iowa Archaeologists (2018) best-practice guidelines.

Results

Pedestrian survey of the agricultural field yielded no archaeological sites or evidence of burials. Subsurface shovel testing identified one prehistoric artifact on the northernmost ridge. This archaeological site is described in greater detail below. No evidence of prehistoric mounds or burials were encountered within the project area.

13SR370

Site Type: Open habitation
Affiliation: Indeterminate prehistoric
USGS 7.5' Quad: Ames, West 1975
Legal Location: NE ¼, NW ¼, NW ¼, Section 7, T84N, R24W, Franklin Township, Story County, Iowa (Figure 2)
UTM Coordinates: NAD83, Zone 15, 4,661,772 North, 442,612 East

Area: 620 m^2 (6,675 ft^2)
Mapped Soil Type(s): Storden loam, Bemis moraine, 10–22% slopes, moderately eroded (Symbol L62E2)
Elevation: 299 m (980 ft) above mean sea level
Nearest Water Source: Intermittent stream, 315 m (1,033 ft)
Disturbances: Plowing, erosion, wind deflation

Present Investigations: Impact7G researchers identified 13SR370 on March 20, 2020 during shovel testing of an upland ridge. At the time of investigation, the site was positioned on an upland summit covered with pasture grass (<25% GSV; Figures 17, 18, and 23). A soil profile was recorded at the site (Soil Profile 1 above) and it indicated that erosion and plowing has truncated the underlying Bt horizon, lessening the potential for intact archaeological sites. Subsurface shovel testing was conducted at 10 m (32.8 ft) intervals across the ridge summit and shoulders. Tests were excavated in 10 cm levels and all sediment was screened through ¼" wire hardware cloth. Tests were excavated at least 15 cm into the underlying Bt horizon. Of the 10 tests placed on the landform, only one was positive for prehistoric artifacts (Shovel Test A3; Figure 23). The recovered prehistoric artifact was obtained from the plowzone.

Artifact Analysis: Shovel Test A3 produced a single flake fragment from 10–20 cm within the Ap horizon (Figure 24). This flake fragment is a knapped piece of Croton chalcedonic chert. The flake fragment has a weight of 3.7 g, a length of 25.9 mm, a width of 17.5 mm, and a thickness of 10.2 mm. Additional information pertaining to this artifact is presented in Appendix B.

Interpretations: Prehistoric flaking debris rarely occurs in a vacuum, and while only one piece of flaking debris was recovered from shovel testing at this site, there are likely other artifacts at this site. No diagnostic artifacts were recovered; therefore, 13SR370 is considered an "indeterminate prehistoric" site. Resource procurement sites often yield a small quantity of artifacts and flaking debris tends to be small, typically the result of late-stage biface reduction and tool maintenance. The recovered flake fragment is relatively large, indicating that the recovered flake is more likely associated with early stage biface production or core reduction. This type of activity usually occurs at habitation sites. Because of the type of flake recovered, the site is interpreted as an "open habitation". The location of the site (prominent ridge overlooking a perennial stream valley) is also consistent with upland prehistoric habitation site locations throughout Iowa. Soils documented at this location indicate that the plowzone has truncated the underlying Bt horizon. As such, there is low potential for intact archaeological materials.

Recommendations: Impact7G recommends that 13SR370 is not eligible for the NRHP because artifacts are sparse and appear to be confined to plowzone contexts. No further archaeological work is recommended for this site.

Recommendations

No burial locations were identified. Archaeological site 13SR370 had artifacts confined to the plowzone of a heavily eroded upland ridge. Site 13SR370 is recommended not eligible for the NRHP. Impact7G recommends no additional archaeological work for the project area.

Despite our best efforts, archaeologists have not devised survey and testing methods that can guarantee all archaeological sites will be identified within a project area all the time. If unanticipated archaeological sites are encountered during earthmoving/development, activities should cease, and the overseeing Federal/State agency should be contacted as well as the State Historic Preservation Office at (515) 281-5111. The developer is responsible for protecting cultural resources from additional disturbance until a professional examination is made and permission to proceed with development is granted by the overseeing

Federal/State agency and State Historic Preservation Office. Human burials are protected by Iowa law (Chapter 716.5, Iowa Code). If human remains are encountered, take measures to secure the find(s) and contact the State Medical Examiner at (515) 725-1400 or city, county, or state law enforcement agencies. If human remains are suspected to be 150 years old or older, also contact the Bioarchaeology Program at the Office of the State Archaeologist at (319) 384-0740.

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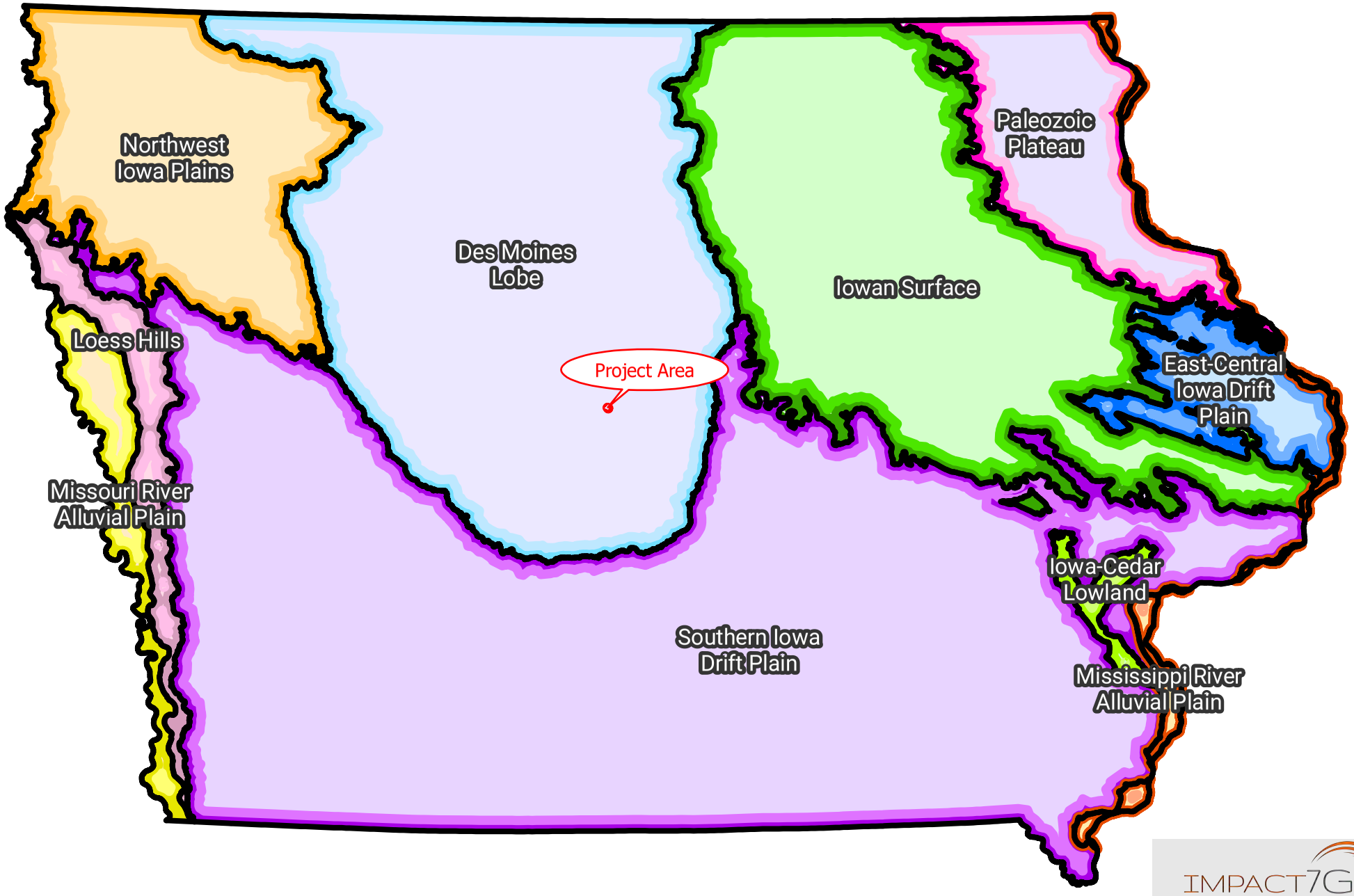
Figures

Figure 1. Physiographic location of the project area

Project Area



IMPACT7G

0 10 20 Miles

0 20 40 Kilometers

Created by: K. Kettler 3/24/2020

Figure 2. Topographic location of the project area

Project Area
Previous Survey
Site Boundary

Not for public distribution. May contain confidential site information.

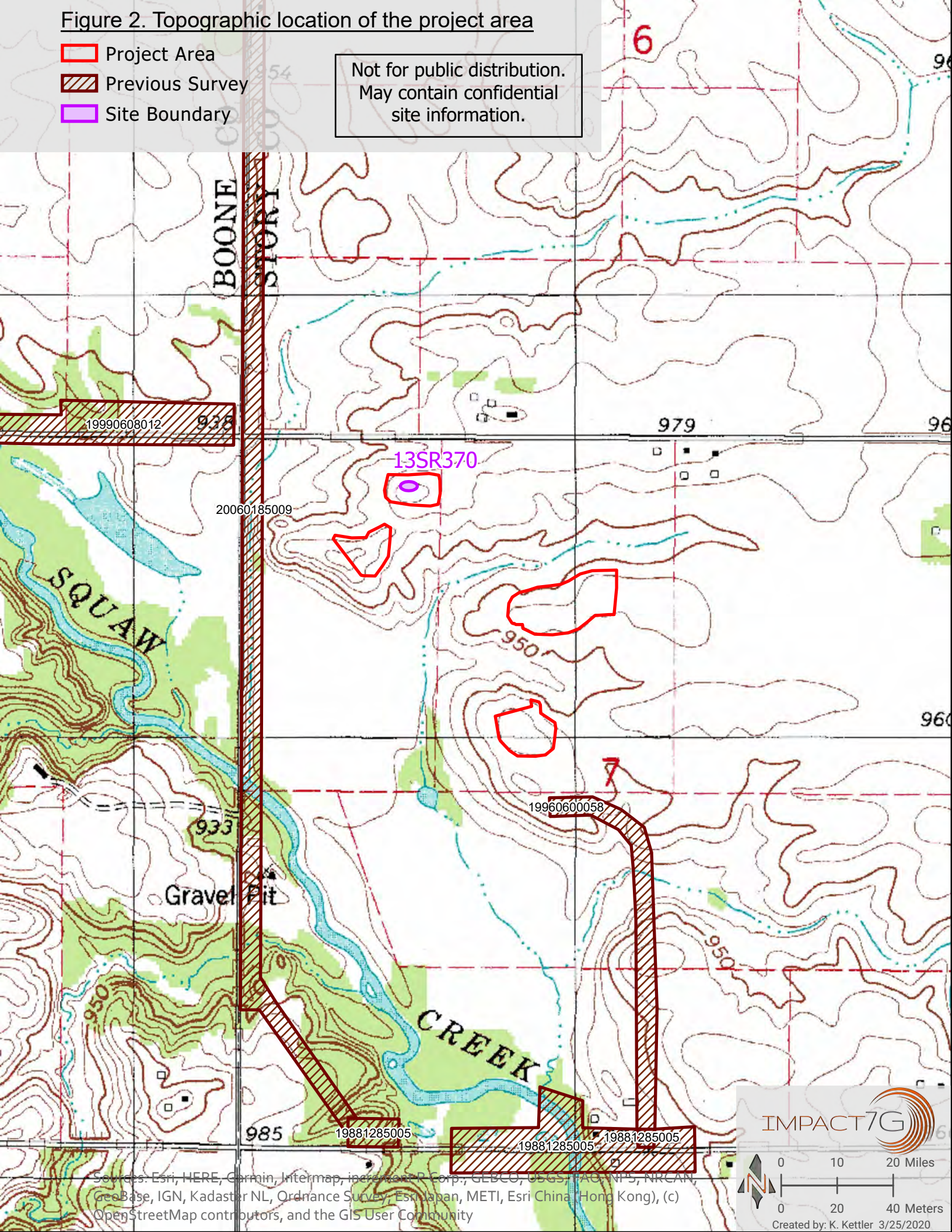


Figure 3. Scale map of the project area

Project Area
Site Boundary
Soil Profile
Shovel Test
Positive
Negative

Not for public distribution. May contain confidential site information.

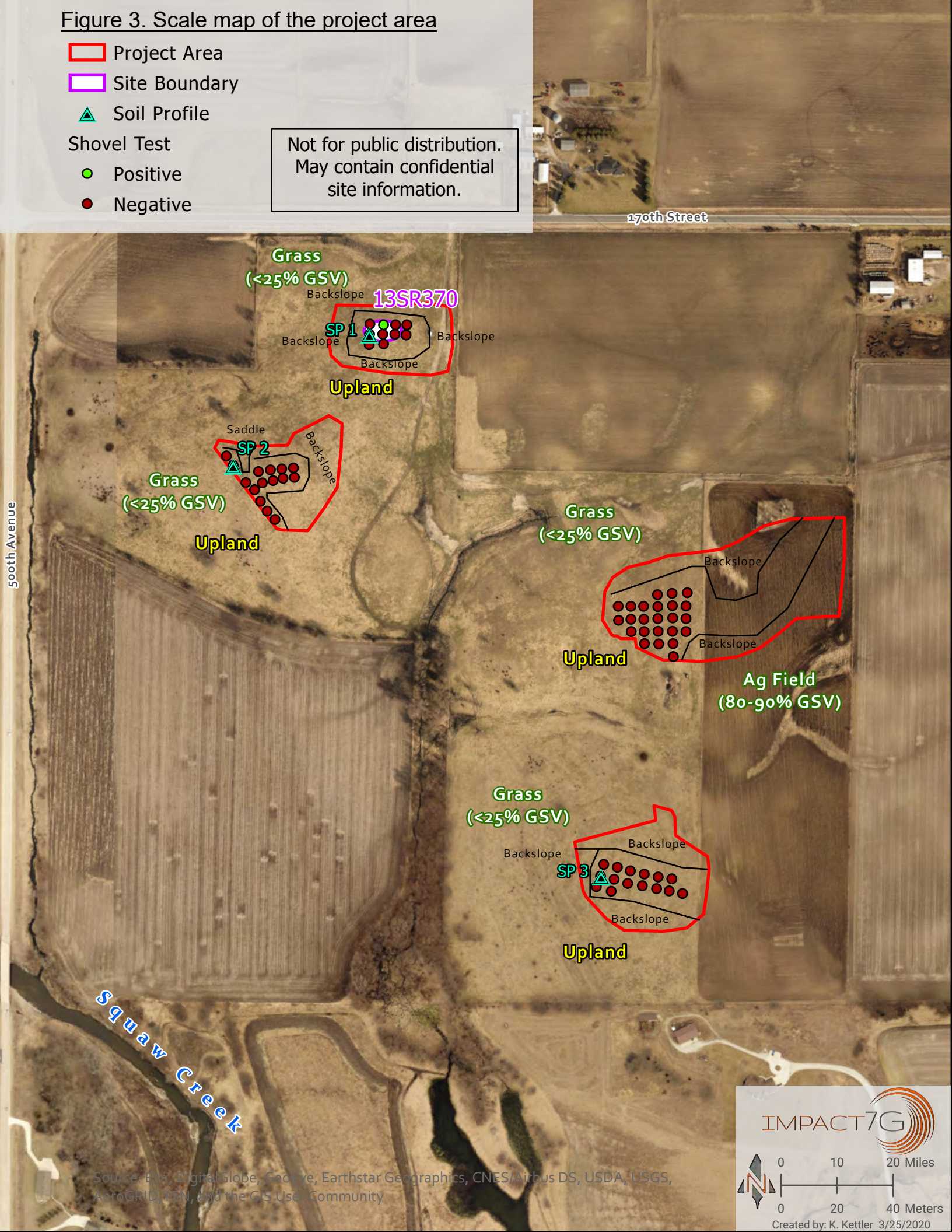


Figure 4. LiDAR image of the project area

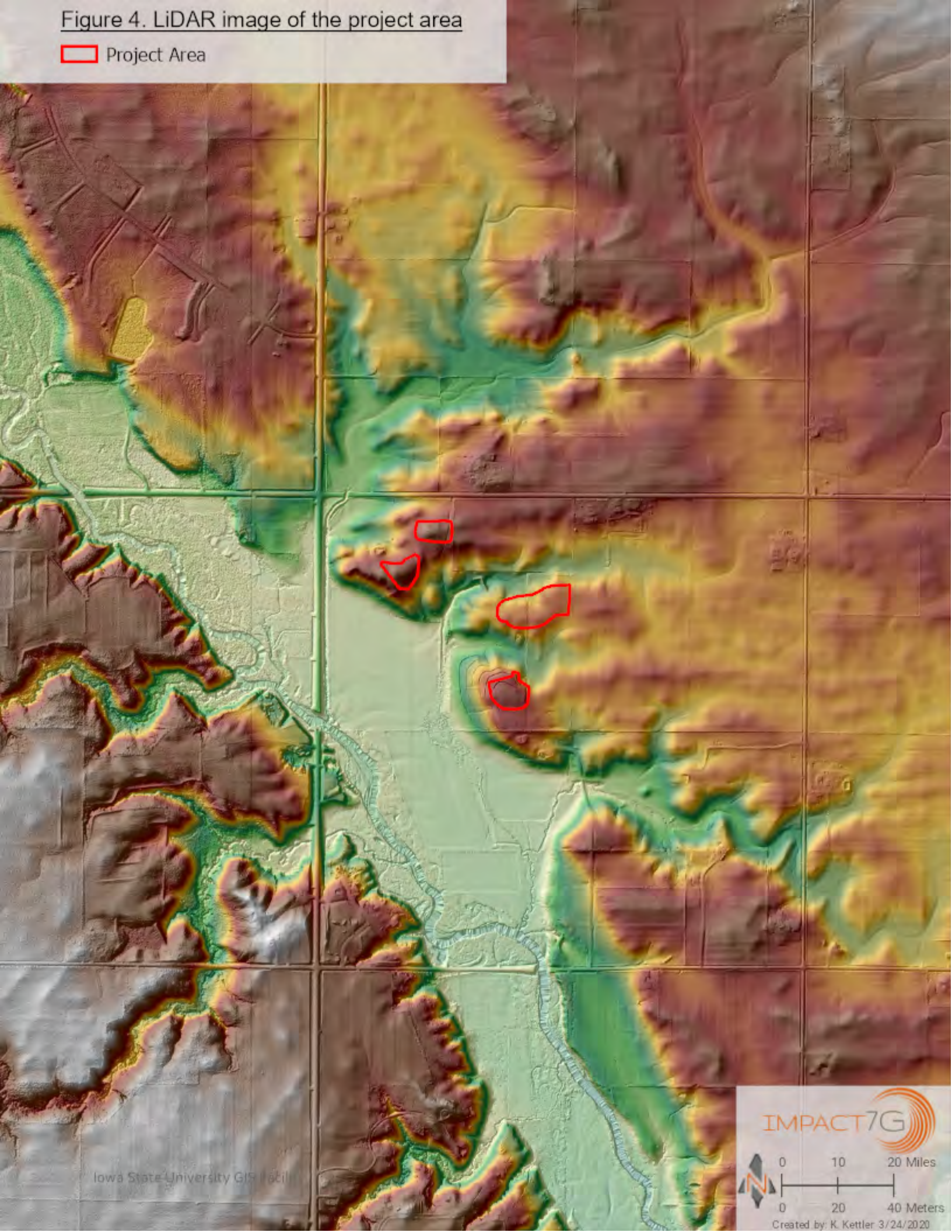


Figure 5. Soil map of the project area

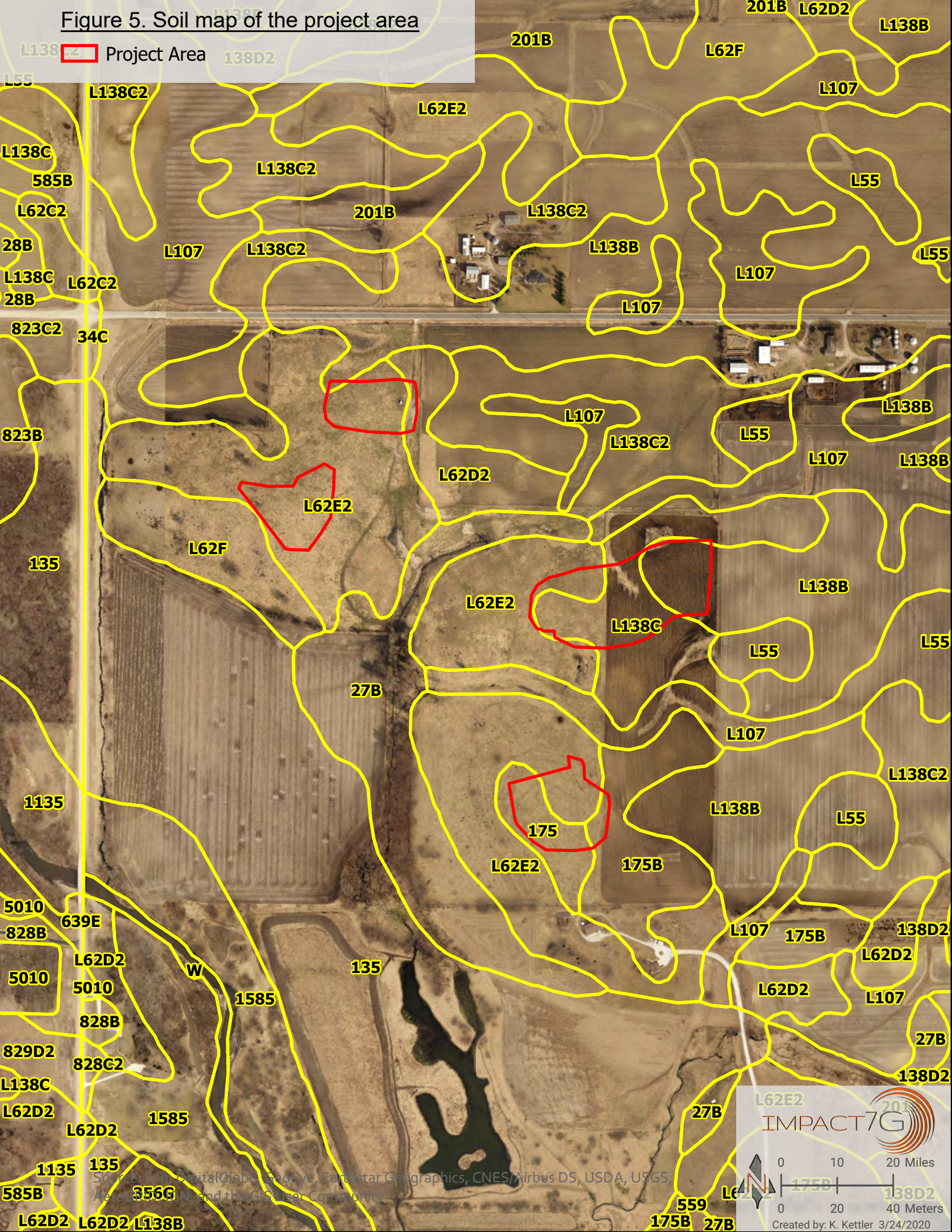


Figure 6. 1847 General Land Office map of the project area

Project Area

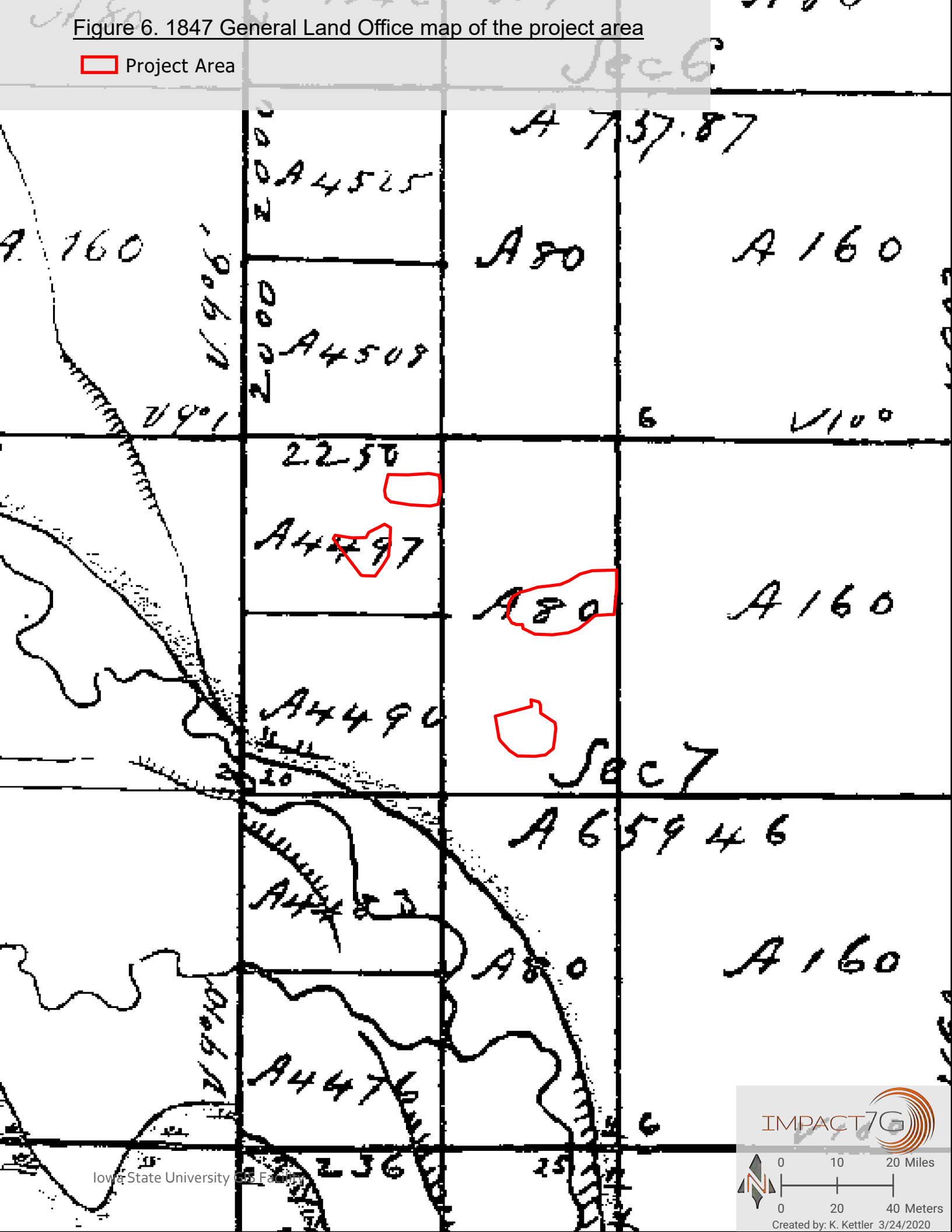


Figure 7. 1875 map of the project area (Andreas)

Project Area

Figure 8. 1902 map of the project area (Huebinger)

Project Area

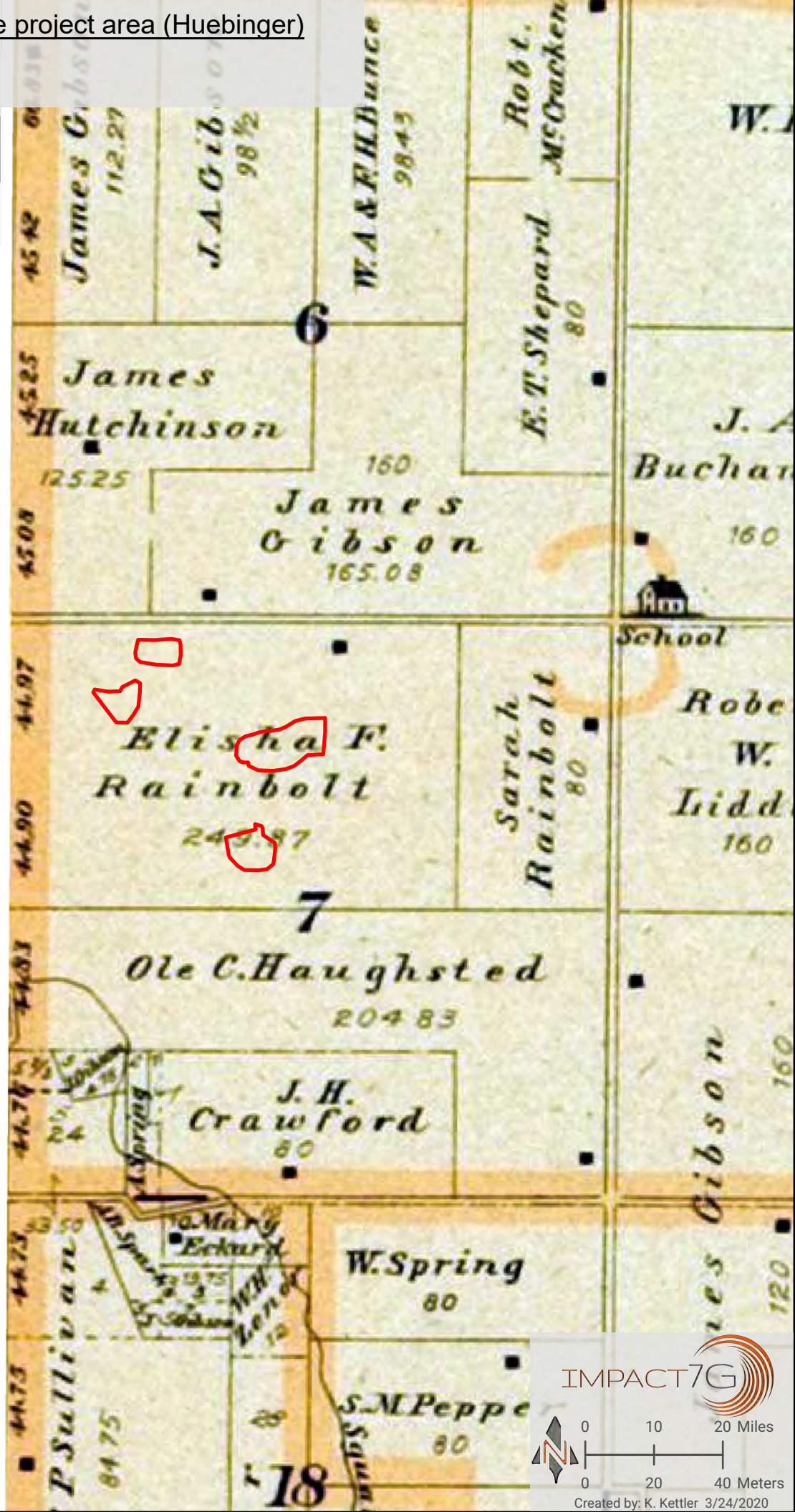


Figure 9. 1908 map of the project area (Nevada Representative)

Project Area

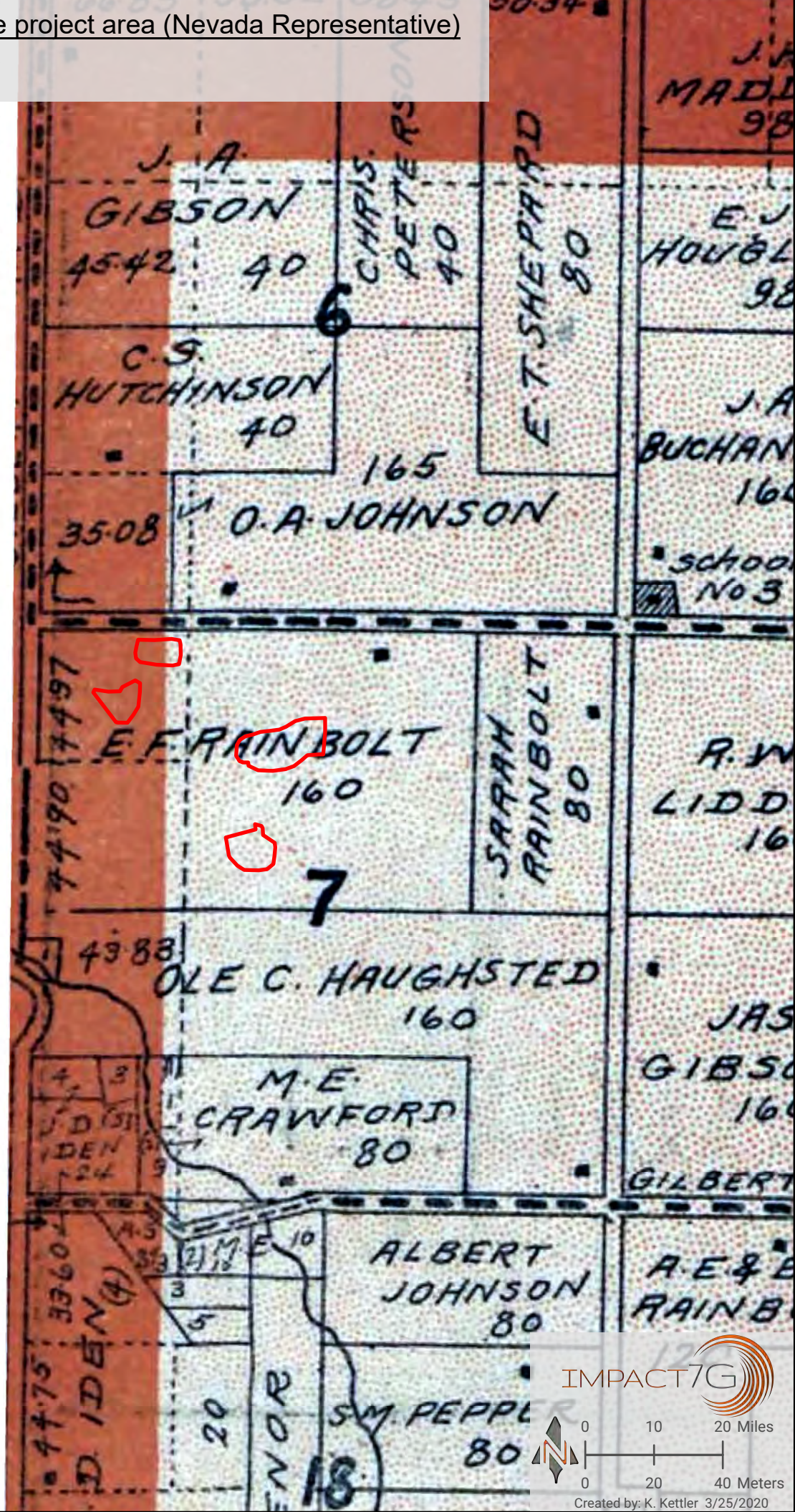


Figure 10. 1919 map of the project area (Nevada Representative)

Project Area

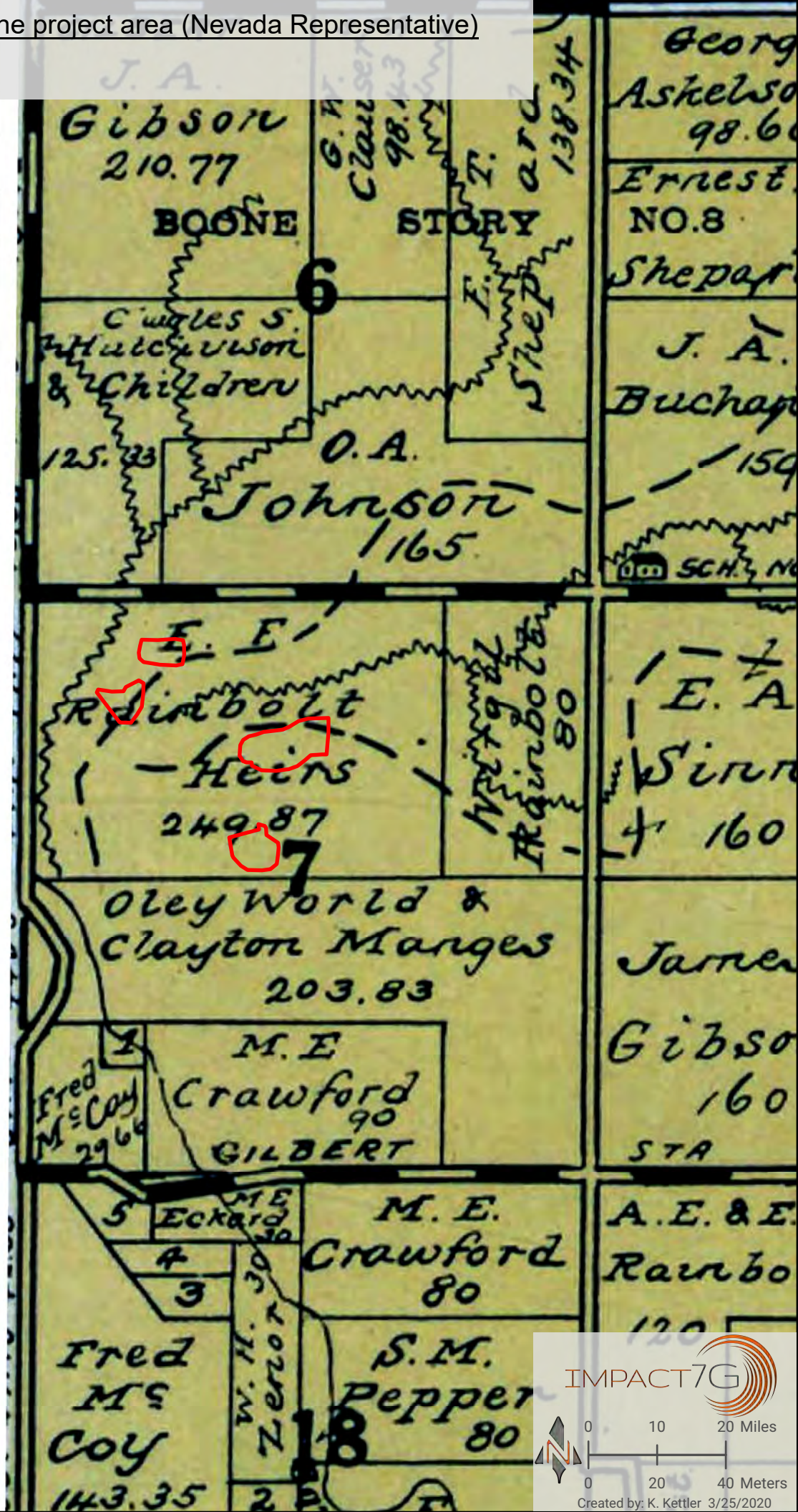
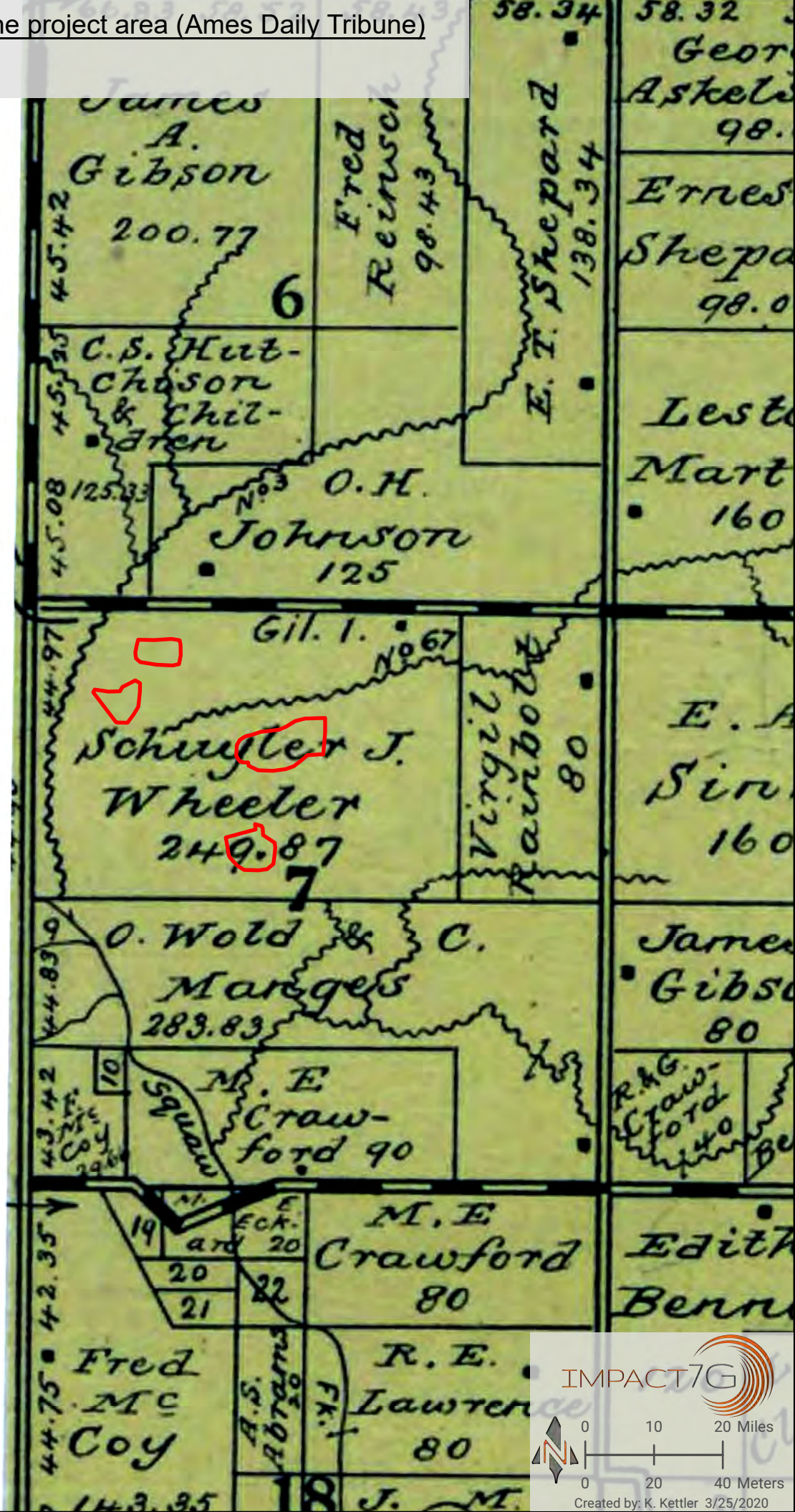


Figure 11. 1926 map of the project area (Ames Daily Tribune)

Project Area



IMPACT7G

0 10 20 Miles

0 20 40 Meters

Created by: K. Kettler 3/25/2020

Figure 12. 1930 map of the project area (Hixson)

Project Area

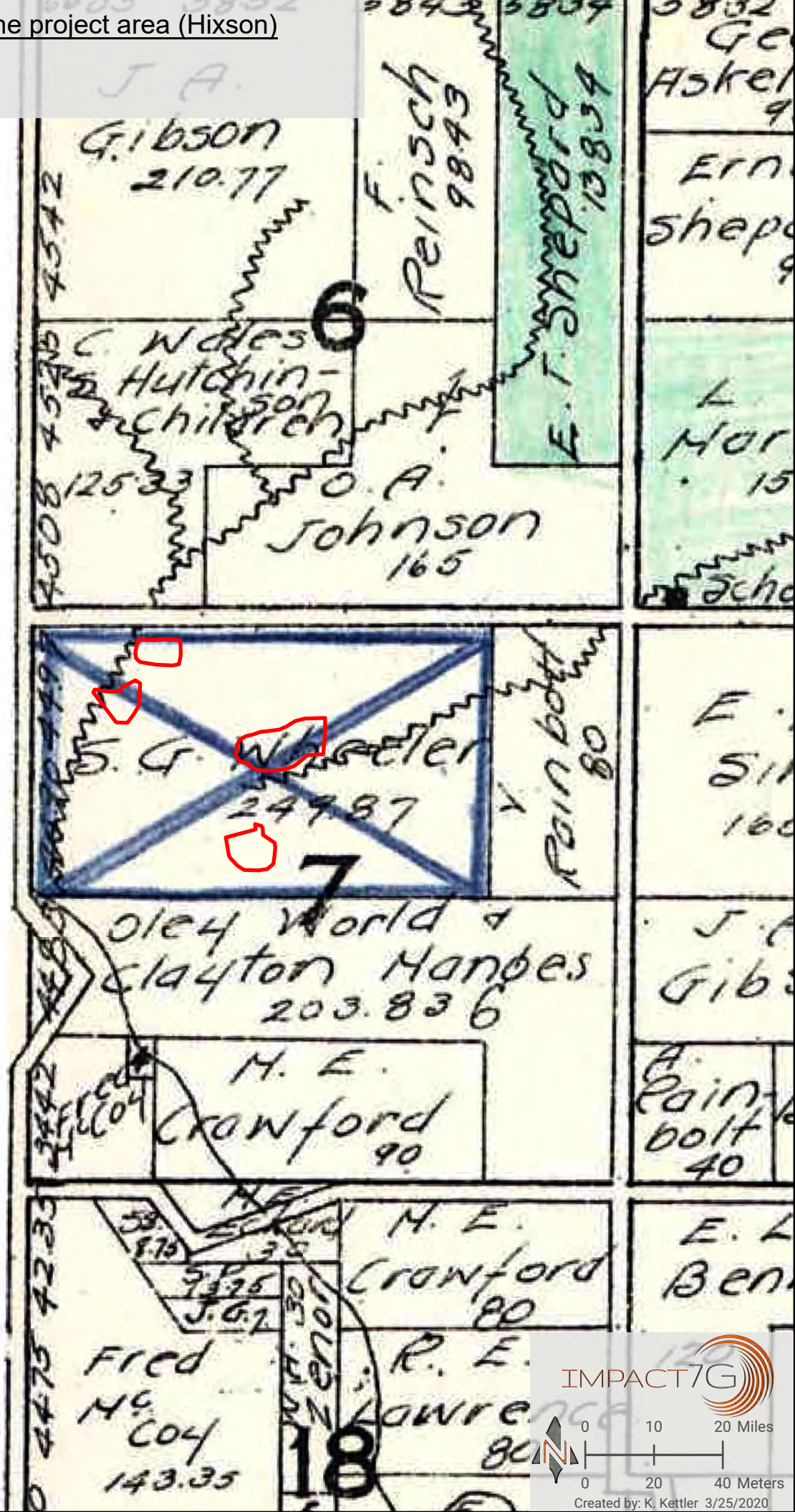
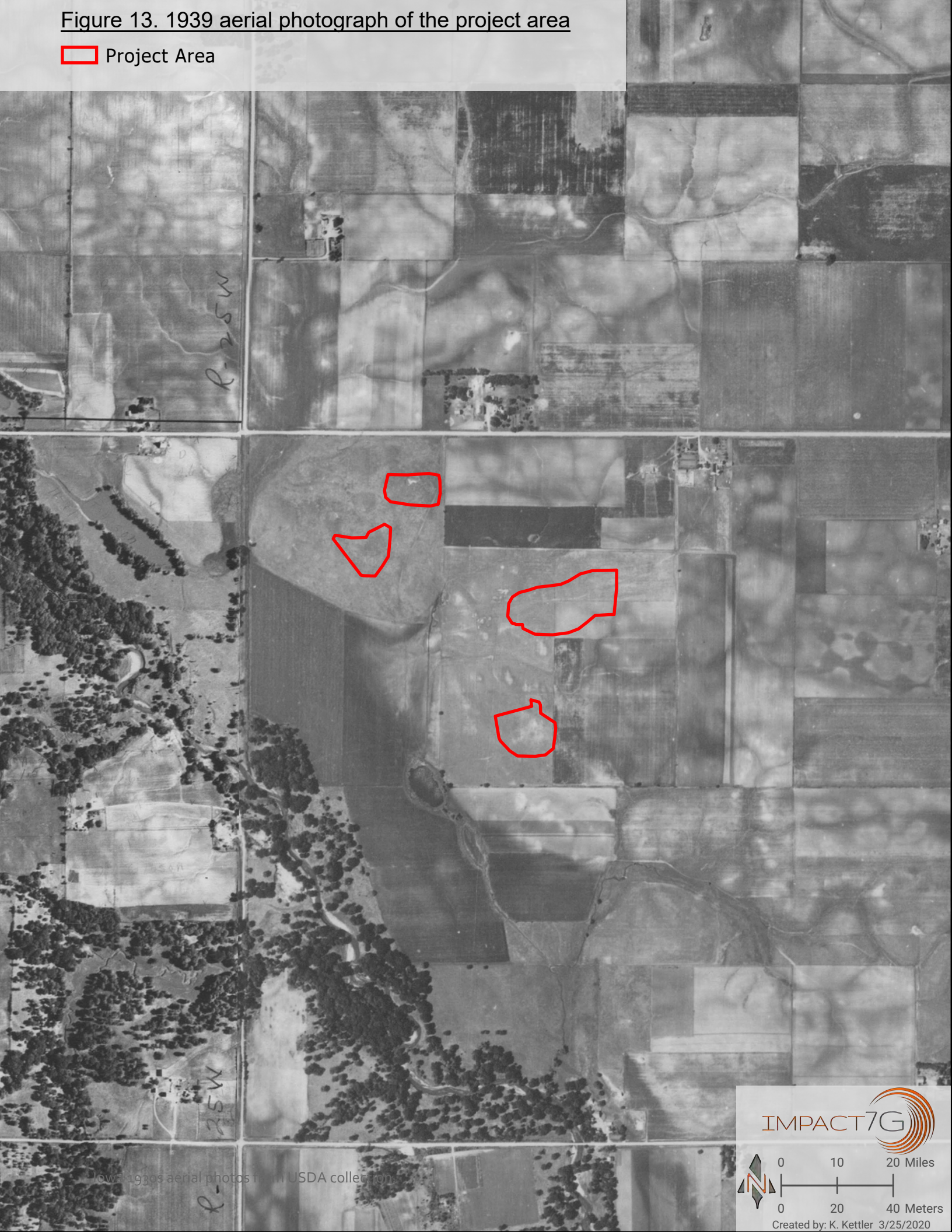


Figure 13. 1939 aerial photograph of the project area

Project Area



Low-res 1930s aerial photos from USDA collection

Figure 14. 1953 aerial photograph of the project area

Figure 15. 1965 aerial photograph of the project area

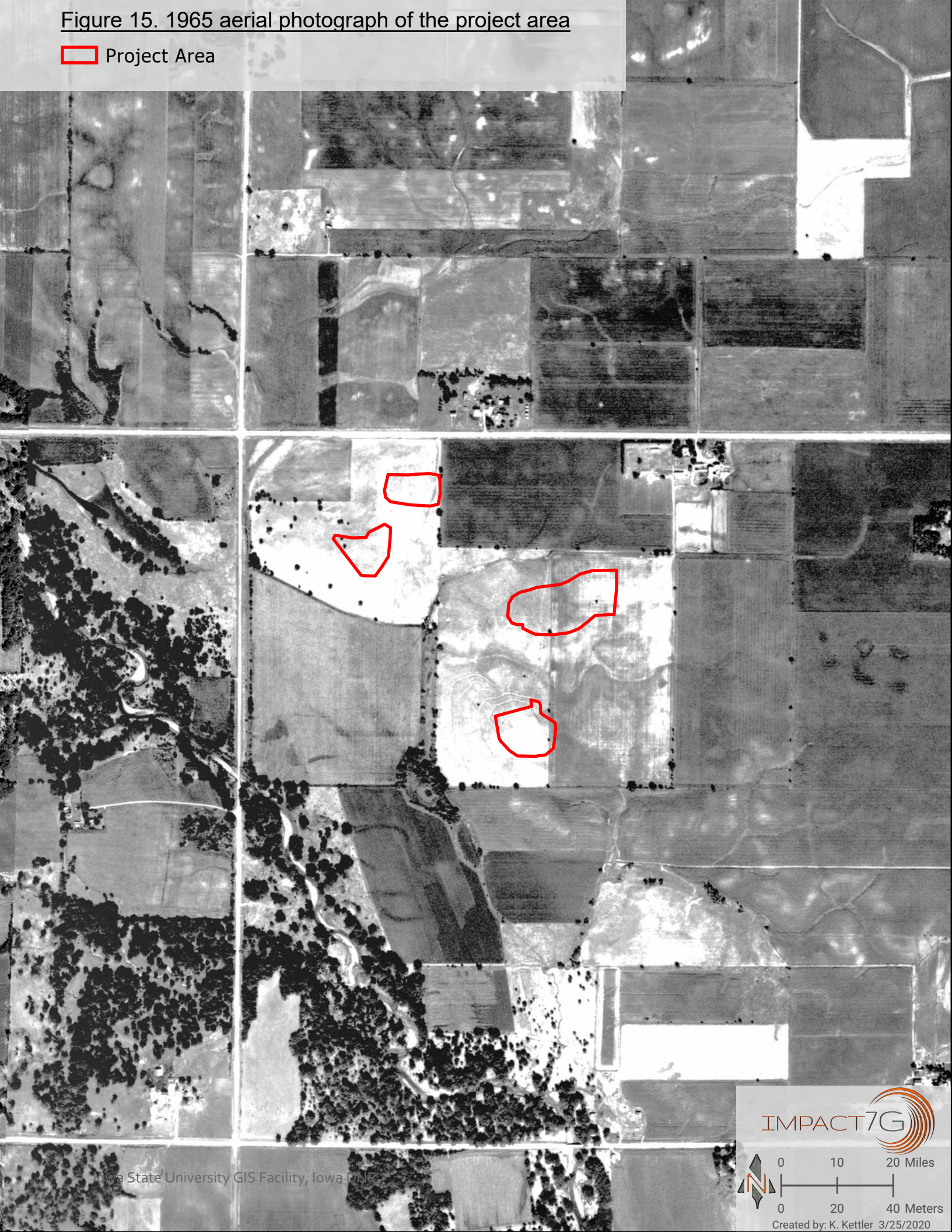


Figure 16. 1971 aerial photograph of the project area

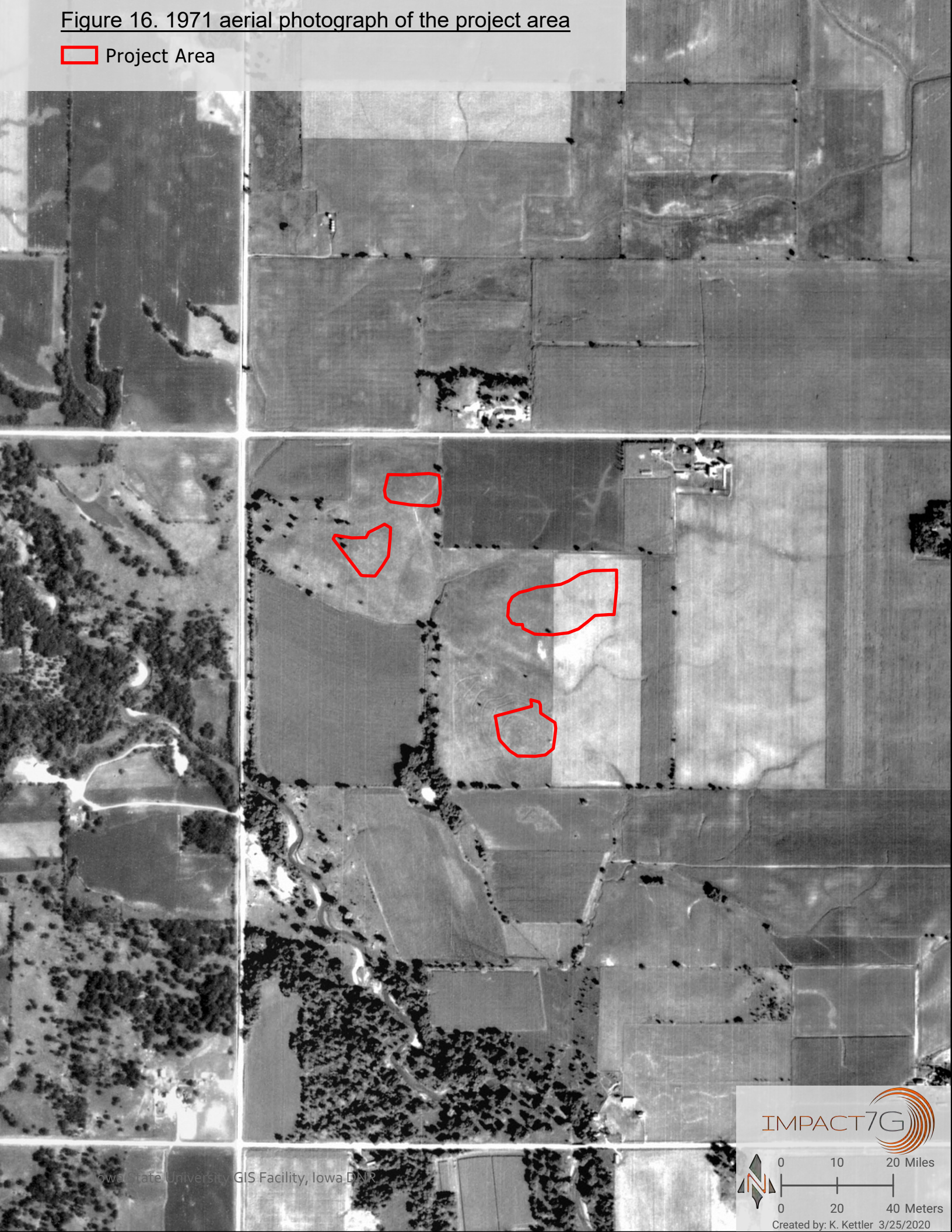


Figure 17. Coverage of 13SR370. View west (3/20/2020)

Figure 18. Coverage of 13SR370. View east (3/20/2020)

Figure 19. Coverage of the project area. View east (3/20/2020)

Figure 20. Coverage of the project area. View west (3/20/2020)

Figure 21. Coverage of the project area. View east (3/20/2020)

Figure 22. Coverage of the project area. View west-southwest (3/20/2020)

Figure 23. Scale map of 13SR370

Site Boundary

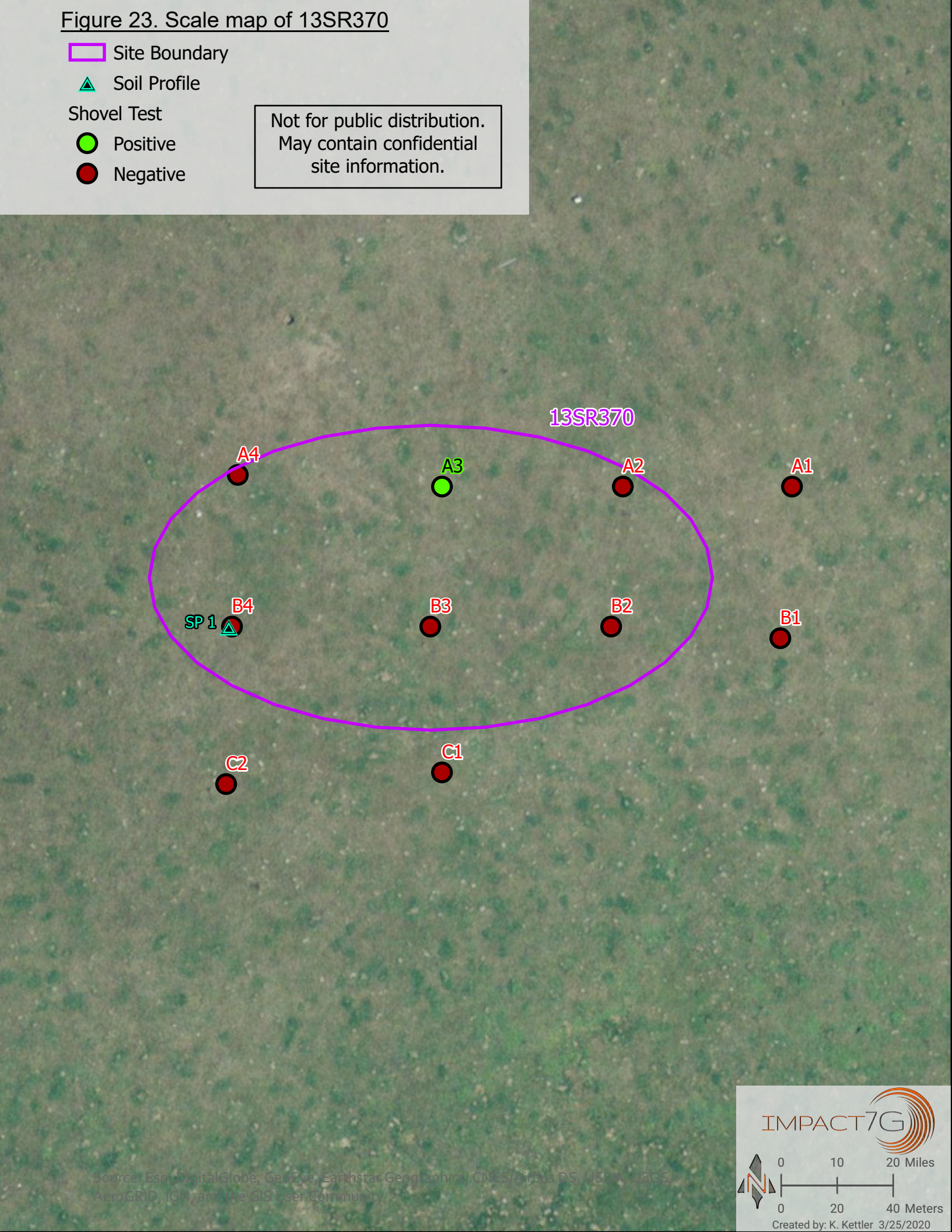
Soil Profile

Shovel Test

Positive

Negative

Not for public distribution. May contain confidential site information.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 24. Flaking debris recovered from 13SR370 (3/23/2020)

Appendix A: Iowa Archaeological Site Form

IOWA ARCHAEOLOGICAL SITE FORM

Office of the State Archaeologist
700 Clinton Street Building
University of Iowa
Iowa City, Iowa 52242-1030

Site Number: 13SR370
County: STORY
Name/Field No.:
New Form: X **Supplemental:** _

I. SITE TYPE INFORMATION

Legal Location:
Township: T84N **Range:** R24W **Section:** 7
NW 1/4 NW 1/4

Quadrangle(s): AMES W

Reliability of Site Location: Good

Site Type/Function
Open habitation

Period/Cultural Affiliation
Period: Prehistoric

II. CULTURAL MATERIALS: 13SR370

Location of Artifact Collection: Impact7G

Category	Description	Collected?
Stone, chipped, debitage	1 flake fragment	yes

Collection Method(s): shovel/posthole/auger tests

Ground Cover: _ row crops X grass _ brush/weedy/open woods _ forest/heavy timber _ exposed/eroded _ unknown

Amount of Ground Surface Visible: X <10% _ 10-50% _ 50-90% _ 90-100% _ unknown
Notes on Visibility: Grass and snow

Surface Conditions in Cropland: _ dry _ recent rain _ wet X unknown

Recently Tilled Cropland: _ true X false

III. GEOGRAPHIC INFORMATION 13SR370

Topography/Landform: Uplands, Summit

Nearest Water Source: Intermittent stream

Distance to Nearest Water: 315 m

Site Size
Dimensions: 38 x 20 m
Area: 620 sq m
Notes on Map Method(s): Landform boundaries

Integrity: _ excellent _ good **X** poor _ completely destroyed _ unknown

Threats To Site

Past/ Present	Future	Threat Type	Description
X	X	agriculture/livestock	
X	X	erosion/weathering/rodents	
	X	development/construction	Housing development

Current Land Use: pasture/grass

IV. INVESTIGATION INFORMATION 13SR370

Recorder(s)

Name	Address
Scott, Branden K.	Impact7G

Start Date of Investigation: 3/20/2020

Level of Investigation: Phase I

Recommendations: No further work

National Register Eligibility Recommendation: Not Eligible for NR

Present Landowner(s)

Name	Address	Attitude Toward Investigation
Quarry Estates, LLC	100 6th Street Ames IA 50010	positive

Photo(s)

Photo Type	Curated At
Digital	Impact7G

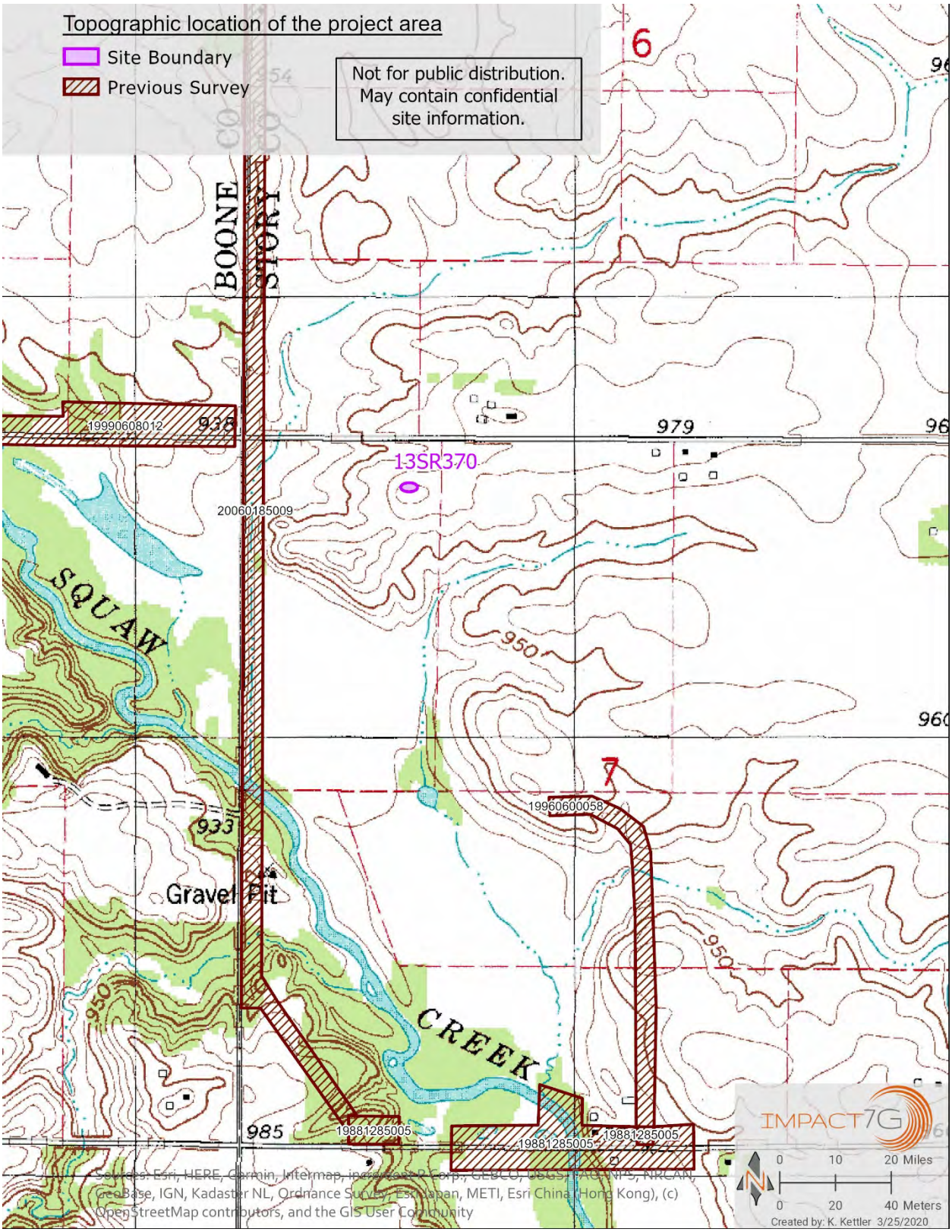
V. VERBAL DESCRIPTION 13SR370

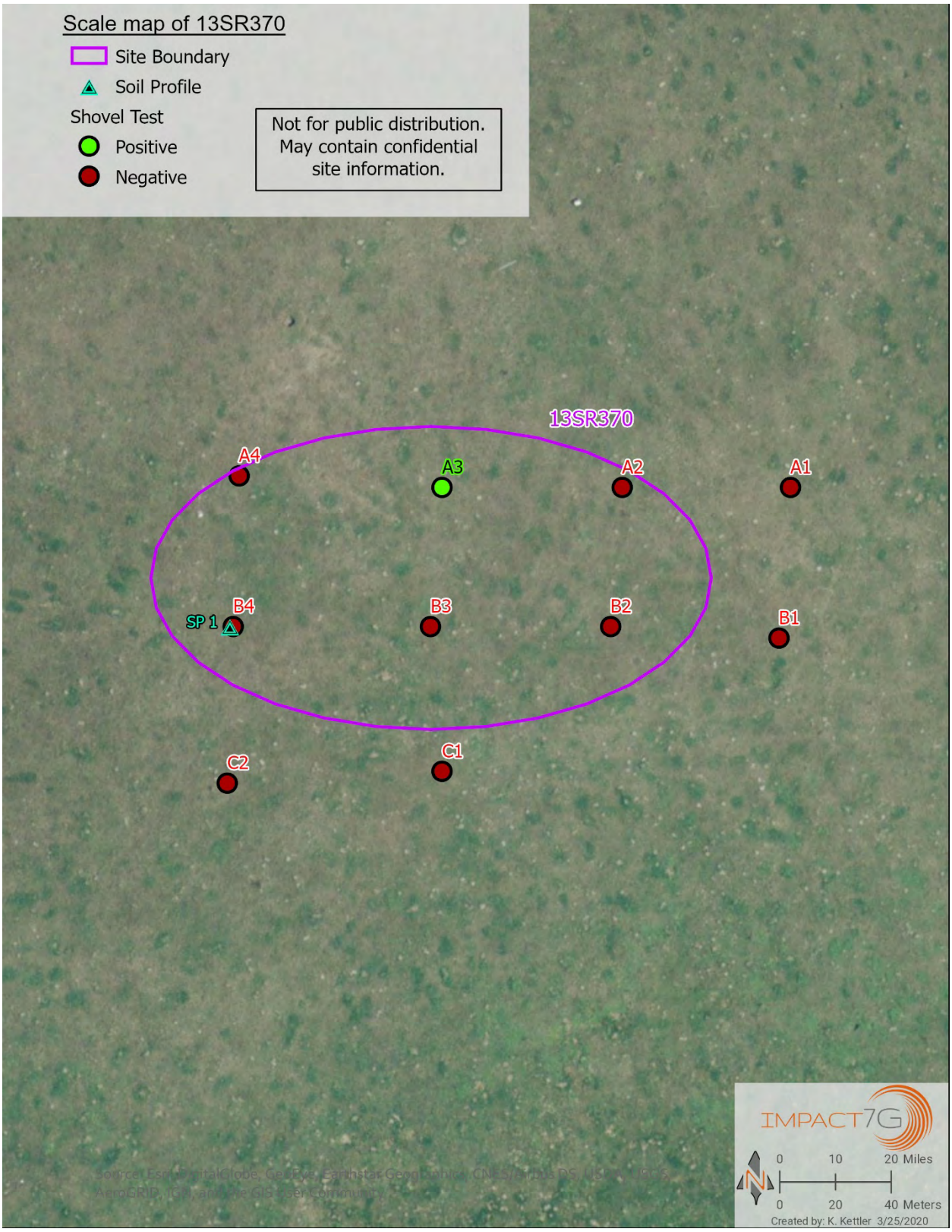
Location: Provide a verbal description of how to locate the site, including distances and direction. This information must be sufficiently detailed to permit accurate site relocation. If possible, include permanent landmarks, roadways, and distances.

From Gilbert, Iowa, proceed west on 170th Street to 500th Avenue. The site is positioned on the summit of the northern most prominent ridge south off 170th Street and east of 500th Avenue, approximately 400 meters west-southwest from the aforementioned intersection.

Site Description: Describe the site and include dimensions, features, nature and content of artifacts and concentrations, extent and location of disturbances, etc.

Impact7G researchers identified 13SR370 on March 20, 2020 during shovel testing of an upland ridge. At the time of investigation, the site was positioned on an upland summit covered with pasture grass. A soil profile was recorded at the site and it indicated that erosion and plowing has truncated the underlying Bt horizon. Subsurface shovel testing was conducted at 10 m intervals across the ridge summit and shoulders. Tests were excavated in 10 cm levels and all sediment was screened through quarter-inch wire hardware cloth. Tests were excavated at least 15 cm into the underlying Bt horizon. Of the 10 tests placed on the landform, only one was positive for prehistoric artifacts. The recovered prehistoric artifact was obtained from the plowzone. Prehistoric flaking debris rarely occurs in a vacuum, and while only one piece of flaking debris was recovered from shovel testing at this site, there are likely other artifacts at this site. No diagnostic artifacts were recovered; therefore, 13SR370 is considered an “indeterminate prehistoric” site. The recovered flake fragment is relatively large, indicating that the recovered flake is more likely associated with early stage biface production or core reduction. This type of activity usually occurs at habitation sites. Because of the type of flake recovered, the site is interpreted as an “open habitation”. The location of the site (prominent ridge overlooking a perennial stream valley) is also consistent with upland prehistoric habitation site locations throughout Iowa. Soils documented at this location indicate that the plowzone has truncated the underlying Bt horizon. As such, there is low potential for intact archaeological materials. Impact7G recommended that 13SR370 is not eligible for the NRHP. Reference: Scott, Branden K. and Kurtis Kettler. 2020. Intensive Phase I Archaeological Investigation of Areas Deemed to Have Prehistoric Burial Potential at the Proposed Story County Dotson Farms Residential Subdivision, Section 7, T84N, R24W, Franklin Township, Story County, Iowa. CRM Report 102. Impact7G, Inc., Clive, Iowa.


Topographic location of the project area
Site Boundary
Previous Survey
Not for public distribution. May contain confidential site information.
6
7
BOONE
STORY
SQUAW
CREEK
Gravel Pit
13SR370
19990608012
20060185009
19960600058
19881285005
19881285005
19881285005
938
979
950
933
985
IMPACT7G
0 10 20 Miles
0 20 40 Meters
Created by: K. Kettler 3/25/2020
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community


Scale map of 13SR370
Site Boundary
Soil Profile
Shovel Test
Positive
Negative
Not for public distribution. May contain confidential site information.
13SR370
A4
A3
A2
A1
B4
SP 1
B3
B2
B1
C2
C1
IMPACT7G
0
10
20 Miles
0
20
40 Meters
Created by: K. Kettler 3/25/2020

Appendix B: Catalog Sheet

Impact7G

Accession Number: Site Number 13SR370 Site Name

Sponsor Quarry Estates, LLC Principal Field Archaeologist B. Scott Principal Lab Archaeologist B. Scott

Catalog Number	Specimen Category and Description		No. of Artifacts	Area/Unit/Feature			Depth Below Surface (cm)	Collection Date	Collector/Remarks
1	FD	Flake fragment, Croton calcedonic, 3.7g	1		ST A3		10-20	3/20/2020	BS
Total			**1**						

Appendix C: National Archaeological Database Form

Database Doc Number:_____

NATIONAL ARCHAEOLOGICAL DATABASE – REPORTS; DATA ENTRY FORM

1. R and C #: _____
2. Authors: Branden K. Scott and Kurtis Kettler

Year of Publication 2020

3. Title Intensive Phase I Archaeological Investigation of Areas Deemed to Have Prehistoric Burial Potential at the Proposed Story County Dotson Farms Residential Subdivision, Section 7, T84N, R24W, Franklin Township, Story County, Iowa

---

3. Report Title: Impact7G Reports

Volume #: _____ Report #: CRM 102 NTIS: _____

Publisher: Impact7G

Place: Clive, Iowa

---

5. Unpublished

Sent From: _____

Sent To: _____

Contract #: _____

---

6. Federal Agency: _____

---

7. State: Iowa
County: Story
Town: _____

---

8. Work Type: 31

9. Keyword:

0 - Types of Resources / Features		1 - Generic terms / Research Questions	
2 - Taxonomic Names		3 - Artifact Types / Material Classes	
4 - Geographic Names / Locations		5 - Time Periods	
6 - Project Names / Study Unit		7 - Other Key Words	
5.4 ha (13.3 ac)	[7]		[ ]
Des Moines Lobe	[4]		[ ]
Upland landforms	[7]		[ ]
Squaw Creek	[4]		[ ]
Prehistoric sites	[0]		[ ]
	[ ]		[ ]
	[ ]		[ ]

---

10. UTM Zone:

15	Easting:	Northing:	
15	Easting:	Northing:	
15	Easting:	Northing:	
15	Easting:	Northing:	

11. Township: 84N
Range: 24W

Other Publication Types:

12. Monographs:
    Name: _____
    Place: _____

---

13. Chapter: In: _____ First: _____ Last: _____

---

14. Journal: Volume: _____ Issue: _____ First: _____ Last: _____

---

15. Dissertation:
    Degree: Ph.D. LL.D. M.A. M.S. B.A. B.S. Institute _____

---

16. Paper: Meeting: _____
    Place: _____ Date: _____

---

17. Other:
    Reference Line: _____

---

18. Site #: 13SR370

---

19. Quad Map: Name Ames West, Iowa Date 1975

To: Fox Engineering and Associates, Inc. (Scott Renaud)\
Story County Conservation Board (Mike Cox)
From: Dr. Thomas Rosburg, Department of Biology, Drake University
Re: Gilbert Prairie Survey
Date: November 6, 2018

On October 15, 2018, at the request of Mike Cox, Director of Story County Conservation, I conducted a late-season plant survey on a 160 acre site located 2½ miles west of Gilbert, Iowa. The property, which lies on the south side of 170th street and the east side of 500th avenue, is adjacent to the Story and Boone county boundary. It occupies the northwest ¼ of section 7 in T84N R24W. The farm site included cool-season pasture land, cropland, hayfields and land in the conservation reserve program.

I was accompanied by Mike Cox and several representatives of Fox Engineering and Associates. The purpose of the field survey was to determine if any evidence of prairie remnants could be located on the pasture portion of the property.

Populations of prairie indicator species were observed at several locations (Figure 1, Table 1). Eight species were recorded, four grasses and four forbs. The highest quality prairie remnants were those that supported these species, in order of highest to lowest quality – hairy grama, side-oats grama, fringed puccoon, rough dropseed, false gromwell and prairie sage. Although prairie three awn and whorled milkweed are also native prairie species, they are less indicative of a good prairie remnant. It is very likely that additional prairie species are present on these remnants. Mid-October is fairly late in the growing season for collecting plant community data. Spring and early summer species may have been present but too inconspicuous to observe. The presence of hairy grama is quite significant. It's a prairie species that characterizes the short-grass prairie which is located in the western Great Plains. In order to occupy plant communities in the tallgrass prairie region of Iowa, it requires specialized microenvironments that provide similar growing conditions as in the short-grass prairie – a habitat that is very dry and low in fertility. Hairy grama is known from 35 counties in Iowa (about a third), but it is always limited in its abundance and frequency.
The GPS data for the map points are presented in Table 2. Map points 1 and 2 are provided as reference points. Map point 1 corresponds to the fence post at the north end of the fence the separates the hayfield from the pasture. Map point 2 corresponds to the corner fence post located at the southwest corner of the hayfield.

The pasture is a typical cool-season grass pasture for Iowa. Predominate species observed include Kentucky bluegrass, yellow foxtail, white clover, dandelion, hoary vervain and common ragweed. Two plant communities were mapped as a polygon feature (Figure 1). A wet swale supported sedge species, bulrush species, blue vervain, foxtail species, curly sour dock and lady thumb smartweed. It was saturated with shallow standing water among hummocks. This area was probably a sedge meadow on the native landscape. The other area mapped is a cottonwood grove. Several cottonwood trees (DBH of 30 to 40 cm) were present, as well as some green ash and Siberian elm (both DBH of 10 cm) Other woody species were sapling-size willow species, gray dogwood and wild grape. The herbaceous layer was dominated by smooth brome. Also present was common milkweed, tall goldenrod, giant goldenrod, stinging nettle and horsetail. Although there was no standing water observed, the soil appeared to be saturated. The presence of the horsetail indicates a fairly wet soil or shallow water table.

Historic aerial photos are presented in Figures 2 and 3, from 1930 to 1994. The pasture appears to be intact in the series of years depicted in the aerial photos. The presence of terraces on the far south end of the pasture is seen for the first time in the 1960s photo. The terraces suggest that row crop agriculture may have occurred here at some time. If so, it must have been short-lived since prairie plant populations were observed. The 1980 aerial photo utilized infrared imagery, which is ideal for identifying prairie remnants. On an infrared image, pink to reddish color indicates actively growing vegetation (green). When the image is made in the spring (the image date for this one is May 15), the difference in cool-season and warm-season growth is very apparent. Cool-season growth, which has been active for several weeks by late April or May, stands out as being very pink. In a cool-season pasture, pink to reddish color will dominate. If prairie remnants are present, the warm-season grasses of the prairie, which are still dormant, impart a grayish hue to the image. In Figure 3d, grayish patches can be seen throughout the pasture. These are mostly associated with dry south- or west-facing slopes. These grayish areas also correspond to the locations of prairie remnants mapped in Figure 1.

In conclusion:

1) There is a significant native prairie component on this site.

2) The south- and west-facing slopes are the most important locations supporting prairie remnant populations.

3) The full extent of the quality of the prairie remnants cannot be fully determined at this point due to the lateness in the growing season.

Table 1. Prairie species observed at map points on Figure 1. Presence at a point is indicated with an "x".

	Map Points										
	3	4	5,6,7	8,9,10,11	12,13	14	15	16	17	18	19
Grasses:											
Side-oats grama	x	x	x	x	x		x		x		
Hairy grama			x	x							
Prairie three awn	x			x		x	x	x			x
Rough dropseed							x	x	x		x
Forbs:											
False gromwell	x	x	x				x	x	x	x	x
Fringed puccoon	x			x							
Prairie sage	x	x	x	x							
Whorled milkweed			x					x			

Table 2. GPS data for point features in Figure 1. All points are UTM Zone 15T, map datum WGS 84.

Map Point	Waypoint	Easterly UTM	Northerly UTM	Feature
1	50	442688	4661876	Reference-north end of fence line
2	41	442684	4661631	Reference-south end of fence line
3	49	442427	4661690	prairie remnant populations
4	48	442323	4661697	prairie remnant populations
5	47	442320	4661647	prairie remnant populations
6	46	442314	4661631	prairie remnant populations
7	45	442330	4661617	prairie remnant populations
8	44	442390	4661608	prairie remnant populations
9	43	442430	4661592	prairie remnant populations
10	42	442467	4661573	prairie remnant populations
11	32	442553	4661520	prairie remnant populations
12	33	442610	4661524	prairie remnant populations
13	34	442644	4661516	prairie remnant populations
14	35	442719	4661506	prairie remnant populations
15	36	442767	4661424	prairie remnant populations
16	37	442766	4661338	prairie remnant populations
17	38	442790	4661197	prairie remnant populations
18	39	442865	4661304	prairie remnant populations
19	40	442864	4661413	prairie remnant populations

Figure 1. Aerial photo of Gilbert prairie site (outlined with blue boundary) with features (yellow) observed during a field survey on October 15, 2018. Imagery date is October 2, 2015 from Google Earth.

Figure 2. Aerial photo of Gilbert prairie site on April 15, 1994 from Google Earth. Point features on Fig. 1 are shown.

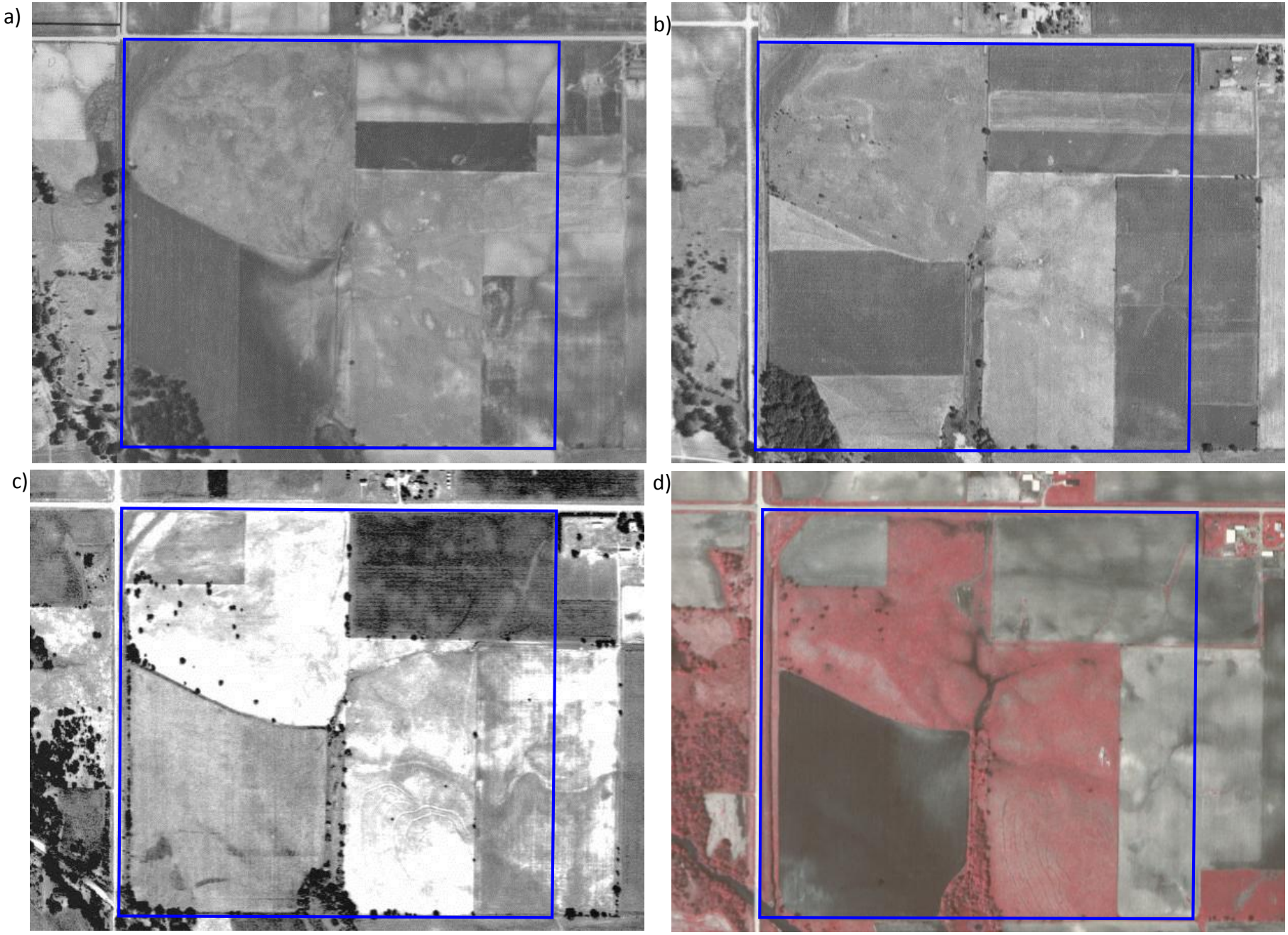


Figure 3. Historic aerial photos of Gilbert prairie site (blue boundary) on the following dates: a) 1930s, b) 1950s, c) 1960s and d) 1983. Images from the Iowa Geographic Map Server (https://www.gis.iastate.edu/).

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MEMORANDUM

TO: Story County Planning and Zoning Commission
FROM: Jerry L. Moore, Planning and Development Director
RE: Ames Urban Fringe Plan Discussion (AUFP) – Preliminary Discussion on Future Amendment
MEETING DATE: May 6, 2020

Overview
With the 2021 expiration of the Ames Urban Fringe Plan and upcoming completion of the Ames 2040 Comprehensive Plan, Planning and Development Staff see an opportunity to amend the AUFP and the land use framework map. The purpose of this memo is to provide the Planning and Zoning Commission with background information on the creation and purpose of the Ames Urban Fringe Plan and recent impacts, changes, and comments on the plan from the Board of Supervisors, Planning and Zoning Commission, and Planning and Development Staff. At the May 6 Planning and Zoning Commission meeting, staff would like to discuss any questions the Commission may have on the AUFP and specifically discuss policies/goals or 28E Agreement, the Land Use Framework Map, and general strengths and weaknesses of the plan. Planning and Development Staff would also like to hold a joint meeting with the Planning and Zoning Commission and Board of Supervisors to further discuss the plan and public outreach plan for an amendment.

I. AUFP Expiration
The Ames Urban Fringe Plan & 28E expires July 11, 2021. To show support for the current plan and interest in working with the Cities of Ames and Gilbert, the Board of Supervisors adopted resolution number 20-64, February 18, 2020. The City of Gilbert adopted resolution 2020-03-02 March 2, 2020, supporting the same. According to the Ames Planning and Housing Director, this matter will be addressed by the Ames City Council this month.

II. AUFP Background
Ames Urban Fringe Plan -AUFP is a land use planning and growth management plan between the Cities of Ames, Gilbert, and Story County. As the Cities and the County updated and adopted new regulations, it became clear the need to adopt consistent planning objectives to manage development and preserve natural resources and prime agricultural land.

While there was cooperation between the three entities, the AUFP was created in 2006 as a way to address previous concerns regarding overlapping of regulations, inconsistencies among different policies on land uses, and impacts of development on rural/agricultural activities. Also, state law delegates

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authority to cities to plan for land uses outside their corporate limits and also subdivision plat review authority within 2 miles. It took multiple years to adopt the AUFP and the 28E Agreement.

Through input obtained from the general public and collaboration with the entity partners, the following **six Guiding Principles for Cooperative Planning** were established.

1. Recognizing that population and economic growth I likely, Boone County, Story County, the City of Ames and the City of Gilbert will strive towards intergovernmental coordination for successful planning within the Ames Urban Fringe.
2. Boone County, Story County, City of Ames and City of Gilbert seek to work together to preserve agricultural lands and protect rural lands from unplanned, rural single-family development and other forms of inefficient urbanization.
3. Boone County, Story County, the City of Ames and the City of Gilbert will work together to ensure that future development will be directed and targeted towards identified growth areas, as identified in a shared fringe area land use plan.
4. Boone County, Story County, the City of Ames and the City of Gilbert seek effective and efficient management of growth. Growth shall be managed by each government entity in order to minimize negative impacts to another affected governmental entity.
5. In efforts to establish an orderly transition of land uses from urban to rural (as well as rural to urban), Boone County, Story County, the City of Ames and the City of Gilbert seek to work together to delineate areas of responsibility and come to a common agreement on the definition of rural and urban land uses.
6. Boone County, Story County, the City of Ames and the City of Gilbert seek to establish growth policy with the Ames Urban Fringe compatible with ecological systems. It is commonly understood by each governmental agency that future growth will be compatible with natural resources. Environmental resources shall be protected.

The Seven Common Goals for the Urban Fringe were established.

1. To provide a balanced mix of land uses that is arranged to avoid conflicts and to maximize efficient delivery of municipal and county services and facilities.
2. To prevent premature development and preserve the highest value farmland in appropriate locations.
3. To provide a variety of housing opportunities in the Ames Urban Fringe in appropriate locations.
4. To provide adequate opportunities for commercial and industrial development in appropriate locations.
5. To coordinate development decisions with the efficient provision of public facilities and services.

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6. To protect and preserve sensitive natural resources, including floodplains, woodland areas, wetlands, and other sensitive natural areas.

In response to the adopted principles and goals, three main land use categories were created including 18 specific land use designations, each with specific policies. The main Land Use Categories include: **Rural Service and Agricultural Conservation Area, Rural Urban Transition Area, and Urban Service Area**.

Key Land Use Designations shown on Land use Framework Map

Agriculture and Farm Service - predominant land use with the AUFP
Policies focus on preserving this land and it is considered to be moderate to high agricultural land. Support commercial and industrial uses that are dependent upon agricultural land uses. Limit nonagricultural uses. Discourage residential subdivisions.

Natural areas - shown along rivers, creeks/streams, drainageways and flood plain areas. These areas provide habitat for wildlife, minimize storm water run-off, stabilize soils, modify climactic effects, and provide visual attractiveness and recreation.

Urban Residential - substantial amount of areas adjacent to both Cities are designated. Policies indicate these areas support density of 3.75 conventional single-family/suburban residential units per acre, density of 8 traditional village units per acre, and 10 conventional suburban/medium density units per acre. Annexation is required, under urban infrastructure and subdivision standards, including ROW standards, development agreements before land is developed or subdivided, and mitigation of stormwater management and soil erosion according to IDNR and City standards.

Rural Residential - areas north of Ames. Policies support maximum average net density of one residential unit per acre. Full urban infrastructure standards are not required. Decentralized wastewater treatment facilities and wells shall meet IDNR, County and City standards. Encouraging clustering of residential sites to limit infrastructure costs and distribution of public services. Protect natural resources and mitigate stormwater management and soil erosion. These subdivisions are developed in the County. Cameron Estates is located in Rural Residential.

Rural Transitional Residential - areas are located north of Ames. Policies support 3.75 residential units per acre for single-family and two-family residential. Locate in areas where land uses will orderly and efficiently transition into City's corporate limits. Encouraging clustering of residential sites to limit infrastructure costs and distribution of public services. Require full urban infrastructure standards either at the time of development or infrastructure assessment agreements. Decentralized wastewater treatment facilities wells to meet IDNR, County and City standards. Agreements required for when property is annexed, the developer or landowner is responsible for full cost of abandoning rural systems and connecting to urban infrastructure. Require annexation agreement and developer agreement for

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intense development. Developments are permitted to remain in the County until annexed. The Irons subdivision in located in Rural Transitional Residential.

Two types of commercial nodes are shown in seven areas of the map.
Community Commercial Node - policies support uses to be more selective such as shopping and service uses and not to exceed 40 to 75 acres total, buildings 100,000 to 800,000 sq. ft., locate at intersections of arterial streets with highways, require annexation before development or subdivision, require urban infrastructure and subdivision standards, and require land development agreements.

Convenience Commercial Node - policies support suburban residential developments and between 2,000 to 3,000 people within one to two miles, land area between one and ten acres, uses serve neighborhood needs, buildings not to exceed 35,000 sq. ft. and a cluster of buildings not to exceed 100,000 sq. ft., locate on collector streets, cluster uses to reduce infrastructure cost, if the City does not require annexation before development require annexation and development agreements, temporary common wastewater system meeting IDNR, common water such as well or water meeting City standards including agreements when property annexed the developer and/or landowner must pay cost to abandon rural systems and connect to urban infrastructure.

III. 28E Agreement – Adopted July 11, 2011, and provides greater clarification to entity staff and applicants about process. Key items of the agreement are as follows.
County Zoning – Nothing in this Agreement shall be construed or applied to limit the County's legislative authority or discretion in adopting or amending its land use regulations.
Official Zoning Map of Story County – County shall not take action on any request to amend the Official Zoning Map of Story County within the Fringe Area when such request is accompanied by a request to amend the Plan. Such request to amend the Plan shall be acted upon by all cooperators before action is taken on the rezoning request.
Subdivisions

Rural Service and Agricultural Conservation Area Designation – Cities agree to waive their extra-territorial subdivision authority and design and improvement standards.
Rural/Urban Transition Area Designation – cooperators apply subdivision review procedures See Attachment A – in Rural/Urban Transitional Areas – the three jurisdictions acknowledge the primacy of Cities interests in regulating development in areas that Cities may, at some future moment, annex. Therefore, Cities are tasked with giving primary review and it appropriate, approval of any proposed division of land, except for Agricultural Subdivisions, which shall remain the sole province of the County.
Cities waive review authority in Rural Service and Agricultural Conservation Areas and the County waives review authority in Urban Service Areas.

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Urban Service Area Designation- County agrees to waive subdivision authority.

Annexation – generally cities shall not review annexation requests until the area is designated Urban Service Area. Cities are to consider comprehensive plan policies, contiguity to the City limits, proximity to City services, cost to extend City services, fiscal impact and funding sources for providing City services, and development needs of the City.

Amendments to Plan – See attachment C

1. Applicant sends letter to City of Ames
2. Ames staff forward to Gilbert and County staff
3. Majority of entities must support allowing application submittal
4. Application is submitted for review by applicant
5. Joint staff meeting and preparation of staff report (coordinated by Ames Staff)
6. Each jurisdiction prepares notices
7. All Planning and Zoning Commissions review and make recommendation
8. Requires support by all three entities (City Councils and Board of Supervisors)

IV. Significant changes to and/or affecting AUFP - last three years

1. Land use change and annexation to Planned Industrial of 1,300 acres located east of I-35, north of HWY 30 and south of the railroad right-of-way. This also involved an AUFP boundary change to reduce the east limit to 590th Avenue to more accurately reflect the contiguous corporate limits boundaries of the Cities of Ames and Nevada. Consistent with the AUFP policy, the 1,300 acres were annexed into the City of Ames.
2. The Irons residential development that includes single-family and two-family dwellings located around the Ames Golf and Country Club. The area is designated Rural Transitional Residential and Parks and Recreation and is waiting for future annexation.
3. Cameron Estates third phase adding two additional lots. Consistent with the policies, the Cities waived their right to review the development, the area is designated Rural Residential and will remain in the County.
4. Story County adoption of Transportation Impact Analysis Ordinance
5. City of Ames sanitary sewer study
6. Planning and Development Department land use study between Ames and Gilbert. Key factors that contributed to this being a Work Program item was:
    a. Construction of Gilbert High School
    b. Traffic on Hyde Avenue
    c. Paving of Hyde Avenue from Ames to Gilbert
    d. Increased zoning permit and rural subdivision activity
    e. Ames sanitary sewer study

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Recommendations from review

Planning staff identified five recommendations and several areas in the Plan area where future growth and opportunity could occur given support from landowners, favorable market conditions, and support from the other entities. Recommendations were:

1. Recognize a residential market segment seeking large lots in a rural setting and support rural residential developments on existing parcels and parcels contiguous to existing rural residential development, including AUFP Map Amendments and rezonings where needed.
2. Support the annexation and development of Urban Residential designated areas for both cities and the development of the Urban Growth Boundary for the City of Gilbert as identified in the C2C Plan).
3. Support the addition and/or expansion of commercial nodes.
4. Support a new Urban Growth Boundary (as in the C2C Plan Future Land Use Map) north of the Ames corporate limits. Future applications in this area would follow the City's plans and agreements for annexation and develop under the City's regulations or if deferred by the City, applicants will develop under County standards.
5. Support plan amendment to allow one additional lot and dwelling through the Residential Parcel Subdivision submittal process when existing dwelling is located on parcel in the Agriculture and Farm Service areas, consistent with other areas in the County that are outside of the AUFP area.

Planning and Zoning Commission comments from April 4, 2018 meeting about the Planning staff review.

1. If we are looking at growth opportunities in the north AUFP area, something needs to be done to address the many names for Hyde Avenue as it is confusing to motorists.
2. A map showing more specific information on the number of parcels and acres for each of the opportunity areas would be helpful to more closely pinpoint the exact locations identified in the recommendation.
3. The information and recommendations in this memo can serve as Story County's talking points and how we want to shape future discussions about proposed AUFP map amendments going forward.
4. Why aren't there recommendations related to transportation planning?
5. George Washington Carver, Hyde Avenue, HWY 69 are the main north/south roads in the area and they are experiencing vehicle capacity issues. We need to look at transportation planning in the north area collectively and not just when a development is proposed. (reference made to current Transportation Impact Analysis Ordinance amendment initially considered by the Planning and Zoning Commission)

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V. Growth trends in unincorporated Story County (last 3 years)

While improvements are noted quarterly throughout the County, a significant amount of the development applications and zoning permits over the last three years occurred within or near the AUFP. This likely reveals a few things; a significant portion of the County's population resides in this area, and this is where a substantial amount of existing improvements have been made, which translates into interest in the area.

VI. Planning & Development staff & PZC Chair meeting with Ames 2040 Comp Plan consultant RDG

Discussion points

1. Background of the AUFP and expiration in 2021
2. The Plan's policies have provided direction on how each of the three entities are to respond to requests
3. Feedback received by property owners and developers regarding the process with three entities
4. The impact of the east industrial land use designation change
5. The north review of the AUFP conducted by the Planning and Development Department
6. Transportation planning, the county's Transportation Impact Analysis ordinance, and three north AUFP dangerous intersections
7. Housing, including the Story County Housing Trust and urban growth areas in the C2C Plan
8. Park and trails planning

VII. March 26, 2019 letter from Board of Supervisors to Ames and Gilbert addressing AUFP concerns.

1. Bring MPO planning into AUFP. Include cities/county plans and MPO plans in AUFP mapping and policies (comprehensive approach to review projects and their impacts)
2. Housing, including the work of the Story County Housing Trust, and urban growth areas in Cornerstone to Capstone (C2C) Plan.
3. Do the Urban Residential Areas match up with growth projections? Do these areas match up with Ames' growth projects?
4. Do we need to review growth priority areas? How will current planned growth areas from Ames 2040 Plan match up/impact AUFP
5. Consider adding policies to address rural water and provisions of full city services to Urban Services Areas. AUFP is silent on rural water and interest in transparency in impact to landowner/developers in buyouts and meeting rural water/city agreements and making sure Urban Service Area are current and realistic plans in place to extend City utilities to these areas as they are supposed to be first to be annexed
6. Review land use designations along HWY 30 with regard to IDOT improvements. This area is in unincorporated Story County and not in a growth area identified in Ames 2040 Plan

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VIII. Impact of AUFP on Story County Departments programs/services
Environmental Health – see comments on Agenda Center
Add Other County department comments

IX. AUFP Revised Discussion Schedule
May 6 – Planning and Zoning Commission
May 12 – Board of Supervisors
June 3 – Joint meeting Planning and Zoning Commission and Board of Supervisors – Discuss details of possible amendments and public outreach plans.

X. PZC Questions

XI. PZC Discussion

1. Comments on current AUFP policies/goals or 28E Agreement
2. Comments on Land Use Framework Map
3. Comments on strengths of current Plan
4. Comments on weaknesses of current Plan

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Ames Urban Fringe Plan

City of Ames
City of Gilbert
Boone County
Story County

JULY 2006

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Why Cooperate to Plan and Manage Land Use?

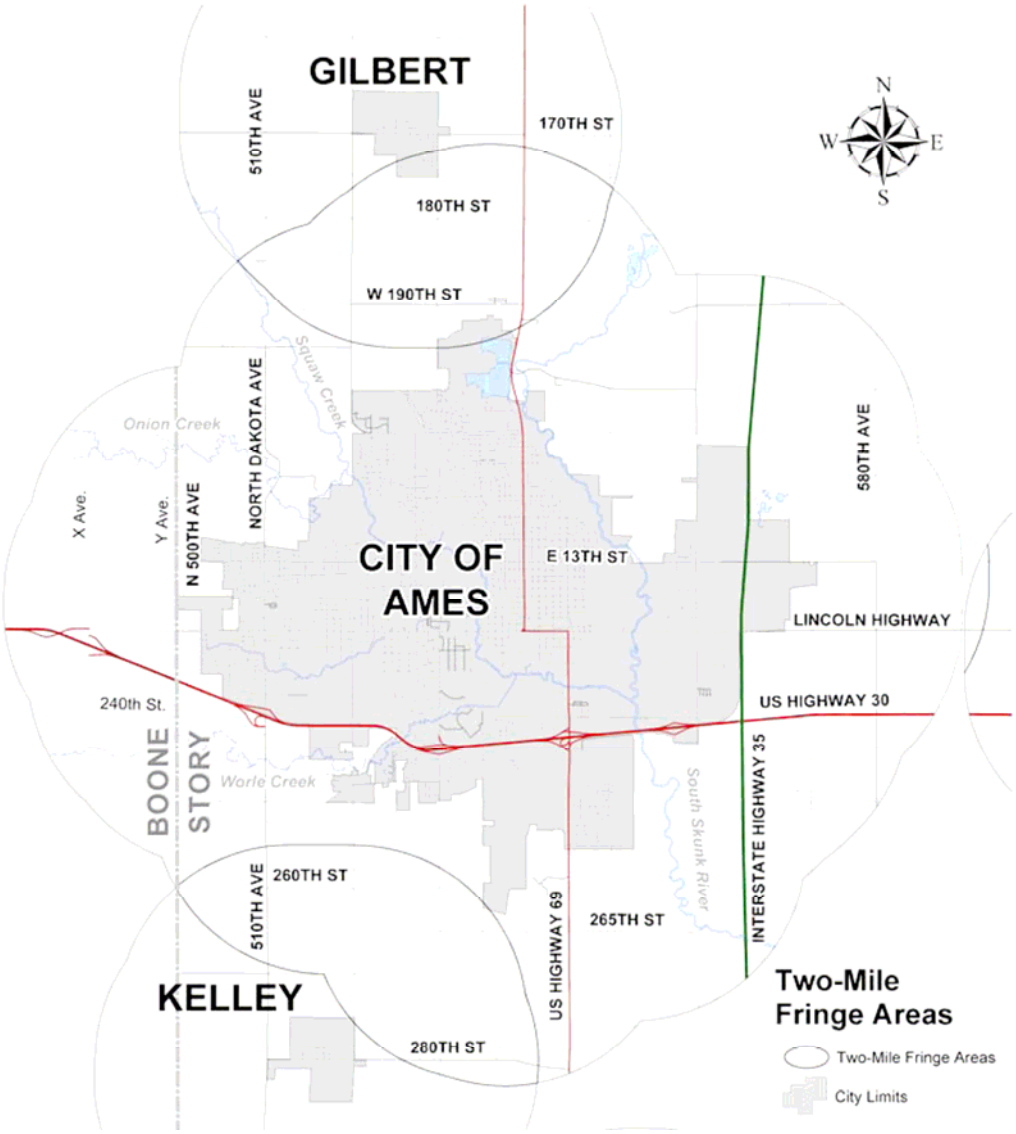
Iowa law delegates authority to county governments to regulate land uses outside city boundaries. The *Code of Iowa* also enables cities to exercise control over subdivision of land outside, but within two miles of, these corporate boundaries. Generally, communities plan for the future of the lands located within their incorporated limits, extending only limited distances beyond these established boundaries. With many overlapping jurisdictions governing land uses and subdivision approval in such areas, clear and consistent plans and standards need to be developed in order to successfully manage growth and development.

The area within two miles of the City of Ames (in this plan, commonly referred to as the "Urban Fringe" or "fringe area") is located mostly within western Story County and partially within the eastern part of Boone County. It also overlaps areas within two miles of the city boundaries of Gilbert and Kelley. The areas surrounding the City of Ames (including areas around the City of Gilbert as well as the City of Kelley) are subject to the land use regulations of Boone and Story County as well as subdivision review by each affected community. The City of Ames has exercised this subdivision review authority for many years to regulate the division of land within Story and Boone County.

The Urban Fringe around the City of Ames has historically been one of the major rural "growth" areas of unincorporated Story County. When the *Land Use Policy Plan (LUPP)* was adopted by the City of Ames in 1997, the City identified a planning area extending two miles from the City's boundary, recognizing the need for cooperative planning efforts. Gilbert, as well, in the *Gilbert Comprehensive Plan* adopted in 2003, identified both a Study Area and a Planning Area extending into the area within two miles of the Gilbert city boundary (also crossing into the Ames' two-mile boundary). Story County further identified the need for cooperative planning among the various overlapping jurisdictions in the *Story County Development Plan – Land Use Framework* adopted in 2003. As all jurisdictions update and adopt new regulations, it becomes clear that shared and consistent planning objectives need to be identified to manage development in and around communities.

The Ames Urban Fringe Plan is a shared land use plan cooperatively developed by Boone County, Story County, the City of Ames and the City of Gilbert. The Plan provides guidelines for understanding and predicting future land use planning for the area. The Plan consists of written principles and policy statements, along with a Land Use Framework Map, which, together, establish guidelines and locations for areas of growth, agricultural land preservation, and natural areas protections.

This Ames Urban Fringe Plan is intended to serve as the blueprint for cooperation among the various governmental entities, providing a road map to an agreed future. Cooperation will help each entity manage its land resources, services, service capital, and infrastructure systems more efficiently and effectively; coordination will lead to better management of public resources.



Planning Area Boundary

The planning area defined in the Ames Urban Fringe Plan is the area lying within two miles of the official boundary of the City of Ames, as it existed in 2006. The Plan seeks to address a future period of time extending to the year 2030 (the planning horizon). However, the two-mile jurisdictional boundary of the City of Ames (as granted by the *Code of Iowa*) expands as the City of Ames annexes lands and expands its boundaries, It is important to note that this Plan uses a defined boundary rather than a constantly changing jurisdictional boundary whenever an annexation occurs. Therefore, from time to time, the Plan will need to be updated to consider areas within a boundary two miles from the corporate limits of City of Ames and the Plan boundary.

Note also that the area of analysis described in the Planning Context section of the *Ames Urban Fringe Plan* and the accompanying *Background Report* vary, depending upon the form of base resource information needed to develop concise analyses for

planning purposes. For example, Census block group boundaries are different from watershed boundaries and are also considerably different from soil type boundaries.

Purposes of Planning in the Ames Urban Fringe

In the Ames Urban Fringe, overlapping regulations (some more restrictive than others), different policies, and overlying service jurisdictions all exist. Despite existing cooperation among governmental entities, each affected jurisdiction shares concerns about issues and impacts from land development in fringe areas, including:

- Overlapping regulations of different local jurisdictions;
- Inconsistencies among different land use policies; and
- Impacts of development on rural/agricultural activities.

Further description of each of these impacts follows. The separate *Background Report* contains research information and analysis on these and many other issues related to conditions in the planning area.

Overlapping regulations of different local jurisdictions

There are many different stakeholders in the identified planning area, each with unique purposes, powers, plans, and priorities for development. Service providers and governmental units include school districts, rural water districts, drainage districts, fire districts, law enforcement agencies, ambulance and emergency service providers, and environmental stewards. Different land use policy plans, subdivision regulations, permitting standards, and zoning criteria overlap in the Ames Urban Fringe.

Overlapping jurisdictions cause intergovernmental inefficiencies and sometimes impose financial burdens on those governments; the lack of coordination and shared knowledge among government agencies can lead to miscommunication and conflicting objectives. Each governing entity can find itself in a reactive role, dealing with problems and inconsistencies after an issue has occurred. Layer upon layer of service providers and governmental organizations impose respective polices, regulations and practices upon private property owners. Private property owners receive inconsistent direction regarding what is and what is not acceptable. This is difficult and frustrating for landowners who are trying to preserve, improve and/or maintain their property.

Inconsistencies among different policies on land use

Lack of coordination hinders each government's ability to effectively accomplish its own land use goals. The regulations and policies of one county, city, or other related agency might undermine or hinder the regulations and policies of others. Lack of coordination and cooperation could lead to poor land use decisions that would be difficult, if not impossible, to reverse or correct at some time in the future. Such inconsistencies and potential for conflict and increased public costs demonstrate the need for shared vision and planning.

Impacts of development on rural/agricultural activities

Decisions affecting growth and development have long-term impacts on many conditions and resources in the planning area. Growth brings a need to carefully balance the needs of residents and businesses within the cities and counties involved without sacrificing the area's assets and quality of life. Positive assets and quality of life are

often associated with growth's long-term impacts on preservation on natural resources, public health, transportation resources and adequate provision of emergency services. Impacts of development on these areas are further discussed below.

Environmental Quality

Decisions affecting growth and development have long-term impacts on the condition of such environmental factors as soils, groundwater, rivers and major drainageways, steep slopes, scattered woodlands, natural prairies, and wetland areas. These natural areas provide habitat for wildlife and are necessary to sustain and support environmental systems (ecosystems). These resources also minimize the negative effects of stormwater run-off, stabilize soils, modify climatic effects, provide visual attractiveness, and serve as recreational areas.

Development encroaching stream corridors, wooded areas, natural vegetation areas, and the like, reduces the quality and extent of these areas for wildlife habitat and the other environmental benefits they provide. Impacts can be direct, as in removing or altering the habitat itself, or indirect, such as increased human activity decreasing vegetation species diversity or increasing predator animal species. Identifying such resources, and cooperatively planning in order to sustain the natural areas within the planning area, helps mitigate the negative affects of growth and development on these areas.

Transportation Facilities

Because of their convenience, safety, and speed of travel, paved rural roads attract development in the Ames Urban Fringe. As suitable sites become less available on paved roads, development also occurs on secondary roads with rock surfacing. As traffic increases on secondary road networks, road rebuilding and surfacing may be necessary, as well as widening existing lanes, adding lanes, increasing shoulder widths, or completing more capital intensive improvements such as bridges, improved intersections, and other traffic control mechanisms. Such improvements may, in turn, encourage~~s~~ more traffic, creating a cyclical effect encouraging more dispersed development patterns, again increasing traffic demand. As a result, costs of maintaining road systems also increase.

Emergency Services

The Ames Urban Fringe is served by the Story County Sheriff's Department and by volunteer fire departments with second response service provided by the City of Ames Fire Department. Mary Greeley Medical Center, Boone Hospital and Story County Hospital also provide ambulance services. The dispersed nature of rural growth reduces emergency response times and the ability of volunteer organizations to provide services at the same levels provided today in urban areas. Unimproved and/or less maintained street networks may slow response times and make emergency incident locating and mitigation more difficult.

School Districts

Due to the relatively static nature of school district boundaries, schools pay special attention to residential development trends and patterns. Widespread growth, especially at very low densities, can impact revenues, service levels, efficiencies of school infrastructure and resources and the ability to sustain educational services. For example, busing is a large cost associated with educational services. The more residential

structures are dispersed, and the development of non-urban street facilities increases, busing costs increase as well.

Agricultural Production

As the number of farms decrease, replaced by residential or other non-agricultural development, the ability to effectively operate family-owned farms decreases. Farmers, often required to travel greater distances to rent land, feed and seed, move equipment, and ship product, face increased costs to farm. In addition, as land values increase due to adjacent residential development, new farmers meet cost barriers that hinder establishing new farming or expanding existing operations.

Without carefully planned buffers and areas designated for agricultural uses only, dispersed and increased residential and other non-agricultural uses can work against the long-term future of agricultural production within the two-mile fringe area. As the fringe area develops, dispersed non-agricultural residential development can conflict with agricultural operations and facilities. Agricultural production activities, such as spraying, harvesting, manure spreading, odorous activities, and other operations may conflict with residential development.

Planning Context

The *Ames Urban Fringe Plan* is accompanied by a *Background Report* detailing forces shaping the Urban Fringe including the physical environment, growth trends, and community values. Due to its length and level of detail, the *Background Report* is printed in a separate document. Nonetheless, it is important to note that the information base in the *Background Report* defines the context from which the *Plan* and *Land Use Framework* were developed.

Some of this foundational information is summarized below. For more detail, please refer to the *Background Report*.

Natural Resources
The Ames Urban Fringe contains scattered woodlands, natural prairies, wetlands, rivers, lakes, and streams. These natural areas provide habitat for wildlife, minimize the negative effects of stormwater run-off, stabilize soils, modify climatic effects, provide visual attractiveness, and serve as recreational areas. The Ames Urban Fringe also benefits from the economic and cultural value of high-value agricultural lands and associated open spaces.

Despite the inherent attractiveness of these resources, these and other natural features may pose significant constraints to development. Environmental factors that challenge development include steep slopes, sensitive soil conditions, propensity for flooding, and conditions of shallow depth-to-bedrock that increase the potential for groundwater contamination as a result of human activities. The public benefit of these natural features also often outweighs that of expanding adjacent development.

The following statistics highlight some of the past trends related to development and natural resources in the Ames Urban Fringe:

- From 1990 to 2000, an average of approximately 12 acres of land per year were absorbed by single-family residential growth in areas defined (at the time) as Critical Resource Areas according to the Story County Development Plan. At a typical lot size of three to three and one-half acres, this roughly translates to four residential lots per year.
- From 1990 to 2000, approximately 35 acres per year were absorbed within 1/8 mile from waterways, and 30 acres per year of soils with a poor rating for septic systems were absorbed.
- From 1990 to 2001, approximately 18 acres of land per year were developed within areas designated as Natural Areas in the “Norris Study” (City of Ames inventory of natural areas).

Demographics
Since 1970, population growth in the Ames Urban Fringe has been greater than the total unincorporated, rural population growth in Story County. The decade of 1970 to 1980 saw a significant population loss for rural Story County. During this same period, the fringe area experienced population gains. Likewise, the decade of 1990 to 2000 saw an increase in population growth for unincorporated Story County; however, the Ames

Urban Fringe population grew at a rate two to three times faster than the total population for rural, unincorporated Story County. When the Ames Urban Fringe growth was excluded from the unincorporated population from 1990 to 2000, the unincorporated area population decreased, suggesting that net increase in population occurred in the Ames Urban Fringe.

Residential Development
Between the years 1970-2001, the land absorption rate due to non-agricultural single-family residential growth in areas considered prime agricultural land by the USDA averaged approximately 27 acres per year.

Based on a 30-year housing projection, the Urban Fringe population is expected to increase by 50% by the year 2030, an increase of approximately 1,100 people. Based on an average of 2.39 people per household, there will be a need for approximately 460 more housing units in the Urban Fringe to accommodate this growth trend by the year 2030 (approximately 15 units per year).

Agricultural Production
When land use policy from Story County, Boone County, and Story County is overlapped, over 80% of high value agricultural land (as defined by the USDA) in the Urban Fringe falls into an agricultural land use designation.

Other Physical Development
The majority of commercial development within the Ames Urban Fringe is generally located along the southeast area adjacent to Highway 30, just east of Interstate 35, and within Boone County along Lincoln Way. There are no well-defined commercial centers located in the Ames Urban Fringe.

Like commercial growth, the majority of industrial development within the Ames Urban Fringe is generally located along the southeast area adjacent to Highway 30, just east of Interstate 35, and within Boone County along Lincoln Way. Limited industrial activity does occur northeast of Ames, along Arrasmith Trail. There are no well-defined industrial areas located in the Ames Urban Fringe. Industrial growth has developed within the corporate limits of the City of Ames, or has been annexed over the years (after initially constructed under county jurisdictions), to utilize the community's urban infrastructure. Most of the industrial activity within the Ames Urban Fringe is small in scale and related to rural/agricultural activities.

Employment
Commercial and industrial development requires urban services (fire, police, sewer, water, etc.). Therefore, the need for non-residential, rural development in the Ames Urban Fringe is more difficult to predict than residential development. Many of the residents within the Ames Urban Fringe commute to employment within the City of Ames.

Community Values
In the spring of 2004, representatives of Boone County, Story County, the City of Gilbert, and the City of Ames met with various groups with an interest or connection to the Ames Urban Fringe to learn about issues, ideas, and aspirations that will affect future use of land. The following is a general summary of input from groups of people represented at these meetings:

Agricultural Producers Group. Farm ground and agricultural services should be protected. Agricultural producers rely on quality road systems, the freedom to farm, separation from the built environment, eased building and zoning restrictions, and the ability to sell land for its highest and best use. Growth adjacent to farms creates significant compatibility issues and can hinder farming activities.

Economic Development Group. The Urban Fringe provides additional housing opportunities that are needed in today's market. The fringe around Ames allows for large rural lots, a development option many families are seeking. Therefore, cooperative planning should result in the reduction of the amount of red tape developers must go through to develop in the fringe. Provisions should be made for more public infrastructure in the fringe, and efforts should continue to streamline methods for additional rural development.

Environment Group. The Urban Fringe includes delicate ecosystems and valuable environmental resources that are important to the region. Measures must be taken to restrict development in sensitive areas, protect existing natural areas, and enhance natural corridors. Growth should stay within the limits of the existing city.

Government/Institutional Group. The operations of Iowa State University must be kept in mind when land is developed in the Urban Fringe. The University maintains many research farm operations that may conflict with rural development. ISU should continue its operations without encumbrance from Urban Fringe land use activities.

Development within the fringe must take government operations into consideration. As the fringe area develops, costs will increase for road maintenance, policing, and fire protection. Today, many of these services are straining limited resources to the maximum.

School districts must be taken into consideration. As areas develop as single-family residential, they in turn contribute to school capacity costs.

Neighborhood/Public Group. Development in the fringe area should respect existing rural residents. Further development can destroy the existing rural lifestyle, add to service costs, and damage the established rural community.

Land within the Urban Fringe should be preserved for agricultural and natural resource purposes and growth should stay within the boundaries of the existing city.

Guiding Principles for Cooperative Planning

Cooperatively planning for development offers opportunities to:

- *Preserve and enhance environmental assets and ecological services;*
- *Efficiently provide infrastructure facilities and services; and*
- *Meet need/demand for certain types of lifestyle/housing choices.*

Given the varied and often competing interests of the agencies within the Ames Urban Fringe, it is most appropriate that all stakeholders within the fringe come together to create and implement common planning objectives. Each brings its own priorities and agendas to the discussion - in the end, all perspectives must be balanced and mutual priorities established in order to develop a shared and workable framework for city/county land use cooperation. Because the overall objective for all who are affected by development in the Ames Urban Fringe is to further the quality of life, consensus must be established about the best course of action to bring about the greatest amount of good to the area. The first step toward such a consensus is agreement on the principles that are to guide the planning.

When the land use policies of Boone County, Story County, City of Ames and City of Gilbert are compared to one another, six common guiding principles emerge. In 2003, the City Councils of Ames and Gilbert and the Boards of Supervisors of Boone County and Story County jointly discussed and agreed to these principles.

Generally, these six guiding principles include intergovernmental coordination, prime agricultural land preservation, targeted growth, growth management, transitional land uses, and environmental protection. These shared fundamental values provide guidance to cooperatively plan and manage land use in the Ames Urban Fringe.

Principle 1: Recognizing that population and economic growth is likely, Boone County, Story County, the City of Ames and the City of Gilbert will strive towards intergovernmental coordination for successful planning within the Ames Urban Fringe.

- **Manage growth** -- Growth should be predictable, sustainable, and foster and protect the quality of life of all citizens. Boone County, Story County, City of Ames and the City of Gilbert seek to manage growth with other governmental agencies whose jurisdictions fall within the Ames Urban Fringe.

- **Formal agreements** -- The four governmental jurisdictions seek to establish and maintain formalized agreements to map out responsibilities and obligations of each jurisdiction within the two-mile fringe area of the City of Ames in accordance with this shared land use plan. In addition, Boone County, Story County, City of Ames and City of Gilbert will work with other governmental agencies when further agreements are warranted.

- **Planning procedures --** Boone County, Story County, City of Ames and City of Gilbert seek to establish planning procedures to review and provide

recommendations regarding proposed land use issues within the fringe area. Such issues could include changes to shared plans and strategy, zoning changes, subdivision coordination, and annexation agreements.

Principle 2: Boone County, Story County, City of Ames and City of Gilbert seek to work together to preserve agricultural lands and protect rural lands from unplanned, rural single-family development and other forms of inefficient urbanization.

- **Define prime agricultural lands --** Boone County, Story County, City of Ames and City of Gilbert have the common goal to reach a consensus on the definition of prime agricultural lands. This common definition shall be the basis for identifying and preserving agricultural resources in the future.

- **Uniform approach to analysis --** The four governmental agencies will work together to adopt a universal and uniform approach to analyze and calculate prime agricultural resources. The method, approach, or tool used for analysis of agricultural land will include the recognition of planned city growth areas, planned county growth areas, environmental resources, crop suitability, and soil conditions. An inventory of prime agricultural lands shall be created and used to establish the demarcation of prime agricultural preservation areas.

Principle 3: Boone County, Story County, City of Ames and City of Gilbert will work together to ensure that future development will be directed and targeted towards identified growth areas, as identified in a shared fringe area land use plan.

- **Mutual growth needs --** Each county and city will work together to ensure that identified growth needs are mutually representative.

- **Logical growth areas --** The four government entities shall work together to identify logical growth areas. These growth patterns will take into account urban growth needs, the preservation of environmental resources, the protection of prime agricultural land, and the efficient and effective distribution of infrastructure and services.

Principle 4: Boone County, Story County, City of Ames and City of Gilbert seek effective and efficient management of growth. Growth shall be managed by each government entity in order to minimize negative impacts to another affected governmental entity.

- **Joint procedures --** Joint planning rules and procedures shall be adopted by each government agency in efforts to manage growth.

- **Shared land use plan --** Boone County, Story County, City of Ames and City of Gilbert shall share a land use plan for the Ames Urban Fringe. This plan will outline common plan objectives, a unified understanding of growth priorities, the enduring responsibilities of managing growth, and the regulation of existing and future land uses.

- **Common standards --** Clear, concise, and common development standards shall be adopted by each government entity. These standards shall include subdivision regulations, zoning regulations, and permitting rules. These shared standards shall be consistent with a common fringe area plan and form the foundation for managed growth.

Principle 5: In efforts to establish an orderly transition of land uses from urban to rural (as well as rural to urban), Boone County, Story County, City of Ames and City of Gilbert seek to work together to delineate areas of responsibility and come to a common agreement on the definition of rural and urban land uses.

- **Define rural uses --** Boone County, Story County, City of Ames and City of Gilbert shall share a common definition of rural land uses, representing each governmental agency's perspective.

- **Spheres of influence** -- Preferred land uses and priority areas for growth shall be defined and delineated on a shared land use plan and map. Each governmental entity shall define critical areas on the map that directly affect the distribution and management of resources and services.

- **Consistent criteria** -- Boone County, Story County, City of Ames and City of Gilbert shall establish consistent criteria to address the contiguity requirements for development, established levels of service, design and improvement standards, annexation requirements and procedures, and issues that may surface during future land use planning and development processes.

Principle 6: Boone County, Story County, City of Ames and City of Gilbert seek to establish growth policy within the Ames Urban Fringe compatible with ecological systems. It is commonly understood by each governmental agency that future growth will be compatible with natural resources. Environmental resources shall be protected.

- **Common resource definitions --** Each governmental entity shall reach a consensus on the definition and delineation of natural resources. The definition shall outline natural plant and animal habitats, stream corridors, drainageways and flood management systems, scenic areas, open space areas, water quality protection areas, critical watersheds, aquifer protection areas, and air quality protection areas.

- **Uniform protection approach --** Boone County, Story County, City of Ames and City of Gilbert shall develop a uniform approach to protect natural resources.

- **Watershed management principles --** Watershed management principles shall be established for future development within the Ames Urban Fringe. These principals shall include standards for nutrient loading, alternative mitigation approaches and techniques, and the development of "best management practices" (BMPs).

The goals, objectives, plans and policies described in this planning document have been guided by these principles.

Vision and Goals for the Urban Fringe

Identifying Issues

Growth pressures around the City of Ames bring challenges to the City of Ames, City of Gilbert, Boone County, and Story County. The issues associated with growth identified in this Chapter form the basis for each jurisdiction's future land use and growth coordination goals and policies, and justify the strategies recommended in this Plan.

The following issues, identified in the planning process, are discussed in detail in the *Background Report*. These issues bring challenges addressed by policies and strategies embodied in this Plan.

Environmental Issues

- Protect properties from flood damage
- Preserve prime agricultural land
- Protect groundwater, river and stream systems, and potable water quality
- Ensure non-agricultural land uses/development adequately addresses constraints from steep slopes and bedrock
- Protect woodland and prairie areas
- Preserve and protect (managed) watersheds
- Mitigate the negative affects of stormwater run-off
- Provide a connected system of open space and greenway corridors

Growth Issues

- Manage residential growth in agricultural areas
- Promote sound economic development and diversification
- Manage impacts from residential, commercial, and industrial growth
- Foster efficient growth patterns and land uses
- Facilitate intergovernmental coordination between Story County, Boone County, City of Gilbert, and City of Ames
- Establish a common growth strategy that includes a shared vision for the location, type, intensity, and timing of growth
- Reach agreement on the type of services and facilities that should be provided for urban and rural development
- Support the agricultural industry
- Reduce commercial leakage
- Support health and welfare of all citizens
- Identify the necessary amount and appropriate areas for growth
- Maximize all forms of transportation networks
- Encourage residential growth where services can be efficiently distributed

Community Facility Issues

- Plan for the provision of adequate public facilities and services (e.g. streets, utilities, storm water facilities, fire services/stations, parks, trails and greenways) to serve planned growth
- Protect transportation corridors

- Provide and maintain an efficient and complete road system
- Minimize conflicts between agricultural and non-agricultural traffic
- Coordinate roadway and land use decisions
- Establish appropriate levels of service
- Establish equitable responsibilities for public improvements and services
- Facilitate development of telecommunications networks

Regulatory Issues

- Ensure that Story County, Boone County, City of Ames and City of Gilbert land regulations are consistent with each jurisdiction's land use goals and objectives
- Develop consistent and appropriate regulations addressing the unique needs of urban and rural development

Balancing Issues

Cooperation to plan and manage land use requires balancing the many issues arising from simultaneously protecting natural resources, preserving agricultural operations, and accommodating rural and urban development all within the Ames Urban Fringe. The following statements address priorities to help balance conflicts among issues.

Agricultural Land Preservation -- means that high value agricultural land will be protected from premature development. Some high value agricultural land will be developed in urban service/urban growth areas, but elsewhere in the unincorporated areas, development will be located and designed to minimize interference with agricultural operations/land uses.

Land Use Compatibility -- means that land uses can exist in close proximity without interfering with one another. It does not imply identical land uses, intensities, or similar densities. It means that potential negative affects/impacts of one use on adjacent properties have been mitigated.

Fiscal Integrity -- means that a jurisdictional decision will not result in an unnecessary public sector fiscal burden on the jurisdiction or other affected jurisdictions. While some decisions may generate public or private short-term losses, all decisions should result in long-term financial and non-financial benefits that enhance the quality of life in Story County, Boone County, and the City of Ames and City of Gilbert.

Efficient Service Provision -- means that the decision will capitalize on existing public investment in infrastructure and minimize increases in long-term capital, maintenance, administrative, and operations costs.

Community Health and Stability -- will be promoted through the regulation of development with the Urban Fringe.

Retention of Viable Agribusiness -- will be fostered through the protection of agricultural operations from incompatible non-agricultural development and support for activities and businesses that strengthen each jurisdiction's economic and agricultural base.

Economic Development -- will be supported through the reservation of key commercial and industrial sites within the Urban Fringe, namely those along the area's major rail, highway, and interstate transportation systems. Capital improvements will favor development of these sites.

Development Quality -- will be a high priority for each jurisdiction in order to enhance the attractiveness of the City of Ames, City of Gilbert, Story County, and Boone County for economic growth and sustain fiscal integrity. Quality development will be measured in terms of subdivision design, efficiency, durability, serviceability, and protection of the natural environment.

Open Space Preservation -- is essential to maintain the natural and rural character of the Urban Fringe and to provide adequate passive recreational opportunities for existing and future residents.

Common Goals for the Urban Fringe

The six principles discussed in the first section of this report guide the cooperation to plan and manage land uses in the Ames Urban Fringe, including intergovernmental coordination, prime agricultural land preservation, targeted growth, growth management, transitional land uses, and environmental protection. These principles are embodied in the following goals for the Urban Fringe.

Common Goal 1.1

To provide a balanced mix of land uses that is arranged to avoid conflicts and to maximize efficient delivery of municipal and county services and facilities.

Common Goal 1.2

To prevent premature development and preserve the most high value farmland in appropriate locations.

Common Goal 1.3

To provide a variety of housing opportunities in the Ames Urban Fringe in appropriate locations.

Common Goal 1.4

To provide adequate opportunities for commercial and industrial development in appropriate locations.

Common Goal 1.5

To coordinate development decisions with the efficient provision of public facilities and services.

Common Goal 1.6

To protect and preserve sensitive natural resources, including floodplains, woodland areas, wetlands, and other sensitive natural areas.

Common Goal 1.7

To secure a system of public and private open spaces throughout the Ames Urban Fringe that serves as a visual and recreational amenity.

Distinct Land Use Classes

It is clear from the research and projections that change is taking place in the Ames Urban Fringe. It contains both rural and urban conditions and areas where one condition is changing to another. By its nature, it accommodates fundamentally different types of land use. Reflecting this, and to balance the issues, land uses and policies for the Ames Urban Fringe are grouped into three separate classes:

- **- Rural Service and Agricultural Conservation Area;**
- **- Rural/Urban Transition Area; and**
- **- Urban Service Area.**

Rural Service and Agricultural Conservation Area

The Rural Service and Agricultural Conservation Area is intended to be rural and agricultural in use and character throughout the life of the Plan. It should be protected from development that would damage the rural character of Boone and Story County. It is not intended for urban-scale growth. Inappropriate development includes both residential and non-residential development not characteristic of the countryside or a rural community.

Key Issues and Goals for Rural Service and Agricultural Conservation Area

Land Use

The Rural Service and Agricultural Conservation Area is intended for agricultural and other very low intensity uses. Limited residential development should only occur as it relates to farming. Provisions may be made to cluster farm related developments on a limited scale; however, adequate road access and quality potable water supply must exist. All rural area development in the Rural Service and Agricultural Conservation Area should be designed to avoid interference with agricultural operations. It shall be developed in unison with the rural agricultural environment.

Water and Wastewater

Since there will be limited growth in the Rural Service and Agricultural Conservation Area, there is not an immediate need for centralized wastewater systems. Rural development may use existing rural water supplies or well water. Wastewater may be treated with on-site systems in accordance with the Iowa Department of Natural Resources and County Boards of Health regulations and standards. Agricultural activity and limited commercial/industrial development servicing the agricultural industry will be encouraged to provide on-site systems.

Transportation

The Rural Service and Agricultural Conservation Area will continue to use the existing county road systems that include dirt, gravel, and hard-surfaced roads. Boone and Story County shall have a limited paving program and generally will not pave roads or add new roads in the Rural Service and Agricultural Conservation Area unless and until increases in traffic volumes indicate the need in order to provide safe roads. System expansions must be done within the fiscal means of the county and should provide flexibility to evolve as needs and technology change. The location and design of new facilities should be compatible with municipal street networks and transportation plans. Street systems shall protect the character of existing areas. Transportation system planning is an on-going process that should be flexible, but comprehensive, open to public participation, and focused on the long-term.

Public Facilities and Services

Development within the Rural Service and Agricultural Conservation Area should not expect the same level of public facilities and services as the urban growth areas of the Cities of Ames and Gilbert. New public facilities and services are likely to be built and provided in identified growth areas as the communities develop. Services shall be provided as the density of population increases, making the provision for services efficient and cost-effective. In rural areas, the affected county will maintain its existing levels of law enforcement and emergency services.

In addition to the goals stated above for all areas, the following goals guide planning and management of land use in the Rural Service and Agricultural Conservation Area.

RSACA Goal 2.1

To maintain the rural character of the countryside.

RSACA Goal 2.2

To maintain the county road systems in areas designated to remain rural to minimize long-term costs while providing adequate access.

RSACA Goal 2.3

To protect and preserve sensitive natural resources, including floodplains, woodland areas, wetlands, and other sensitive natural areas.

RSACA Goal 2.4

To secure a connected system of public and private open spaces throughout the Ames Urban Fringe that serves as a visual and recreational amenity

RSACA Goal 2.5

To prevent premature development and preserve the most productive farmland.

RSACA Goal 2.6

To ensure that all areas have safe and adequate water and wastewater service.

RSACA Goal 2.7

To maintain the identities of both Gilbert and Ames as separate and distinct communities.

Rural/Urban Transition Area

The Rural/Urban Transition Area is to accommodate rural development that can also be accommodated within municipal jurisdiction at some time, perhaps beyond the life of the Plan. This area coordinates public preferences for broad choices in rural development with orderly and efficient future transition between land uses within municipal limits and unincorporated areas. These areas are not necessarily expected to be developed under sole municipal jurisdiction during the life of the Plan, but because of their proximity and/or juxtaposition in relation to city limits, development of these areas must be carefully orchestrated to be compatible with city development patterns.

Key Issues and Goals for Rural/Urban Transition Area

The Rural/Urban Transition Area represents a critical intersection of county and city land use policies. It is here that the greatest potential for conflict among cooperating communities exists, and also where the greatest potential for public frustration over a non-unified planning approach exists.

Lands in the Rural/Urban Transition Area, if developed appropriately, can contribute to efficiently meeting the needs of the City of Ames and City of Gilbert to grow, while also helping to meet the market demand for larger residential lots in a rural setting. Lands identified for future industrial or commercial use are also included in the Rural/Urban Transition Area, but not all of this land will be utilized this way in the near future. Until such time that conversion of these land resources is justified, land in the Rural/Urban

Transition Area designated for industrial or commercial uses is best maintained for agricultural production.

Because of the dual role of land in the area, the Rural/Urban Transition Area becomes the center stage for cooperative planning among the City of Ames, City of Gilbert, Story County, and Boone County. All have strong interests in the land use of the area, and may therefore seek to apply differing policies at different times, depending on the location of proposed development. Therefore, a clear outline of split jurisdictional responsibilities, shared goals, and clear expectations are needed.

Land Use

The Rural/Urban Transition Area is intended to create as smooth a transition as possible between rural and urban areas. Residential land uses occur, in some cases, at a density more typical of rural areas, while in other areas where city expansion is more likely in the near future, residential density is more typical of an urban area. Likewise, urban infrastructure standards may be applied in certain critical areas, while other areas are subject only to the minimum urban standards necessary to smooth potential transition into city limits in the distant future.

Water and Wastewater

The provision of water and wastewater services in the Rural/Urban Transition Area will need to be carefully orchestrated to ensure that the needs of all cooperating communities are met, while unnecessary expenditures on urban-type services are eliminated where urban expansion is not anticipated in the near future. In certain areas, the installation of dry sewer and water services may be necessary to ease the future rural-to-urban transition of development. Annexation and development agreements may also be necessary.

Transportation

The existing county road systems that include dirt, gravel, and hard-surfaced roads, will continue to be utilized within the Rural/Urban Transition Area. Boone and Story County shall have a limited paving program and generally will not pave roads or add new roads in this area unless and until traffic volume increases indicate the need to improve the system in order to provide safe roads. However, developer-funded additions to the road system are probable in keeping with city and county subdivision improvement standards. System expansions must be done within the fiscal means of the county and should provide flexibility to evolve as needs and technology change. The location and design of new facilities should be compatible with the Cities of Ames and Gilbert street networks and transportation plans. Street systems shall protect the character of existing areas. Transportation system planning is an on-going process that should be flexible, but comprehensive, open to public participation, and long-term focused.

Public Facilities and Services

Development within the Rural/Urban Transition Area should not expect the same level of public facilities and services as the urban growth areas of the City of Ames and City of Gilbert. New public facilities and services are likely to be built and provided in the urban growth areas as the cities develop. Services shall be provided as the density of population increases, making the provision for services efficient and cost-effective. In rural areas, the affected county will maintain its existing levels of law enforcement and emergency services.

In addition to the goals stated above for all areas, the following goals guide planning and management of land use in the Rural/Urban Transition Area.

RUTA Goal 3.1

Provide for strategically located development in portions of the Urban Fringe that will not be served by the City of Ames or City or Gilbert in the time horizon of the Ames Urban Fringe Plan.

RUTA Goal 3.2

To prepare non-agricultural development for efficient rural-to-urban transition.

RUTA Goal 3.3

To ensure that new development has safe and adequate water and wastewater service and other adequate facilities and that there is sufficient space for these facilities to be improved so that they may become public facilities.

RUTA Goal 3.4

To maintain the rural character of the surrounding countryside.

RUTA Goal 3.5

To maintain the county road system and effectively incorporate new subdivision roads and other system expansions in the existing and planned road system.

Urban Service Area

The Urban Service Area contains the lands into which Ames and Gilbert may expand its municipal boundaries as development occurs. This area is adjacent to city limits and should be planned for urban development, with urban development standards, such as centralized water and wastewater services. These areas should be protected from any form of development that would constrain the efficient growth of the communities. Inappropriate development includes low-density residential lots served by on-site wastewater treatment systems and other forms of rural development. This will enable Ames and Gilbert to grow in unison with the growth in the Ames Urban Fringe, in an orderly manner where there is coordination of annexation with the timely and efficient extension of public facilities and services.

Key Issues and Goals for Urban Service Area

Balanced, Smart Growth

Rural and city residents are affected by large lot, scattered development in the Urban Fringe. Development that occurs in a disorderly, unplanned pattern can create barriers to planned expansion of infrastructure and city boundaries. Infrastructure is expensive and barriers add unnecessary costs to the expansion and extension of services. Expansion of infrastructure is critical to the physical and economic health of each county, Gilbert, and Ames. Unplanned, sporadic residential growth also consumes areas ideal for agricultural uses. There are areas within the Urban Fringe where high value agricultural land needs to be preserved. There are also natural areas that are negatively affected by residential development. Sprawling development increases the area of conflict between agricultural uses and residential development. It is critical that the Ames Urban Fringe Plan provide better guidance for the timing and intensity of land use and development decisions.

Utility Capacity and Service Area Definition
Ames and Gilbert expect to grow beyond their current boundaries. Both communities have identified areas where infrastructure can be efficiently extended in the next 30 years. Property owners in the Urban Fringe have reasonable expectations for the extension of centralized water and sewer service in the future. Developed rural water suppliers provide rural levels of service; however, limited capacity for adequate fire protection exists.

On-site wastewater treatment systems can be used successfully by certain levels of non-urban development. These systems, however, are not ideal for suburban and urban-intensity development and are very costly when they fail. When these areas are annexed, conversion to urban-type wastewater treatment system is also very costly, for property owners as well as taxpayers. Requiring up-front installation of infrastructure or agreements for the development of infrastructure in order to install municipal water and sewer service will be required for development within the identified growth areas. When on-site systems are requested for planned areas outside of the growth area, these areas will be reviewed by their proximity or affect on the municipalities. Additional requirements for water and sewer services, both on-site and off-site, may be required in some locations.

Development in Identified Growth Areas
Identified growth areas delineate locations where the communities expect to support growth over the next 30 years. Development within these growth corridors will be required to provide the necessary infrastructure to support the expanding urbanized population. If interim development is allowed, it should not create a barrier to future infrastructure expansion and growth. Such development should entail explicit development and annexation agreements and may require the installation of "dry" sanitary and sewer systems – meaning installing the necessary water and sewer infrastructure that will eventually connect to municipal services. Since the growth areas provide undeveloped areas for planned growth for City of Ames and City of Gilbert development, these unincorporated areas should be reserved for annexation. Involuntary annexation should not occur unless it is determined that the affected community has sufficient capacity to serve the location with municipal infrastructure and services, including but not limited to public safety services, water, sewer, and road maintenance. However, reasonable availability of adequate municipal water and wastewater service does not mean that infrastructure will be extended to each vacant parcel. It means that the affected community, in review of the annexation, will provide for the extension of utilities to existing developed parcels in a reasonable time frame as specified in State of Iowa law.

Peripheral Development
There has been a proliferation of new parcels created through the plat of survey process. Historically, there has been little political resistance to these incremental, small subdivisions of land. This practice has created more intensive development without the consideration of the cumulative impacts. These developments form an obstacle to rational urban growth. Irregular platting of land becomes a prime motivation for defensive actions by the City of Ames because it provides obstacles to orderly city growth.

Rural Planning and Development Regulations
Rural residential development may consume valuable farmland, generate public services demands usually exceeding revenues from the development, often interfere with normal

farm practices, and increases pressure on the conversion of farmland. Designated areas for rural development avoid creating barriers to the long-term growth of the City of Ames and City of Gilbert and the preservation of valuable farmland and farm economy.

Fiscal Planning

Development patterns impact the ability of Boone County, Story County, the City of Gilbert, and the City of Ames to provide public facilities and services generated by new development. The establishment of impact fees or "pay-as-you-grow" programs for new growth may be necessary to promote development in designated areas. Service and infrastructure capacity should be in place to serve designated growth areas. Development outside of service areas is costly and should be avoided or should be required to pay the expense of inefficient growth.

Development Review Process

Development review is the key implementation mechanism for the Ames Urban Fringe Plan. Defining a common and straightforward development review process for land use decisions in the Ames Urban Fringe, building on shared plan that identifies growth goals and objectives with specific growth policies, results in a common understanding of each other's jurisdictions, goals, and objectives, and provides more streamlined and effective development decisions.

In addition to the goals stated above for all areas, the following goals guide planning and management of land use in the Urban Service Area.

USA Goal 4.1

Ensure that development and improvements in the Urban Fringe are consistent with Ames Urban Fringe Plan.

USA Goal 4.2

Ensure that new development has adequate public facilities.

USA Goal 4.3

Require new development to fund the cost of new improvements and services required by new development.

USA Goal 4.4

Coordinate infrastructure development and provision of services with applicable entities.

Land Use Framework Plan and Policies

Sources of the Land Use Framework Plan

The vision for the Ames Urban Fringe Plan generally describes future conditions that all cooperating jurisdictions desire to achieve. These desired conditions are based on existing physical and social conditions of the Ames Urban Fringe, as the "Planning Context" section summarizes, and the *Background Report* describes in detail. This planning context makes possible the desired conditions. The physical and social conditions, such as the natural environment, demographic composition, current land use pattern and community values, create both opportunities and constraints. These documents also describe how land use and management can change these physical and social conditions over time.

By consciously and purposefully planning and managing land use, we can guide how conditions in the Ames Urban Fringe will change in the future. The Land Use Framework Plan and Policies are intended to guide how Story County, Boone County, City of Gilbert and City of Ames plan and manage land use within this planning context in order to move toward the vision for the Ames Urban Fringe.

Uses of the Land Use Framework Plan

The Land Use Framework Plan is primarily intended as a guide for land use decisions by all four of the governmental entities in the Ames Urban Fringe. Policies are intended to guide the application of the Ames Urban Fringe Plan and its land use designations through review of land use, zoning, subdivision and other regulations and procedures of local government. By adopting the Plan, each jurisdiction adopts the Framework Plan map and the Plan's definitions, designations and policies for land use. The Ames Urban Fringe Plan will guide the regulatory activities by each government. It will also guide other actions of government, such as capital investments, economic development activities, land acquisition, annexation, and resource conservation. Identified growth areas are intended to provide a more effective growth management tool besides statutory two-mile extraterritorial subdivision jurisdiction of the City of Ames and City of Gilbert. The "Implementation" section describes in more detail how this Plan is intended to be used.

The Land Use Framework Plan is not intended to compromise the individual authorities of Story County, Boone County, City of Ames or City of Gilbert. Rather, it is intended to help each of these governments to coordinate the exercise of their authority with each other.

Boone County, Story County, City of Gilbert and City of Ames all support the Urban Fringe and associated cities as a center for social and economic vitality. Each jurisdiction, through this Plan, is entering into a partnership to ensure that development within the Urban Fringe reinforces long-term vitality. The establishment of land use designations and policies and their implementation throughout the Ames Urban Fringe will address land use, transportation, utilities, and other public service issues in a manner that reinforces a shared growth plan.

As described in the previous chapter, the Ames Urban Fringe Plan has identified three distinct land use classes. The Land Use Framework Map builds upon these three classes, establishing land use designations. These are described in detail below, and are shown on the Land Use Framework Map (Appendix A.)

A Note on Boone County Future Land Use

Although there seems to be no great demand for Ames to grow into Boone County by annexation, the Plan shows more limited area for rural development in Boone County compared to current practice. At the time this Ames Urban Fringe Plan is being prepared, Boone County is in the process of preparing a new comprehensive plan for land use in the entire county. Therefore, the parties preparing this Plan recognize that the comprehensive plan may identify future land use needs in Boone County different from what is shown on the Ames Urban Fringe Land Use Framework Map at the time it is first adopted. Should that occur, the jurisdictions that are parties to this Plan may need to come to agreement on modifying the Plan and the Land Use Framework Map. This is consistent with the role of this Plan as a guide for land use decisions by all four of the governmental entities in the Ames Urban Fringe and their stated intention to coordinate the exercise of their authority for land use policy.

Story County Study Area

The area between the cities of Ames and Gilbert, because of its key location, is identified as the 'Story County Study Area' and is set aside as an exception to the Urban Fringe Plan until a detailed study for potential land uses in the area is completed. The County and respective cities shall retain their jurisdictional powers in the study area and continue to maintain status quo with respect to current land use, zoning and subdivision until a joint decision is made.

Land Use Designations and Policies for Rural Service and Agricultural Conservation Area

With isolated exceptions, all land within the Rural Service and Agricultural Conservation Area is expected to remain rural in character. Urban services and development standards are not typically required for the limited non-agricultural development that is expected to occur within this area. Inappropriate development includes both residential and non-residential development not characteristic of the countryside or a rural community.

The following policies apply to the entire Rural Service and Agricultural Conservation (RSACA) Area:

> RSACA Policy 1: Maintain farming and agricultural production as the predominant characteristic of the Rural Service and Agricultural Conservation (RSACA) Area.
>
> RSACA Policy 2: Prohibit urban-scale growth and development in the Rural Service and Agricultural Conservation Area. (Relates to RSAC Goal 2.1)

RSACA Policy 3: Within the Rural Service and Agricultural Conservation Area, minimize conflicts between agricultural and non-agricultural land uses by educating residents and potential residents on the realities of rural living and by requiring adequate buffers between land uses. (Relates to RSAC Goal 2.1)

RSACA Policy 4: Permit agricultural/farmstead and strategically located rural residential development (areas at a large distance from municipal services) to use well water or other water systems in conformance with the standards of the Iowa Department of Natural Resources and respective County Boards of Health. (Relates to RSAC Goal 2.6)

RSACA Policy 5: Permit agricultural/farmstead and strategically located rural residential development (areas at a large distance from municipal services) to use on-site wastewater treatment systems where soils provide adequate drainage and filtration in conformance with the standards of the Iowa Department of Natural Resources and respective County Boards of Health. (Relates to RSAC Goal 2.6)

RSACA Policy 6: Limit development in areas that would create a need for the upgrade of roads before they are scheduled in the appropriate jurisdiction's capital improvements program. Where proposed development will potentially increase the traffic volumes in excess of the current road capacity, provide for the cost of road improvements at the time of development. (Relates to RSAC Goal 2.2)

The following land use designations are planned in the Rural Service and Agricultural Conservation Area.

Agriculture and Farm Service (AFS)

The designation encompasses large areas of highly valuable farmland, with farming and agricultural production as the primary activity. This designation also includes areas where the landowner has chosen not to use the land for agricultural production. The vegetative cover of this land may be native (either original or re-established) or introduced, but not part of the Natural Areas land use designation.

AFS Policy 1 Recognizing that agricultural land is a natural resource of the Ames Urban Fringe that should be protected, farming and agricultural production is and will continue to be the predominant land use of areas given the Agriculture and Farm Service designation. Land given this designation has been determined to be moderate to high value agricultural land with regard to one or more of the following general factors: soil productivity, effect of surrounding land uses on agricultural use, and physical characteristics that affect the ease with which the land can be utilized for agriculture. (Relates to RSACA Goals 2.1, 2.5)

AFS Policy 2: Recognizing that industrial and commercial land uses dependent on proximity to local agricultural land uses are essential to the continued feasibility of farming in Story County and Boone County, support these services within the Agriculture and Farm Service designation. (Relates to RSACA Goals 2.1, 2.5)

AFS Policy 3: Strategically locate such industrial and commercial uses in order to:

-utilitize existing adequate access and road capacity and otherwise assure the existence of adequate public facilities;
-protect productive soils and environmental resources;
-support the continued use of these areas for farming and agricultural production.
(Relates to RSACA Goals 2.1, 2.2, 2.3, 2.6)

AFS Policy 4: Limit non-agricultural residences in the Agriculture and Farm Service designation to homes existing at the time of this Plan or remaining scattered building sites where farmstead homes once existed or homes on very large parcels of ground typical of the agricultural setting. Otherwise, subdivision for the creation of new residential development lots is not supported within the Agriculture and Farm Service designation. (Relates to RSACA Goals 2.1, 2.5)

AFS Policy 5 Allow the clustering of agricultural-related development at a limited scale where properties have adequate access to a public road. Such development shall be configured and designed to be harmonious with agricultural activities and avoid negative impacts to agricultural operations.

Rural Residential (RR)

Residential land uses within Rural Residential designated areas are developed at a rural density and in areas where urban infrastructure may not be in place for a time period beyond the Ames Urban Fringe Plan. The Rural Residential designation recognizes a residential market segment seeking large lots in a rural setting, benefiting from agricultural activities on a small scale

RR Policy 1: This land use designation includes all single-family residential land uses/developments that involve maximum average net densities of one unit per acre.

RR Policy 2: Full urban infrastructure standards are not required. (Relates to RSACA Goal 2.6)

RR Policy 3: Decentralized wastewater treatment facilities and wells shall meet IDNR, county, and city standards. (Relates to RSACA Goal 2.6)

RR Policy 4: Encourage clustering of residential sites within these land areas to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services. (Relates to RSACA Goal 2.6)

RR Policy 5: Make provisions to protect environmental resources, environmentally sensitive areas and adjacent Natural Areas. (Relates to RSACA Goal 2.3, 2.4)

RR Policy 6: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge from Rural Residential land uses according to IDNR and county standards. . (Relates to RSACA Goal 2.3)

RR Policy 7: Protect the rural character of the Rural Service and Agricultural Conservation Area through residential density requirements, buffering requirements between conflicting land uses and other appropriate transitions from urban to rural areas. (Relates to RSACA Goal 2.1)

RR Policy 8: Limit rural residential development on prime agricultural land. Assure that the development on prime agricultural land is farm-related and has adequate access to road systems and potable water. Development should not interfere with agricultural-related activities. . (Relates to RSACA Goal 2.1, 2.2, 2.5, 2.6).

RR Policy 9 Minimize the impact of non-agriculture development in rural areas on existing agricultural operations. . (Relates to RSACA Goal 2.1, 2.5)

Parks and Recreational Areas (PRA)

This designation involves private areas for recreation that do not fall within areas designated as Natural Areas, such as golf course facilities.

PRA Policy 1: Include in this designation recreation, conservation and closely related uses.

PRA Policy 2: Uses in this designation are highly intensive and limited in duration.

PRA Policy 3: Locate these areas to utilitize as much as possible existing adequate access, road capacity and other public facilities. (Relates to RSACA Goal 2.2, 2.5, 2.6)

PRA Policy 4. Full urban infrastructure standards are not required. Decentralized wastewater treatment facilities and wells shall meet IDNR, county, and city standards. (Relates to RSACA Goal 2.6)

PRA Policy 5: Make provisions to protect environmental resources, environmentally sensitive areas and adjacent Natural Areas. (Relates to RSACA Goal 2.3)

PRA Policy 6: Development of parks and recreational areas should not interfere with agricultural-related activities. Minimize the impact of non-agriculture development in rural areas on existing agricultural operations. (Relates to RSACA Goal 2.1, 2.5)

Land Use Designations and Policies for Rural/Urban Transition Area

This area is intended to be rural in character as it develops, but within an urban setting at some time in the future, beyond the time horizon of the Ames Urban Fringe Plan. Urban services and development standards are required for non-agricultural development in certain critical locations within this area. Annexation agreements and/or

other tools also may be utilized to ensure that the future transition into the City of Ames or City of Gilbert is a smooth one.

The following policies apply to the entire Rural/Urban Transition Area (RUTA)

> RUTA Policy 1: Rural-type services and development standards are often acceptable in the Rural/Urban Transition Area, but urban services and standards may be required in certain critical locations or in response to certain intensities of development. (Relates to RUTA Goal 3.1, 3.3)
>
> RUTA Policy 2: At the discretion of the cities, annexation agreements and other tools may be utilized to ensure that new development is prepared for potential annexation in the future. (Relates to RUTA Goal 3.2)
>
> RUTA Policy 3: Ames, Gilbert, Story County and Boone County seek to accommodate public preferences by permitting an expanded range of rural development options that allow orderly and efficient future transition between urban and rural land uses. (Relates to RUTA Goal 3.1, 3.4)
>
> RUTA Policy 4: Permit interim development to occur in a manner that will support long-term urbanization of the Ames Urban Fringe. (Relates to RUTA Goal 3.2)
>
> RUTA Policy 5: Limit development in areas that would create a need for the upgrade of roads before they are scheduled in the appropriate jurisdiction's capital improvements program. Where proposed development will potentially increase the traffic volumes in excess of the current road capacity, provide for the cost of road improvements at the time of development. (Relates to RUTA Goal 3.5)

The following land use designations are planned in the Rural/Urban Transition Area:

Rural Transitional Residential (RTR)

Areas designated Rural Transitional Residential are located in areas where urban infrastructure may not be in place for a time period beyond the Ames Urban Fringe Plan planning horizon. Rural Transitional Residential development is designed to transition seamlessly into adjacent rural residential and agricultural land use, providing buffers where necessary to separate residences from particularly intense or noxious agricultural activities. Residential densities with this designation are between rural densities and urban densities.

> RTR Policy 1: This land use designation includes all single-family and two-family residential land uses/developments that involve average net densities between one unit per acre and 3.75 units per acre. (Relates to RUTA Goal 3.2)
>
> RTR Policy 2: Strategically locate Rural Transitional Residential land uses in areas where they can provide for an orderly and efficient future transition between land uses within the likely future extent of municipal limits and the unincorporated area. (Relates to RUTA Goal 3.2)

RTR Policy 3: Encourage clustering of residential sites within these land areas to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services. (Relates to RUTA Goal 3.2, 3.4)

RTR Policy 4: Depending on location, density of units, size of lots, timing of development, development design, clustering of proposed sites, or other considerations, require full urban infrastructure standards. If the City does not require these improvements to be installed at the time of subdivision, require infrastructure assessment agreements.
(Relates to RUTA Goal 3.2, 3.3, 3.5)

RTR Policy 5: Any decentralized wastewater treatment facilities, wells and supporting infrastructure shall meet IDNR, county, and city standards. Other rural development standards may be acceptable on a case-by-case basis. Require agreements that if and when the property is annexed to a city, the land developer and/or landowner shall be responsible for the full cost of abandoning the rural systems and connecting to urban infrastructure. (Relates to RUTA Goal 3.2, 3.3)

RTR Policy 6: Make provisions to protect environmental resources, environmentally sensitive areas and adjacent Natural Areas. (Relates to RUTA Goal 3.4)

RTR Policy 8: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR and city standards. (Relates to RUTA Goal 3.4)

RTR Policy 7: Require annexation agreements and developer agreements in instances of new development that is particularly intense, or that occurs in certain critical locations. (Relates to RUTA Goal 3.2)

Priority Transitional Residential (PTR)

Priority Transitional Residential development provides for an orderly and efficient transition between existing or future urban areas and rural unincorporated areas. If future annexation is required, Priority Transitional Residential development will transition seamlessly into adjacent urban-scale land uses. Therefore, they require a greater degree of urban infrastructure standards.

PTR Policy 1: This land use designation includes all single-family residential land uses/developments that involve minimum average net densities of 3.75 units per acre.

PTR Policy 2: Strategically locate Priority Transitional Residential land uses in targeted areas adjacent existing municipal limits or Urban Service Areas. (Relates to RUTA Goal 3.2)

PTR Policy 3: Encourage clustering of residential sites within these land areas, in order to limit the short-term and long-term costs associated with infrastructure

improvements and the distribution of public services. (Relates to RUTA Goal 3.2, 3.3)

PTR Policy 4: Require urban infrastructure and subdivision standards, including urban right-of-way standards, urban street construction and urban sanitary and potable water systems. If the City does not require these improvements to be installed at the time of subdivision, require infrastructure assessment agreements. (Relates to RUTA Goal 3.2, 3.3)
.
PTR Policy 5: Require well water and common treatment systems, but these shall be abandoned upon annexation. If rural water systems are incorporated into a development, require agreements that upon annexation the land developer and/or landowner shall be responsible for the full cost of abandoning the system and connecting to urban infrastructure. Common treatment systems, potable water systems, and supporting infrastructure must meet IDNR, county, and city standards. (Relates to RUTA Goal 3.2, 3.3)

PTR Policy 6: Make provisions to protect environmental resources, environmentally sensitive areas and adjacent Natural Areas. (Relates to RUTA Goal 3.4)

PTR Policy 7: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR, county and city standards. (Relates to RUTA Goal 3.4)

PTR Policy 8: Require annexation and development agreements to guide future transition of the subdivision/development into the City of Ames or City of Gilbert. (Relates to RUTA Goal 3.2)

Highway-Oriented Commercial (HOC)

This designation applies to commercial land uses along arterial corridors that are primarily designed to accommodate the automobile. It is intended to provide for an orderly and efficient transition between existing or future urban areas and the rural, unincorporated areas.

HOC Policy 1: Highway-Oriented Commercial designation includes commercial uses that are more compatible with the characteristics of rural areas than with urban commercial corridors and centers.

HOC Policy 2: Strategically locate Highway-Oriented Commercial in targeted areas along high traffic transportation corridors. (Relates to RUTA Goal 3.2. 3.5)

HOC Policy 3: Give preference to clustering of uses in order to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services. (Relates to RUTA Goal 3.2, 3.4)

HOC Policy 4: Require urban transportation infrastructure to meet the demands of high vehicular movement. (Relates to RUTA Goal 3.2, 3.3)

HOC Policy 5: Require full urban infrastructure standards under certain conditions such as location with respect to existing or planned urban infrastructure, intensity or size of development improvements, timing of development, development design, and commercial use, such as a restaurants, water intensive uses, or places designed for the gathering of people. Such urban infrastructure standards may include, but not be limited to, wastewater treatment and potable water distribution of sufficient size to support emergency services. If these improvements are not installed at the time of development, require infrastructure assessment agreements. (Relates to RUTA Goal 3.2, 3.3)

HOC Policy 6: Where the city does not require urban standards, require temporary common wastewater collection systems that meet IDNR and city specifications, and temporary common water distribution systems, such as wells or rural water services, that meet specifications of the City of Ames or City of Gilbert. Require agreements that if and when the property is annexed to a city, the land developer and/or landowner shall be responsible for the full cost of abandoning the rural systems and connecting to urban infrastructure. (Relates to RUTA Goal 3.2, 3.3)

HOC Policy 7: Make provisions to protect environmental resources, environmentally sensitive areas and adjacent Natural Areas. (Relates to RUTA Goal 3.4)

HOC Policy 8: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR, county and city standards. (Relates to RUTA Goal 3.4)

HOC Policy 9: Require annexation and development agreements to guide future transition of the subdivision/development into the City of Ames or City of Gilbert. (Relates to RUTA Goal 3.2)

Gateway Protection (GP)

The Gateway Protection land use designation provides the opportunity to enhance the perception of significant entrances into the urban areas and to link major areas or activity centers.

GP Policy 12: Gateway Protection designation applies to entrances into the City of Ames from major transportation corridors (Highway 30 and Interstate 35).

GP Policy 3: Require distinctive design characteristics and other standards more specific than in other land use designations, including, but not limited to, more restrictive signage regulation, higher landscape standards, building placement standards, limited ingress and egress, limited parking in front of uses, and compatibility standards that promote the continuation and preservation of distinctive design elements associated with the entrance area. (Relates to RUTA Goal 3.2)

Watershed Protection Area (WPA)

The existing natural/man-made resources of the Skunk River, underground alluvial aquifers, and quarried lakes provide vital water resources to the area and surrounding

region. Stormwater run-off from increased urban and agricultural development can have negative impacts that jeopardize water quality. The Watershed Protection Area designation includes watersheds for existing wetlands and other vegetation that protect and/or improve water quality. Within a Watershed Protection Area, buffers and other mitigation measures filter out and prevent pollutants from entering the region's water resources.

WPA Policy 1: This designation applies to watershed areas of Ada Hayden Lake and other important water resources particularly sensitive to negative impacts of stormwater run-off.

WPA Policy 2: Construct mitigation facilities at nodal locations where they can protect effectively the water resources within the watershed. Develop mitigation facilities or Best Management Practices according to city standards.

WPA Policy 3: Accommodate or provide Best Management Practices within all development within Watershed Protection Areas.

WPA Policy 4: Name Watershed Protection Areas named according to the waterway, water body, or aquifer they are designated to protect.

Airport Protection Area (APA)

This land use designation is intended to reduce risk, increase safety and promote land use compatibility between the airport and adjacent land uses. The Federal Aviation Administration (FAA) regulates operations of both airplanes and airports. The FAA, however, has no jurisdiction over land uses adjacent to the airport. Given that risk in this area cannot be completely eliminated, the goal of this designation is to reduce the consequences of accidents and the compatibility issues related to noise and pollution.

APA Policy 1: Land in this designation is adjacent to or in close proximity of the airport.

APA Policy 2: Limit or restrict intensity and density of land uses in order to protect life and maintain the integrity of aviation operations.

APA Policy 3: Analyze land uses within this designation in terms of aviation risk, noise attenuation, height, and by local, state, and federal regulations.

General Industrial (GI)

This designation applies to the existing surface operation that supports the subsurface mineral extraction in the Agricultural/Subsurface Mining land use designation.

GI Policy 1: Locate this use designation in the area that can best support the extraction of the existing mineral resource and has access to roads and highways needed to transport its products. The extent of the area accommodates the needs of the operation and the need to limit negative impacts on other surrounding established uses.

GI Policy 2: Water, wastewater systems and other infrastructure meet IDNR and county standards. At the time that surface activities for mineral resource

extraction need to be expanded, required appropriate permits and rezoning may be to regulate these surface operations.

Agriculture/Subsurface Mining (ASM)

This designation supports the long term planning objective of preserving resources and avoiding land use conflicts.

ASM Policy 1: Designate Agriculture/Subsurface Mining areas where substantial geological resources exist below the surface, specifically limestone of a quality required for concrete and other construction uses.

ASM Policy 2: Agricultural uses are compatible with this designation. Prohibit land uses to which blasting and very heavy truck traffic would be a nuisance, such as residential and commercial uses. This designation does not include surface operations necessary for mineral extraction, which have an Industrial land use designation.

Agriculture/Long Term Industrial Reserve (ALTIR)

The Agriculture/Long Term Industrial Reserve designation supports the long term planning objective of accommodating future demand for industrial growth as described in the Industrial Study of July 2002 by the City of Ames. Although the need for this land use at these location may arise only after the planning horizon of this Plan, preventing uses incompatible with large industrial facilities and maintaining agricultural use will help secure the availability of suitable land for future industrial uses.

ALTIR Policy 1: Agricultural uses are compatible with this designation. Industrial development is not anticipated during the life of the plan unless significant development of Planned Industrial areas has already occurred, or unless it can be demonstrated that significant public benefit would be gained from such development.

ALTIR Policy 2: Prior to consideration of any request for rezoning or industrial subdivision development approval, require an amendment to the Ames Urban Fringe Land Use Framework Map re-designating the area proposed for development from Agriculture/Long Term Industrial Reserve to Planned Industrial.

ALTIR Policy 3: When development is proposed, require the urban level design requirements and service standards as required in areas designated Planned Industrial.

Industrial Reserve/Research Park (IRRP)

The Industrial Reserve/Research Park area provides for future expansion of uses similar to the ISU Research Park: innovative technology companies that are supported by proximity to Iowa State University, within a planned development setting. There is land available for this use within the adjacent Planned Industrial portion of the Urban Service Area, but demand for this land use is difficult to predict accurately. This Industrial Reserve/Research Park designation provides additional expansion area for this use.

IRRP Policy 1: Locate this land use designation adjacent to areas within the Urban Service Area land use classification that are designated for expansion of the ISU Research Park.

IRRP Policy 2: Agricultural uses are compatible with this designation.

IRRP Policy 3: Prior to consideration of any request for rezoning or industrial research park subdivision development approval, require an amendment to the Ames Urban Fringe Land Use Framework Map re-designating the area proposed for development from Industrial Reserve/Research Park to Planned Industrial.

IRRP Policy 4: When development is proposed, require the urban level design requirements and service standards as required in areas designated Planned Industrial.

Natural Areas (NA)

Natural Areas are vital to the region. They provide habitat for wildlife, minimize storm water run-off, stabilize soils, modify climactic effects, provide for visual attractiveness, and serve some recreational purposes. This designation seeks to conserve such natural resources. This designation is intended to prevent development encroachment and encourage greater mitigation standards. A buffer or other mitigation device may be necessary to fully protect Natural Areas.

NA Policy 1: Natural Areas are composed of the following features and locales that intermingle with each other.

Environmentally Sensitive Areas – flood-prone areas, wetlands, water bodies, areas of steep slopes and sensitive soil conditions, and other designated areas that should be protected from detrimental impacts from other land uses.

Significant Natural Habitat -- areas surveyed and evaluated based on vegetation type and condition in the “Norris Study.” These Significant Natural Habitat Areas may also occur outside of the designated Natural Areas. In such locations, the underlying land use designation applies.

Parks and Open Spaces – facilities, land, and/or structured programs for a variety of public recreational opportunities. The term "Open Space" refers to primarily undeveloped areas; such areas are typically maintained and managed as natural areas for passive recreational uses.

Future Parks -- general areas where future parks are anticipated.

Greenways -- stream ways, parks, improved and unimproved trail systems, and open spaces that provide linkages that in effect create a continuous "greenway" or recreational system. Greenways provide recreational and open space linkages in both rural and urban areas.

Particular features and locales in the Natural Areas often are appropriately described by more than one of the above labels. This is a reflection of the multiple benefits of, and the diversity of landscapes represented in the areas designated Natural Areas. Regardless of type, Natural Areas are protected from negative land use impacts.

NA Policy 2: Prevent subdivisions for new non-farm residential development. However, Natural Areas may include farm and non-farm residences existing at the time of this Plan or remaining scattered building sites where farmstead homes once existed or homes on very large parcels of ground typical of the agricultural setting.

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.

Land Use Designations and Policies for Urban Service Area

This area is intended to be urban in character and become part of a municipal jurisdiction as it develops. Urban services and development standards are required for development within this area. Typically, lands within this area are annexed as they are developed.

The following policies apply to the entire Urban Service Area (USA):

USA Policy 1: Require land uses and the intensity of development within identified growth areas to be consistent with the Ames Urban Fringe Plan. (Relates to USA Goal 4.1)

USA Policy 2: Require all urban development to provide improvements consistent with the improvement standards, building codes, and service requirements adopted by the City of Ames to ensure adequate public facilities and building safety. (Relates to USA Goal 4.2)

USA Policy 3: Ensure that annexation is coordinated with the timely and efficient provision of adequate public facilities and services. (Relates to USA Goal 4.1, 4.4)

USA Policy 4: Require developments to provide adequate street, right-of-way, and drainage, bicycle, pedestrian and connected open space improvements.

Such improvements should allow for adequate emergency access and ability to connect to municipal street networks in the future. (Relates to USA Goal 4.1)

USA Policy 5: At the time of development provide secure funding sources for the cost of new improvements and services required by new development. (Relates to USA Goal 4.3)

USA Policy 6: Ensure that development for which services may change from rural systems to urban infrastructure when available has guaranteed the costs for installation and connection to future urban infrastructure in an acceptable manner before recording final plats for development. (Relates to USA Goal 4.3)

USA Policy 7: Coordinate street and drainage improvement projects with other service providers to meet the demands from planned development more efficiently. Prior to constructing improvements, ensure that needed utility improvements are coordinated so new pavement will not need to be disturbed for planned upgrades. (Relates to USA Goal 4.4)

USA Policy 8: Promote coordination and cooperation among all fire prevention, emergency medical services, and law enforcement agencies. (Relates to USA Goal 4.4)

USA Policy 9: Support the provision for responsive, high-quality fire suppression and emergency medical services. Require that development have adequate access to emergency services. Coordinate the design, location, and construction of standpipes and fire hydrants with fire districts and the City of Ames Fire Department as needed to protect new development. (Relates to USA Goal 4.4)

USA Policy 10: Establish a process to enable the City of Ames to negotiate with the owners of property planned for park and recreation purposes prior to the approval of rezoning or subdivision applications. (Relates to USA Goal 4.4)

The following land use designations are planned in the Urban Service Area:

Urban Residential (UR)

This land use designation applies to areas reserved for future city growth. Residential land uses within Urban Residential designated areas are annexed and then developed at an urban density and with infrastructure and subdivision according to urban standards.

UR Policy 1: This land use designation includes residential use in "traditional" Village Residential Development with minimum average net density of 8 units per acre. It also includes conventional single-family/suburban residential development with minimum average net residential densities of 3.75 units per acre and conventional suburban/medium density residential development with minimum average net residential densities of 10 units per acre. When combined in a development or area, conventional suburban single-family and conventional suburban medium density residential developments should not exceed 5 dwelling units per net acre.

UR Policy 2: Require annexation by the city before land is developed or further subdivided.

UR Policy 3: Require urban infrastructure and subdivision standards, including urban right-of-way standards, urban street construction, urban sanitary and potable water systems and urban storm water management systems.

UR Policy 4: Require land development agreements with the city before land is developed or further subdivided.

UR Policy 5: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR and city standards.

Community Commercial Node (CCN)

Community Commercial Node designates a cluster of mixed commercial uses typically associated with one or more arterial streets. This designation is intended to contain the majority of future community-scale commercial activities that are appropriate within an urban area. Each nodal location is 40 to 75 acres in total land area.

CCN Policy 1: Require uses within the nodes to be more selective than those permitted in the City's commercial corridors. Allow shopping and service uses that together create a shared attraction involving one vehicular trip to two-or-more destinations within a node.

CCN Policy 2: The development scale within these nodal locations is 100,000 to 800,000 gross square feet of commercial land uses, with a maximum of 150,000 gross square feet in any one commercial building. Allow larger buildings and area only where there is an exceptional concentration of residents.

CCN Policy 3: Strategically locate Community Commercial Node land uses in targeted areas at intersections of arterial streets with highways or other arterial streets.

CCN Policy 4: Require clustering of uses to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services.

CCN Policy 5: Require annexation by the city before land is developed or further subdivided.

CCN Policy 7: Require urban infrastructure and subdivision standards, including urban right-of-way standards, urban street construction, urban sanitary and water systems and urban storm water management systems.

CCN Policy 8: Require land development agreements with the city before land is developed or further subdivided.

CCN Policy 9: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR and city standards.

Convenience Commercial Node (CVCN)

Convenience Commercial Nodes represent areas for neighborhood scale commercial development for conventional suburban residential developments and support a population base of 2000 – 3000 persons within a one to two mile radius. Total land area of a Convenience Commercial Node is generally between one and ten acres. Land use and standards for building placement and materials, landscaping and screening, signage and lighting ensure compatibility between the commercial activity and adjacent residential land uses will be.

CVCN Policy 1: Require land uses that serve convenience and localized neighborhood needs and are functionally and aesthetically compatible with surrounding residential land uses.

CVCN Policy 2: Each commercial building can be no larger than 35,000 square feet, and is located within a cluster of other commercial land uses, which cannot exceed a total of 100,000 square feet.

CVCN Policy 3: Locate Convenience Commercial Nodes on streets of collector class or greater.

CVCN Policy 4: Require clustering of uses to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services.

CVCN Policy 5: Require annexation by the city before land is developed or further subdivided. In some cases, depending on the initial square footage to be developed, type of commercial use, or timing of development, the City may determine that convenience commercial node is to be rural in character and may not be required to be annexed until some time after initial development.

CVCN Policy 6: Require urban infrastructure standards and subdivision standards, including urban right-of-way standards, urban street construction, urban sanitary and water systems and urban storm water management systems.

CVCN Policy 7: Where the city does not require annexation before development, require temporary common wastewater collection systems that meet IDNR and city specifications, and temporary common water distribution systems, such as wells or rural water services, that meet specifications of the City of Ames or City of Gilbert. Require agreements that if and when the property is annexed to a city, the land developer and/or landowner shall be responsible for the full cost of abandoning the rural systems and connecting to urban infrastructure.

CVCN Policy 8: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR, county and city standards.

CVCN Policy 9: Where the city does not require annexation, require annexation and development agreements to guide future transition of the subdivision/development into the City of Ames or City of Gilbert.

Planned Industrial (PI)

Planned Industrial is a designation intended for clustered industrial uses. These uses are strategically located to minimize environmental impacts and conflict with residential land uses. Locations also provide for an orderly and efficient transition between land uses within municipal limits and the unincorporated areas of the county. Such areas involve the integration of uses, access, and appearance.

PI Policy 1: Land uses are clustered/industrial park uses that are larger in scale than most general industrial uses.

PI Policy 2: Locate Planned Industrial uses near limited access thoroughfares and/or major railroad systems to accommodate the transportation of industrial goods and services. Minimize environmental impacts and conflict with residential land uses.

PI Policy 3: Give preference to clustering of uses to limit the short-term and long-term costs associated with infrastructure improvements and the distribution of public services.

PI Policy 4: Permit Planned Industrial uses when suitable infrastructure and services are available. Require annexation into the city and comply with all municipal regulations, including zoning, land use policy, subdivision, and building code requirements.

PI Policy 5: Mitigate and manage stormwater run-off, soil erosion, and wastewater discharge according to IDNR, county and city standards.

PI Policy 5: Require buildings to front major thoroughfares to minimize the appearance of industrial operations and enhance the aesthetics of the road corridor. Require landscape and earthen buffering of parking areas and industrial activity, such as assembly yards, storage locations and loading facilities.

Additional Policies for All Areas

These policies statements are organized based on the Common Goals listed in the section “Vision and Goals for the Urban Fringe”.

Goal 1.1: To provide a balanced mix of land uses that are arranged to avoid conflicts and to maximize efficient delivery of municipal and county services and facilities.

Policy 1.1.1: Use the identified land use designations in the Land Use Framework Plan section for future land use planning, as they relate to the Ames Urban Fringe Land Use Framework Map. The uses set forth in the Land Use Designations section generally describe uses and should not be considered all-inclusive. Intensities establish the minimum net density or density range for each land use category. Residential densities are expressed as dwelling units per acre

of a development subdivision proposal, which excludes street right-of-way, protected areas, and other public dedication areas. General locations are described where each land use category is appropriate, but the Land Use Framework Map more accurately defines locations of uses.

Policy 1.1.2: Use the Land Use Framework Map to coordinate and guide land use and development decisions. Zoning and subdivision decisions should be consistent with the adopted Land Use Framework Map and other policies of this Plan.

Policy 1.1.3: Maintain the Land Use Framework Map and include adopted Map amendments as they occur. Each jurisdiction must approve a Map amendment.

Policy 1.1.4: Establish a process and criteria for amendment of the Land Use Framework Map in each jurisdiction's land development policies and regulations.

Policy 1.1.5: The four jurisdictions will clearly define roles and responsibilities for coordinated review for proposed zoning, subdivision and annexation actions based on the Plan and Framework Map.

Policy 1.1.6: Provide for citizen participation from Boone County, Story County, the City of Gilbert and the City of Ames for development proposals located in the Ames Urban Fringe.

Goal 1.2: To provide a variety of housing opportunities in the Ames Urban Fringe in appropriate locations.

Policy 1.2.1: Ensure that the Ames Urban Fringe Plan provides for adequate development potential for a variety of housing types required to meet the housing needs of present and future residents. When evaluating need for new housing, each jurisdiction shall consider the availability of housing within Ames and Gilbert where infrastructure and housing choice exists.

Policy 1.2.2: Direct the construction of new affordable housing projects to locations within Ames and Gilbert where such developments have immediate access to water and wastewater infrastructure, paved street systems, and access to employment opportunities.

Goal 1.3: To provide adequate opportunities for commercial and industrial development.

Policy 1.3.1: Ensure an adequate supply of commercial land resources. Locate urban commercial services strategically within the communities or in commercial areas designated in the Framework Map and locate agricultural-based commercial services locate in unincorporated areas that provide the most economical and efficient access to the agricultural industry.

Policy 1.3.2: Ensure an adequate supply of industrial land resources. Locate agricultural-based industrial services in unincorporated areas that provide the most economical and efficient access to the agricultural industry. Locate large

industrial services/land uses strategically within the communities or in commercial areas designated in the Framework Map

Policy 1.3.4: Allow existing commercial and industrial uses to be maintained, expanded, or redeveloped. Limit new commercial and industrial development in areas in the Framework Map where the following conditions are met:

- Adequate roads;
- Adequate water and wastewater facilities are provided to serve the proposed industrial/commercial use, including the provision of water for fire suppression; and
- Proposed development will be compatible with surrounding land uses.

Policy 1.3.5: Encourage commercial development serving regional commercial needs to locate within city limits where existing zoning regulations and established adequate public facilities and services for such levels of development exist.

Goal 1.4: To coordinate development decisions with the efficient provision of public facilities and services.

Policy 1.4.1: Ensure that street, bicycle, pedestrian and trail configurations provide for adequate and efficient connectivity to provide for effective long-term access to and through all properties planned for development.

Policy 1.4.2: Ensure that street configurations and design provide for adequate access for fire and emergency medical services.

Policy 1.4.3: Secure adequate right-of-way for planned road expansion.

Policy 1.4.4: Maintain a safe and effective transportation system and program that meets the needs of residents and businesses with the City of Ames, City of Gilbert and Ames Urban Fringe. Incorporate bicycle, pedestrian and trail facilities in road projects so that streets are complete transportation systems.

Policy 1.4.5: Provide for adequate and efficient connectivity of utility systems where required or planned for in the future.

Policy 1.4.6: Coordinate development activity with the capital improvement programs of Boone County, Story County, City of Gilbert, and the City of Ames.

Policy 1.4.7: Communicate and coordinate with school districts to ensure that proposed developments can be adequately-served and that all service providers are aware of each other's improvement plans.

Policy 1.4.8: Develop policies whereby the City of Ames, the City of Gilbert, Boone County, and Story County identify growth-related costs and implement suitable financial tools to offset these costs.

Goal 1.5: To protect and preserve natural resources sensitive to changes in development type and intensity and activity, including flood plains, woodland areas, wetlands, and other sensitive natural areas.

Policy 1.5.1: Protect environmentally valuable land, including woodlands, steep slopes, wetlands, stream banks, and wildlife and vegetative habitat areas from inappropriate development. Encourage the use of buffers and clustering of development to preserve open space and undisturbed, natural areas.

Policy 1.5.2: Preserve scenic and historic areas through zoning and flexible design standards.

Policy 1.5.3: Locate future development outside of flood hazard areas. Where development is allowed in the floodplain, require the development to be elevated, flood-proofed, and located outside of the floodway.

Policy 1.5.4: Ensure that flood management programs of each jurisdiction meet or exceed the regulatory requirements of the Federal Emergency Management Agency (FEMA), and all applicable state regulations and agencies.

Policy 1.5.5: Establish a system of greenbelts along all rivers, as well as their tributaries. Encourage the development of trail systems, where appropriate, along these waterways. Some trail systems or segments may be appropriate adjacent to waterways, but separate trails that parallel waterways should be considered based on their aesthetic value, safety, and cost-effectiveness.

Policy 1.5.6: Coordinate with private property owners and other agencies to preserve and protect environmentally-sensitive areas and to retain non-farm lands with high aesthetic or environmental value (e.g., ridgelines, steep slopes, floodplains, woodlands, and wetlands), and promote the linkage and connection of these area to larger natural and/or wildlife refuges. Hold private open space in conservation easements where appropriate. Encourage public dedication or purchase for key trail linkages and land that is identified for inclusion in the park system of each County, City of Gilbert and City of Ames.

Policy 1.5.7: Preserve natural features to the greatest extent practical through the design of developments in unincorporated areas.

Implementation

Overview

The Ames Urban Fringe Plan represents the shared goals, policies, and future vision of the City of Gilbert, the City of Ames, Boone County, and Story County for land use and development within the Urban Fringe. The Plan, together with a map depicting the intended land uses and referencing the Plan's policies, meets the expectations of the public that the use of land in the Urban Fringe follow a predictable pattern.

The Plan serves as the basis for the regulation of land use, and all applications of policy affecting land use – regulatory or otherwise – should clearly conform to the vision, goals, policies, and spirit and intent of the Plan. These applications of policy may take the form of zoning and subdivision regulations, capital improvement plans and investments, and voluntary incentive-based programs, as well as others. If and when the City of Ames, City of Gilbert, Boone County, and/or Story County disagree on the best approach toward implementing the provisions of the Plan, the core intent of the Plan and the end result of a given jurisdiction's actions should be broadly critiqued to ensure that cooperation among the jurisdictions is not threatened by such disagreement.

It is unusual that four different jurisdictions are called upon to jointly implement a single, shared vision. This tends to invite complication, making a simple and clear implementation strategy especially important. In some instances it may be necessary for the four jurisdictions to surrender authority where individually each finds it to be less critical, in order to accept autonomous authority where land use and development issues tend to have the greatest impact on each jurisdiction. This "give and take" approach may be atypical, but it serves the interests of all four jurisdictions while better serving the public, which is seeking straightforward, efficient, effective government action regardless of jurisdictional lines.

Though the Plan reliably indicates how land use will generally be regulated and how development proposals will be considered, it is not intended to be static. In order to address changing needs and conditions, the Plan must make accommodation for amendments in response to significant changes in the economic climate, the political and administrative environment of the four jurisdictions, and the values of the residents of each jurisdiction. Nonetheless, such changes should not be made lightly. Each jurisdiction should carefully consider each proposed amendment to determine if the proposed change is consistent with the Plan's goals and policies. The cumulative effect of minor changes may create a significant change in policy direction. For these reasons, amendments to the Ames Urban Fringe Plan must be evaluated in terms of their significance to the Plan's overall policy.

Jurisdictional Influence

The Ames Urban Fringe Plan describes land use types that are envisioned in each of three different areas:

- Rural Service and Agricultural Conservation Area,
- Rural/Urban Transition Area, and
- Urban Service Area.

Land use types that bear the most scrutiny from the City of Ames and City of Gilbert because of their potential impact on municipal services, expenditures, and future growth objectives are included in the Urban Service Area. Annexation of these land uses is imminent, or is probable within the window described by the Plan.

Land use types that by their nature are more rural and have a greater long-term effect on the services, expenditures, and growth objectives of Boone and Story Counties are included in the Rural Service and Agricultural Conservation Area. Annexation of these areas within the Plan's time frame is unlikely.

Those land use types that fall in the intermediate have roughly equal degrees of impact on the cities and counties, and are thusly located in the Rural/Urban Transition Area. While annexation of these land uses is not expected during the life of the Plan, changing growth trends and other conditions may make urban expansion into this area necessary sometime near the Plan's horizon. In the meantime, however, Boone and Story County will be greatly affected by the land use pattern in this area.

The logical breakdown of land uses into these three areas points toward an equally logical regulatory approach to guiding development in the Urban Fringe. Based on the relative priority with which each jurisdiction must address the impacts of development in each of the areas, a give and take of regulatory authority between the three jurisdictions should be considered. A workable scenario follows:

	Zoning and Permitting Authority	**Subdivision Review Authority**	**Urban Fringe Land Use Plan Amendment Authority**	**Special or Conditional Use Permit and Rezoning Authority**	**Responsibilities and Agreements**
Rural Service and Agricultural Conservation Area	Boone County or Story County (as applicable) exclusively	Boone County or Story County (as applicable) with recommendation from City of Ames/Gilbert; county standards apply	Unified application process requiring approval from all three jurisdictions	Boone County or Story County (as applicable) with recommendation from City of Ames/Gilbert	Rural infrastructure standards
Rural/Urban Transition Area	Boone County or Story County (as applicable) exclusively	Unified application process requiring approval from applicable county and City of Ames/Gilbert; joint staff report and recommendation; most stringent standards apply except when waived by either jurisdiction	Unified application process requiring approval from all three jurisdictions	Boone County or Story County (as applicable) with recommendation from City of Ames/Gilbert	Urban infrastructure standards or agreements except for Rural Transitional Residential
Urban Service Area	Boone County or Story County (as applicable) exclusively	City of Ames with recommendation from applicable county, City of Ames/Gilbert standards apply	Unified application process requiring approval from all three jurisdictions	Boone County or Story County (as applicable) with recommendation from City of Ames/Gilbert	Urban infrastructure standards

The above scenario is only an example of the general form that joint regulation of the Urban Fringe could take. Detailed intergovernmental agreements would be necessary to formalize an authority sharing arrangement as illustrated above. The adoption of this approach would be a substantial improvement over the status quo, in which the public must navigate the often confusing – and sometimes conflicting – regulations of two or more jurisdictions. Other demands on the public, such as multiple application submittals, conflicting procedural schedules, and multiple layers of public hearings would also be reduced.

Development Regulations

As noted earlier in this Chapter, land use and development regulations are only one tool of several available to City of Gilbert and City of Ames, Boone County, and Story County to implement to the vision, goals, and policies of the Ames Urban Fringe Plan. In most cases, though, development regulations tend to be the most effective tool for advancing jurisdictions toward their land use goals. Codified zoning and subdivision standards are the most common example of development regulations, which may include subsets of rules for signs, site design and landscaping, dedication and improvement of infrastructure, parking, and lighting, to advance the goals of the plan on which they are based.

The City of Gilbert, City of Ames, Boone and Story County all currently enforce zoning and subdivision regulations in their jurisdictions. Ideally, the day-to-day administration of these regulations will be maintained by each of the jurisdictions individually with a few notable exceptions as described in the section of this chapter on *Jurisdictional Influence*. Give and take of authority will be necessary when new development approvals are sought by the public, but the usual issuance of zoning permits and enforcement of regulations, when in conformance with the Plan, should remain the exclusive domain of each jurisdiction with respect to current jurisdictional lines. This will minimize confusion on the part of the public, and avoid the need to create a new joint appeals board and other additional layers of bureaucracy.

The four communities should seek agreement on processes for new development proposals requiring something more stringent than day-to-day administrative review. These proposals usually require review by the jurisdictions' planning and zoning commissions and legislative bodies. The best example of this type of development proposal is a subdivision. Subdivisions in the Urban Fringe currently are reviewed by two or more jurisdictions, applying two or more sets of development regulations. Implementation of the Plan, in order to be successful, must include agreements between jurisdictions clearly outlining which community(ies) have jurisdiction, and which set of development regulations will be applied.

Balancing four different sets of development regulations in the Urban Fringe is possible and preferable if all of the following can be achieved:

- It is clear which jurisdiction(s) have authority;
- It is clear which set of regulations will be applied, and;
- The regulations, though different for each jurisdiction, all conform to the Plan.

In order to ensure that the regulations of each jurisdiction all conform to the Plan, it will be necessary for each jurisdiction to review the regulations of the others and make

recommendations for amendments. It will be important to review each other's regulations from a broad perspective, evaluating the general conformance of the development regulations with the Plan. Disagreement about the details of the regulatory approaches of each jurisdiction has the potential to slow the implementation process.

This review of development regulations should occur as soon as possible after adoption of the Plan, but should not delay the implementation process. An initial presumption of Plan conformance should be granted to existing regulations, as the values of each jurisdiction are simultaneously reflected in current regulations and in the Plan.

Relationship to Budgets and Capital Improvement Plans

The annual budget is one of the most important tools for plan implementation because it sets priority for action. Capital, operational, and administrative funding decisions should directly reflect the goals and policies of the Ames Urban Fringe Plan. The Plan should serve as the basis for the staff's recommended work programs and a focus for each jurisdiction's discussion of priorities for the Urban Fringe from year to year. Boone County, Story County, City of Gilbert and City of Ames staff should review the Plan's goals and implementation programs and recommend appropriate strategies to achieve the Plan's goals in a manner consistent with the Plan's policies.

If specific Plan recommendations are not funded by the appropriate jurisdiction, through the established amendment process the affected jurisdiction shall recommend alternatives or provide sound reason why the recommendation should be omitted from the Plan. Where there is a conflict between budget priorities and the goals and policies of this Plan, collectively Boone County, Story County, and City of Gilbert and City of Ames should consider whether those specific goals and/or policies remain valid. If they are valid, the affected jurisdiction should consider reevaluation of budget priorities or recommend alternatives through the established amendment process.

The long-range Capital Improvements Program (CIP) is an important planning tool to ensure that the Ames Urban Fringe maintains the most cost effective facilities and to determine whether there is capacity to fund additional public facilities. Each jurisdiction should establish, maintain and regularly update a long-range CIP that reflects the size, approximate location, and estimated costs for improvements needed to serve anticipated growth within the Ames Urban Fringe for the life of this Plan. However, the plan is not an engineering document. Nevertheless, it should provide enough specificity to determine which costs are required to remedy existing deficiencies and which costs provide new capacity that will be demanded by new development. The long-range CIP should establish the basis for appropriate development fees and conditions. The CIP should be updated when significant changes to base systems modify long-term capital investment strategies (e.g. changes to service areas, significant changes to the Ames Urban Fringe Plan, and/or changes in demand or service delivery patterns.)

The CIP should also list short-term projects needed to maintain existing levels of service, with each project being assigned a budget and time frame for completion. The CIP should delineate the proportion of costs that is designed to provide new capacity and the proportion that is required to fund existing deficiencies. The delineation will enable each affected jurisdiction to quantify the capital costs associated with new development.

Plan Implementation Program

The Ames Urban Fringe Plan requires on-going action to achieve its goals. The "Plan Implementation Program" *(not included in this document)* provides an initial listing of tasks required to carry out the goals and policies of the plan. This program should be updated on a regular basis to reflect accomplishments and incorporate new program proposals. The "Plan Implementation Program" is a tool for establishing budgetary priorities. Programs that are not funded in the recommended time frame should be reevaluated and amended for later implementation. Programs that are completed should be removed from the list. The Plan Implementation Program is intended to be the most dynamic component of the Plan. Through updates, Boone County, Story County, and City of Gilbert and City of Ames can ensure that the Plan continues to serve each jurisdiction effectively.

Review, Monitoring and Amendments

The Ames Urban Fringe Plan is intended to serve as a guide for public and private development and land use decisions. The intent of the Ames Urban Fringe Plan is for each jurisdiction to adopt a mutually accepted formal amendment process that will be codified in each jurisdiction's development regulations. Future map changes are anticipated as growth occurs, boundaries are modified, environmental conditions change, and market conditions fluctuate. Nevertheless, the strategic focus and overriding policies adopted in this Plan shall take precedent over an amendment decision. Each jurisdiction should discourage and/or limit changes to the Ames Urban Fringe Plan and Land Use Framework Map to reduce the potential for incremental land use changes that could result in unintended policy shifts. Such shifts could greatly compromise the shared vision and policy of Boone County, Story County, and City of Gilbert and City of Ames for the Urban Fringe.

To ensure that the Ames Urban Fringe Plan remains an effective guide for decision makers, the jurisdictions should cooperatively conduct periodic evaluations of the Plan's goals and policies. These evaluations should be conducted every 3-5 years, depending on the rate of change in the Urban Fringe, and should consider the following:

- Progress in implementing the Plan;
- Changes in conditions that form the basis/framework of the Plan;
- Fiscal conditions and the ability to finance public investments recommended by the Plan;
- Community support for the Plan's goals and policies; and
- Changes in State or Federal laws that affect each jurisdiction's tools for the Plan's implementation.

This major review process should encourage input from neighborhood groups, representatives from each jurisdiction, planning and zoning commissions from each jurisdiction, developers, business groups, and other community interests. The process should represent interests on an equal platform; no interest group should be singled out to provide input in the review process. Plan amendments that appear appropriate as a result of a comprehensive review would be incorporated according to the adopted Plan amendment process.

LAND USE FRAMEWORK MAP (Ames Urban Fringe Plan)

Land Use Designations for Rural Service and Agricultural Conservation Area

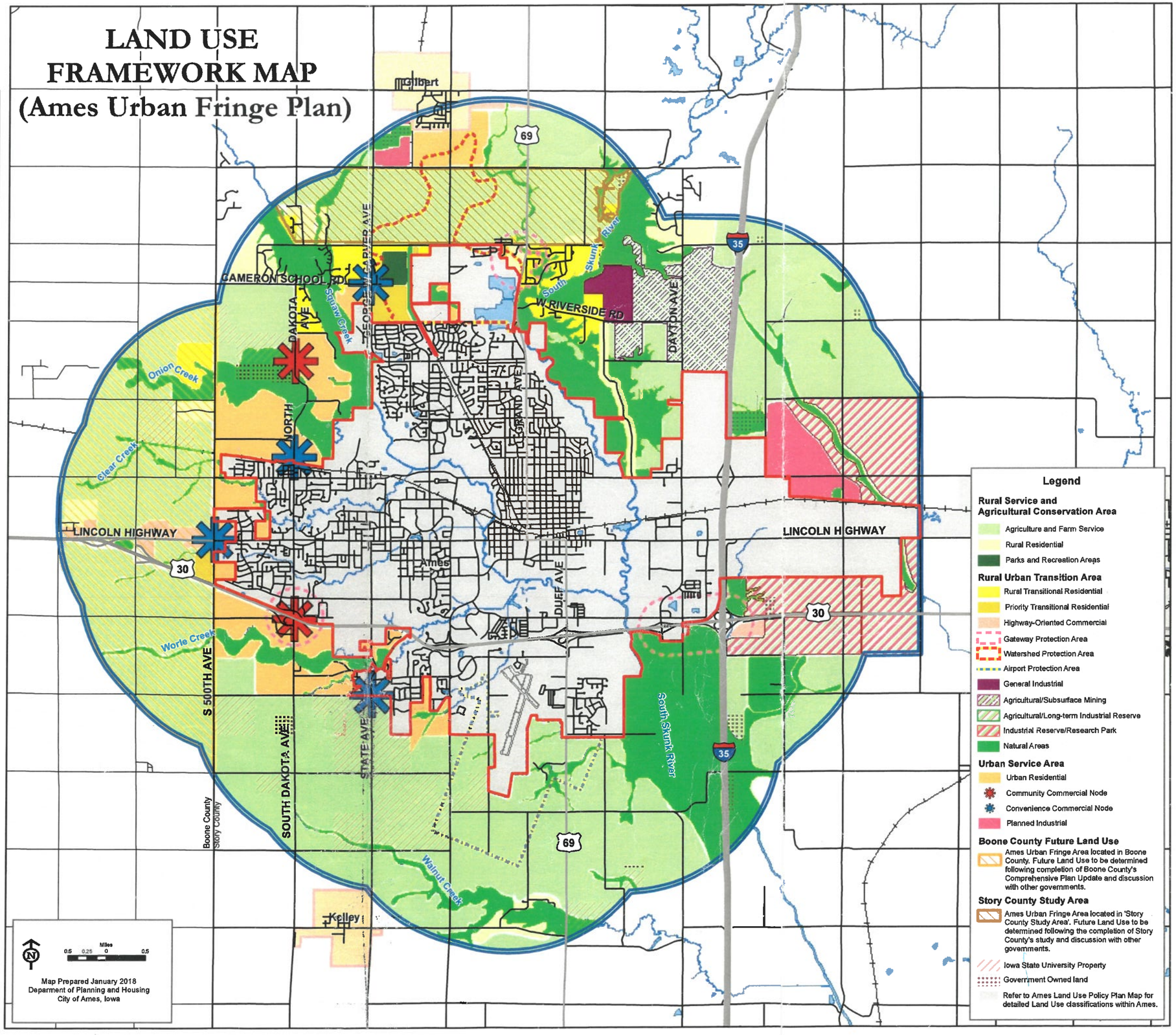
- Agriculture and Farm Service – Farming and agricultural production; industry and commerce that need to be close to agriculture; farmsteads, farmstead sites and pre-existing homes.
- Parks and Recreation Areas – privately owned recreation, conservations and related uses, with rural services and decentralized systems.
- Rural Residential – Single-family residences at one unit per acre or lower density, with rural services and decentralized systems; protect agricultural operations and environment.

Land Use Designations for Rural/Urban Transition Area

- Rural Transitional Residential – Single- and two-family residences at densities from one unit per acre to 3.75 units per acre, preferably in clusters, with rural services and decentralized systems; in some cases, urban services for future use or assessment waivers and other agreements about future costs and annexation.
- Highway-Oriented Commercial – Commercial uses most compatible with rural areas, located on high-traffic roads and preferably in clusters; urban services; in some cases, rural services and decentralized systems with assessment waivers, other agreements on future costs and annexation.
- Agriculture/Subsurface Mining – Farming and agricultural production; farmsteads, farmstead sites and pre-existing homes; with limestone resources suitable for subsurface mining.
- General Industrial – Surface portion of existing subsurface mining operation.
- Natural Areas – Environmentally sensitive areas; significant natural habitat; public parks and open space; future parks; greenways; farmsteads, farmstead sites and pre-existing homes.
- Watershed Protection Area – Watersheds for wetlands and with vegetation that protects or improves water quality; mitigation facilities; Best Management Practices.
- Priority Transitional Residential – Single-family residences at densities above 3.75 units per acre, preferably in clusters, with rural services and common systems; urban services for future use or assessment waivers and other agreements about future costs; development agreements; annexation agreements.
- Industrial Reserve/Research Park – Agricultural uses; future expansion of ISU Research Park with innovative technology companies supported by proximity to ISU; before development, change to Planned Industrial land use designation.
- Agriculture/Long-Term Industrial Reserve – Farming and agricultural production; farmsteads, farmstead sites and pre-existing homes; future large-scale industrial uses; before development, change to Planned Industrial land use designation.
- Gateway Protection – Land uses and design that defines, accentuates and enhances entrance areas to community.
- Airport Protection Area – Land close to airport; development characteristic that protects life and maintains integrity of aviation operations.

Land Use Designations for Urban Service Area

- Urban Residential – Village residential developments at densities above 8 units per acre; suburban/single-family residential developments at densities above 3.75 units per acre; suburban/medium density residential development at densities above 10 units per acre; annexation; urban services: development agreements.
- Planned Industrial – Large-scale industrial uses clustered in industrial parks; annexation; urban services: development agreements.
- Community Commercial Node – Clustered commercial uses up to 800,000 square feet per cluster; annexation; urban services: development agreements.
- Convenience Commercial Node – Clustered commercial uses that serve convenience and localized neighborhood needs; up to 100,000 square feet per cluster; annexation; urban services: development agreements.



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(env)

AMES URBAN FRINGE
JOINT AND COOPERATIVE AGREEMENT
[Pursuant to Code of Iowa, Chapter 28E]

This Joint and Cooperative Agreement (hereinafter referred to as the "Agreement") is entered into pursuant to the authority of the *Code of Iowa*, Chapter 28E on this 11 day of July, 2011 by and between Story County, Iowa, (hereinafter referred to as "County"); the City of Ames, Iowa (hereinafter referred to as "Ames"); and the City of Gilbert, Iowa (hereinafter referred to as "Gilbert"). The two cities shall be referred to hereinafter collectively as "Cities", and all three entities collectively as the "Cooperators".

WHEREAS, continued growth and development within the two mile extraterritorial jurisdiction area of Ames requires increased coordination among the Cooperators to achieve better land use management and control of development within the area; and

WHEREAS, the two mile extraterritorial jurisdiction area of Gilbert overlaps into significant portions of the Fringe Area; and

WHEREAS, the councils of Cities have previously asserted the two mile extraterritorial jurisdiction over land divisions available to them pursuant to the *Code of Iowa*, Chapter 354; and

WHEREAS, the long range, comprehensive planning documents of each Cooperator establish goals and policies that promote the rational and efficient development of land in furtherance of the social and economic well-being of its respective citizens; and

WHEREAS, the governing bodies of Cooperators have determined that the best method for achieving such rational and efficient development is through a coordinated program of inter-jurisdictional land use planning; and

WHEREAS, the provisions of the *Code of Iowa*, Chapter 28E were adopted to facilitate such inter-jurisdictional cooperative efforts; and

WHEREAS, the Cooperators have heretofore developed and approved in July of 2006, pursuant to public notice, hearing and decision, a document entitled "Ames Urban Fringe Plan" (hereinafter referred to as "Plan") that sets forth specific understandings, goals and policies to guide and control the future development of the fringe area; and

WHEREAS, the Cooperators now seek to provide a legal mechanism for the implementation of the Plan through the adoption of this Agreement; and

WHEREAS, each Cooperator has determined, and deems, that it is in the best interests of the Cooperator and the most efficient use of the Cooperator's power and authority with respect to land use planning within the Fringe Area, that the County and Cities enter into this Agreement pursuant to the provisions of the *Code of Iowa*, Chapter 28E.

NOW, THEREFORE, THE PARTIES HERETO AGREE AS FOLLOWS:

Section 1. Compliance with the Plan
The Cooperators agree to observe, follow, and comply with all policies for development in the Fringe Area as set forth in the Plan, and its approved attachments, including the Land Use Classes Map and the Land Use Framework Map, in establishing and amending land use regulations within the territory of the Fringe Area.

Section 2. Reference to Planning Documents
The Plan and its accompanying maps, approved July, 2006, and as subsequently amended, are hereby adopted as the guiding documents for development in the Fringe Area.

Section 3. Protecting Agricultural Operations
It is agreed and understood by the Cooperators that neither this Agreement, nor any policy set forth in the Plan, shall interfere with the agricultural exemption as provided by *Code of Iowa*, Section 335.2.

Section 4. Fringe Area Boundary
The area within which this Agreement shall be known as the Ames Urban Fringe as specifically established by the Plan. It may also be known as the Fringe Area or Planning Area.

Section 5. Administration of the Plan
It is the purpose of this Agreement to provide for an alternative, and more efficient, method for the regulation and processing of development within the Fringe Area. To achieve this purpose, Cities and County agree that each will waive the exercise of some portion of its otherwise existing land use authority in order to facilitate the operation of this Agreement in the manner hereinafter set forth in this Section 5. Where an existing land use authority is not specifically referenced in this Section 5, it shall continue to be normally exercised unless it would render one or more of the following subsections inoperative, in which case it shall be deemed to be waived to the extent necessary to give effect to any subsection hereof. In any instance when a Cooperator seeks to exercise its land use authority, including but not limited to Conceptual Reviews,

Annexations, Change of Zone, and Sketch Plans, in the Fringe Area, it shall notify the other Cooperators within ten (10) days of submittal of an application for such action.

5.1 County Zoning Regulations:

5.1.1 **Story County Land Development Regulations.** Zoning regulations for unincorporated Story County are under the authority of Story County through the adoption of the *Story County Land Development Regulations* and the provisions of *Code of Iowa*, Chapter 335.

5.1.1.1 Nothing in this Agreement shall be construed or applied to limit the County's legislative authority or discretion in adopting or amending its land use regulations.

5.1.1.2 The A-2, Agribusiness Zoning District, defined in the *Story County Land Development Regulations*, is intended and designed to provide for those activities strongly interrelated with agricultural uses and must therefore be located in agricultural areas. While the Plan recognizes that there are industrial and commercial land uses which are dependent on proximity to local agricultural land uses and which are essential to the continued feasibility of farming in the County, it furthermore seeks to strategically locate such uses. With the growth of the agri-business and agri-technology industries, the Cooperators agree that the intensities of uses allowed in the A-2 Zoning District could escalate beyond what each of the Cooperators may have individually envisioned or intended for identified agricultural areas. Further, the Plan creates Planned Industrial and Industrial Reserve areas in which the Cooperators will invest or have invested in infrastructure to accommodate more intense uses. Some uses in the A-2 Zoning District are incompatible with the Agriculture and Farm Services designation in the Plan. Therefore, the County agrees to limit the intensity of uses allowed within the A-2 Zoning District outside of said Planned Industrial and Industrial Reserve areas through Conditional Rezoning Agreements that allow all permitted uses in the A-2 Zoning District except the storage, retail or wholesale marketing, or processing of agricultural products into a value added agricultural product.

5.1.2 **Official Zoning Map of Story County, Iowa.** Amendments to the Official Zoning Map of Story County, Iowa within the Fringe Area shall conform to the goals and policies set forth in the Plan and the Land Use Framework Map.

5.1.2.1. All applications for amending the Official Zoning Map of Story County, Iowa will be processed in accordance with the requirements set forth in the *Story County Land Development Regulations.*

5.1.2.2. County shall not take action on any request to amend the Official Zoning Map of Story County, Iowa, within the Fringe Area when such request is accompanied by a request to amend the Plan.

5.1.2.2.1 Such request to amend the Plan shall be acted upon by all Cooperators as provided for in Section 6.2 of this Agreement prior to action by the County on an amendment to the Official Zoning Map of Story County, Iowa.

5.1.3 **Non-conforming Properties.** Properties zoned a classification inconsistent with this Agreement or the Plan as determined by the Cooperators, as of the date this Agreement is executed, shall not be deemed to be in violation of this Agreement or the Plan, as long as such zoning remains in effect on the property.

5.2 Subdivision Regulations:

5.2.1 **Rural Service and Agricultural Conservation Area Designation.** In areas designated Rural Service and Agricultural Conservation Area in the Plan, Cities agree to waive the exercise of their extra-territorial subdivision authority and application of their respective related design and improvement standards.

5.2.2 **Rural/Urban Transition Area Designation.** In areas designated Rural/Urban Transition Area in the Plan, Cooperators shall apply Subdivision Review Procedures as described in Attachment A. However, Agricultural Subdivisions in the Rural/Urban Transitional Area shall be processed solely by the County.

5.2.3 **Urban Service Areas Designation.** In areas designated Urban Services Area in the Plan, County agrees to waive the exercise of its subdivision authority.

5.3 Annexation:

5.3.1 **Planning Area Boundary.** In consideration of the fact that annexation has the effect of extending the two-mile extraterritorial subdivision plat review area as defined by the Code of Iowa beyond the Planning Area Boundary defined in the Plan, Cooperators understand and agree that Cities shall waive their extra-territorial jurisdiction in such extended area, and that County shall approve pursuant to such waiver and within such extended area, only those subdivisions meeting the definition of Agricultural Subdivisions, which shall be so designated on the face of each Final Plat. Alternatively, a property owner may request the Cooperators to amend the Plan to extend the Planning Area. Such request shall be processed as provided for in Section 6 of this Agreement.

5.3.2 **Annexation in Accordance with Plan.** Cities agree to annex territory in accordance with the goals and policy statements set forth in the Plan.

5.3.3 **Annexation of Property within the Rural Service and Agricultural Conservation Areas.** In areas designated Rural Service and Agricultural Conservation Area in the Plan, Cities shall not review annexation requests until such time the Plan has been amended to designate such property as Urban Service Area and then such annexation processed in accordance with this Agreement.

5.3.4 **Annexation of Property within the Rural/Urban Transition Areas** In areas designated Rural/Urban Transition Area in the Plan, Cities shall not review annexation requests until such time the Plan has been amended to designate such property as Urban Service Area and then such annexation processed in accordance with this Agreement.

5.3.5 **Annexation of Property within the Urban Service Area.** It is the Cooperators' intent that Cities will annex all property within the Urban Service Area. Such annexation will occur only after Cities gives full consideration to comprehensive plan policies, degree of contiguity to the City limits, proximity to existing City services, the cost of extending City services, the fiscal impact and funding sources for providing City services, and the development needs of the City.

5.3.6 **Annexation of Right-of-Way.** When undertaking any annexation of land within the Fringe Area, Cities shall annex the entire width of public rights-of-way located within and immediately adjacent to such lands.

Section 6. Plan Review and Amendment

6.1 Plan Review

At any time during the term of this Agreement, either the Chair of the County Board of Supervisors or a Mayor of either of the Cities may initiate a review of the Plan by providing a notice in writing of the intent to so review.

6.2 Amending the Ames Urban Fringe Plan

6.2.1 The Plan may be amended at any time following a review pursuant to Section 6.1 above, or upon petition by a Property Owner. As the Ames Urban Fringe Plan shall be adopted by each of the Cooperators as a part of their respective comprehensive plans, the procedures of adopting an amendment to the comprehensive plan is unique to each Cooperator, subject to meeting the notification requirements of Code of Iowa. Each Cooperator shall process an amendment to the Plan as an amendment to their comprehensive plan.

6.2.2 Upon the approval of a proposed amendment by the governing body of all Cooperators, notice shall be made to all other cooperators within twenty (20) business days. The amendment shall be effective upon receipt by the other Cooperators of all such notices.

6.2.3 Outside its two-mile extra-territorial zone, Gilbert shall have the right to participate in the approval process only of those Plan amendments where there is reasonable expectation of significant cumulative impact on Gilbert resulting from the amendment. In assessing the potential impact, both the magnitude of possible impact, as well as the geographic proximity to Gilbert of the possible impact, shall be considered.

6.2.4 Cooperators have agreed to an administrative process for the consideration of Plan amendments, which process is set forth on Attachment C, Plan Amendment Process, and incorporated herein for all purposes.

6.2.5 It is understood and agreed that the provisions of Attachment C may be revised from time to time by an affirmative vote of the governing body of each Cooperator.

Section 7. Amendment of Agreement

7.1 This Agreement may be amended at any time by an affirmative vote of the governing body of all Cooperators. Any Cooperator desiring an amendment to this Agreement shall notify the other Cooperators of its desire, and the reasons for the request.

7.2 Such request shall be in writing to the other Cooperators, and shall be considered without unreasonable delay and within no more than ninety (90) days of receipt.

7.3 If the request is agreed to by the other Cooperators, each Cooperator shall prepare and submit to the others a certified resolution confirming the affirmative vote of the Cooperator's governing body.

7.4 The amendment shall take effect ten (10) days following receipt of the last such resolution by the other Cooperators. Amendments shall be filed and recorded as required by Section 14 hereof.

Section 8. Termination of Agreement.

8.1 It is the intent of this Section to provide the sole and exclusive method for termination of the mutual rights and obligations of Cooperators pursuant to this Agreement.

8.2 The governing body of any Cooperator may terminate this Agreement at any time, and for any reason, by approving a resolution of notice of intent to terminate to the other Cooperators, such termination shall not be effective for one hundred twenty (120) days following receipt by the other Cooperators.

8.3 If, at the time of the giving of such notice, a Cooperator is in breach of this Agreement, it is understood and agreed that the actions of Cooperator giving rise to such breach shall be null, void and of no force or effect whatsoever, ab initio, and that for such actions to be effective will have to be repeated following termination of this Agreement pursuant to this Section 8.

8.4 During these one hundred twenty days, Cooperators shall seek to resolve issues, if any, that gave rise to the notice of intent to terminate through direct meetings of governing bodies, mediation, or other means to which all parties shall agree.

8.5 During these one hundred twenty days no waiver of governmental power established by this agreement shall be effective.

8.6 If resolution is not achieved after one hundred twenty days, the governing body of the Cooperator who initiated the notice of intent to terminate the agreement may approve a resolution terminating the agreement effective thirty (30) days following receipt of a certified resolution by the other Cooperators.

Section 9. Effective Period.

This Agreement shall become effective as of the date first set forth above, following acceptance and execution by the parties, and shall be in effect for five (5) years after such date, unless earlier terminated pursuant to Section 8 above. This Agreement shall be automatically renewed for an additional five years unless any Cooperator objects in writing to such renewal no less than one hundred fifty (150) days prior to the termination date.

Section 10. No Separate Legal/Administrative Entity Created.

It is the intention of this Agreement that there be no new or additional legal or administrative entity created by this Agreement, nor that the inherent governmental powers of any Cooperator be affected in any way beyond the terms of this Agreement. It is further agreed and understood by the parties hereto that no financial obligations upon any Cooperator are intended to be created hereby.

Section 11. Entire Agreement.

This Agreement represents the entire understanding between the Cooperators and no Cooperator is relying on any representation or understanding which may have been made by another Cooperator and which is not included in this Agreement.

Section 12. Severability/Invalidity
If any term, provision or condition of this Agreement shall be determined to be invalid by a court of law, such invalidity shall in no way effect the validity of any other term, provision or condition of this Agreement, and the remainder of the Agreement shall survive in full force and effect unless to do so would substantially impair the rights and obligations of the parties to this Agreement or substantially frustrate the attainment of the purposes of this Agreement.

Section 13. Notices.
Notices under this Agreement shall be in writing and delivered to the representative of the party to receive notice (identified below) at the address of the party designated to receive notice for each Cooperator as set forth in this Agreement. The effective date for any notice under this Agreement shall be the date of actual delivery of such notice and not the date of dispatch. The preferred means of notice shall be either actual hand delivery, certified US Mail, return receipt requested with postage prepaid thereon, or by recognized overnight delivery service, such as FedEx or UPS.

Notices shall be delivered to the following persons at each Cooperator:

County: Chairperson, Story County Board of Supervisors
Story County Administration
900 6th Street
Nevada, Iowa 50201

Ames: Mayor, City of Ames
City Hall
515 Clark Avenue
Ames, IA 50010

Gilbert Mayor, City of Gilbert
City Hall
119 Main Street
Gilbert, IA 50105

Section 14. Recordation
This Agreement shall be recorded pursuant to the requirements of *Code of Iowa*, Chapter 28E.

Section 15. Entire Agreement.
This Agreement and attachments attached hereto constitute the entire Agreement, among the Cooperators and supersedes or replaces any prior agreements among the Cooperators relating to its subject matter.

Section 16. No Waiver.
The waiver or acceptance by any Cooperator of a breach or violation of any provisions of this Agreement by another Cooperator shall not operate as, or be construed to be, a waiver of any subsequent breach.

Section 17. No Assignment or Delegation.
Neither this Agreement, nor any right or obligation under it, may be assigned, transferred or delegated in whole or in part to any outside party without the prior written consent of all the Cooperators.

Section 18. Authority and Authorization.
Each party to this Agreement represents and warrants to the other that it has the right, power and authority to enter into and perform its obligations under this Agreement; and that it has taken all requisite actions necessary to approve the execution, delivery and performance of this Agreement, and that this Agreement constitutes a legal, valid and binding obligation upon itself in accordance with the terms of the Agreement.

Section 19. Headings and Captions.
The paragraph headings and captions set forth in this Agreement are for identification purposes only and do not limit or construe the contents of the paragraphs.

Section 20. Counterparts.
The Cooperators agree that this Agreement has been or may be executed in several counterparts, each of which shall be deemed an original and all such counterparts shall together constitute one and the same instrument.

[Signature page follows]

STORY COUNTY

Dated this 5 day of July, 2011.

By: Wayne E. Clinton
Wayne Clinton, Chairperson, Board of Supervisors

Attest: LMM
Lucinda Martin, County Auditor

(seal)

CITY OF AMES

Dated this 28th day of June, 2011.

By: Ann Campbell
Ann Campbell, Mayor

Attest: Jill Ripperger
Jill Ripperger, Deputy City Clerk

(seal)

APPROVED AS TO FORM
BY DRMarek
DOUGLAS R. MAREK
CITY ATTORNEY

CITY OF GILBERT

Dated this 11 day of July, 2011.

By: Jonathan C. Popp
Jonathan Popp, Mayor

Attest: Susan Gens
Susan Gens, City Clerk

(seal)

ATTACHMENTS:

Attachment A

Subdivision Review Procedures – Rural/Urban Transition Area Land Use Class

The Cities and County all have established subdivision review and approval and, for the Cities, have extended that review and approval outside its boundaries in accordance with Code of Iowa 354.9 and as amended. In establishing a process for subdivision review in the Rural/Urban Transitional Area Land Use Class, the three jurisdictions acknowledge the primacy of the Cities' interests in regulating development in areas that the Cities may, at some future moment, annex. Therefore, the Cities are tasked with giving primary review and, if appropriate, approval of any proposed division of land, except for Agricultural Subdivisions, which shall remain the sole province of the County.

As noted in Section 5.2.1 of this agreement, Cities agree to waive their subdivision review authority in areas designated Rural Service and Agricultural Conservation Area in the Plan. And as noted in Section 5.2.3 of this agreement, County agrees to waive its subdivision review authority in areas designated Urban Services Area in the Plan.

1. City Sketch Plan application form submitted to the closer City.

2. Sketch Plan review by City and County staff and determination as to whether the proposed division is a Major, Minor, or Agricultural Plat or whether the division can be allowed by Plat of Survey.

3. If a Major Subdivision Plat, follow City's Preliminary Plat process through to City Council decision. Plat is then forwarded to the County for action. Final Plat follows City's Major Final Plat process through to City Council decision. Plat is then forwarded to the County for action.

4. If a Minor Subdivision Plat, follow City's Minor Final Plat process through to City Council decision. Plat is then forwarded to the County for action.

5. If an Agricultural Plat, follow County's Agricultural Plat process through to Board of Supervisor's decision. No action by the City is required.

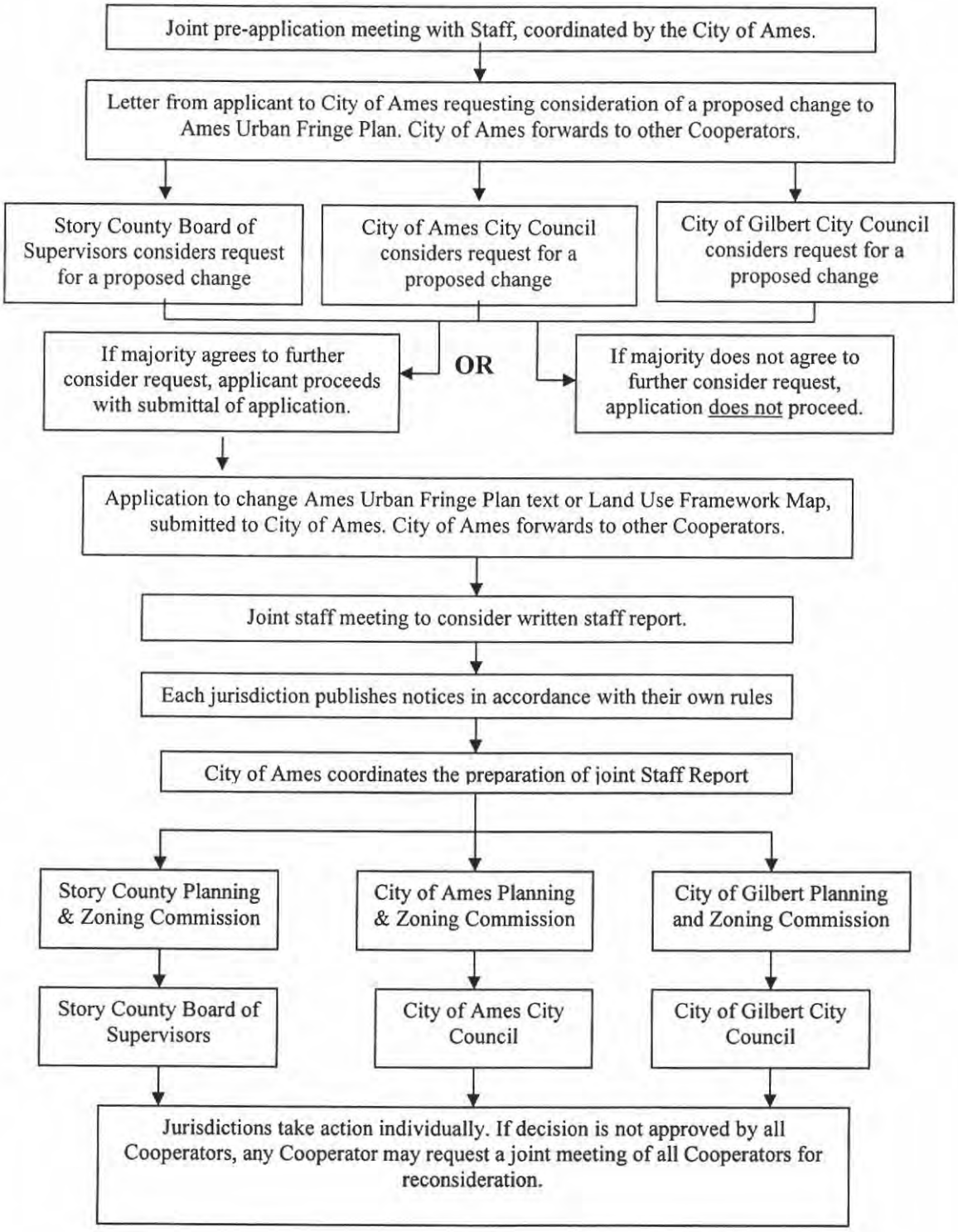
6. If a Plat of Survey, follow City's Plat of Survey process through to City Council decision. Plat is then forwarded to the County for action.

Attachment B

Reserved

Attachment C

Ames Urban Fringe Plan Amendment Procedures



Stephanie L. Jones

From: Margaret C. Jaynes
Sent: Friday, May 01, 2020 11:14 AM
To: Jerry L. Moore
Subject: RE: Ames Urban Fringe Plan Discussion with Planning and Zoning Commission and Board of Supervisors

Hi Jerry, I am resending this email to you, as I added one more bullet point (second to last). Please use this version. Also, let me know if I am not being PC enough with regards to Irons comment. m

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From: Margaret C. Jaynes
Sent: Thursday, April 30, 2020 12:56 PM
To: Jerry L. Moore ; Darren R. Moon ; Scott T. Wall ; Ethan P. Anderson ; Wayne V. Schwickerath ; Dina M. McKenna ; Leanna J. Ellis ; Michael D. Cox
Subject: RE: Ames Urban Fringe Plan Discussion with Planning and Zoning Commission and Board of Supervisors

Hi Jerry,
Thanks for including us in your discussion on the Ames Urban Fringe Plan. Here are a few thoughts to consider:

- Lot size. My main concern is figuring out a septic system design that fits on a smaller lot with a large house footprint, which seems to be somewhat common for parcels closer to town. Technology has brought us to a point where we can use "mechanical" systems, basically using filtering material in a container, approximately 14' x 7'. While these require a lot less space compared to standard septic systems, there are still space issues for tertiary treatment. The mechanical systems are designed to discharge treated water. Typically the water is discharged to a lateral ~100' long, but sometimes this is not possible due to setback requirements. A second option is to use UV light for tertiary treatment, and then discharging to the ground surface. These systems are quite a bit more expensive (maybe five thousand dollars more and up) and require a maintenance contract for the life of the system ($200-$300 annually).
- Landscaping. The state and county require soil-based systems be used whenever possible, making the mechanical systems last on the list of possible design choices. If soil based systems are used, a large portion of the yard is used for wastewater treatment, which cannot have trees, bushes or gardens on them (it is recommended to keep trees and bushes 20' away from laterals). For lots in wooded areas, it may be necessary to do some tree removal for septic.
- Geothermal heating. Use of vertical and horizontal geothermal collection lines are limited on lots that have a large house and septic system to compete with. Septic laterals must be a minimum of 100' from vertical geothermal wells.
- Cluster septic systems. It may be necessary to have cluster systems (several houses, each with their own tank, but one common treatment system) to accommodate subdivisions with small lots. This is probably more expensive than individual systems and may require a wastewater operator, depending on wastewater volume. This approach presents maintenance issues, and time of transfer inspection complications. Story County has a few sites with two houses sharing one system. The main downside is agreeing to what level of maintenance both parties are comfortable with. South Squaw Valley Subdivision has a privately owned public wastewater treatment system that is owned by the HOA, and serves forty houses. IDNR and Fox Engineering are in the process of designing a replacement system. I believe it will cost each property roughly $40,000, plus HOA fees for the wastewater operator and maintenance.
- Big pipe ready. For subdivisions being constructed close to municipal sewer service areas, with the expectation of city annexation, it would be ideal to have the systems plumbed so that you can remove the treatment system(s), and connect the houses directly to the municipal lines. This is less than ideal for those houses or systems that will need a lift station. I will point to the Irons Subdivision, near the Ames Golf and Country Club, as an example. The Irons subdivision

has exceptionally poor soil, and mechanical systems were planned for all houses. The City of Ames was involved in the planning and setting of requirements on wastewater treatment because the subdivision is located in the Ada Hayden protected watershed. Each set of duplexes were designed to share a secondary system, and the single family houses were designed to have individual systems. The city required sewer lines exit each house toward the street, so as to make connection to city sewer easier when it becomes available. At a Board of Supervisors meeting, during the planning phase, I suggested that sewer lines be installed when the roads were being constructed in the subdivision. I was told by the applicant's representatives that it would be cost prohibitive for the developer to do this. They also stated that installing sewer lines before they were ready to be used could result in deterioration of the lines that may have to be replaced anyway. The BOS accepted the developers reasoning. When the city annexes, the subdivision will be required to install collector lines to the "big pipe", at the property owner's expense.

- Increased groundwater. With the addition of every house, comes the addition of a new block of water, approximately 100 gallons per person per day. This adds stress to existing waterways, and compounds flood events.
- Water service. Service area buy-out is expensive and time consuming.

Let me know it you have any questions Jerry. I am sure these are standard hurdles for building in non-sewered areas in the municipal fringe. Sensible guidelines would be greatly appreciated.

Margaret Cemashko Jaynes, Director
Story County Environmental Health Department
900 6th Street | Nevada, Iowa 50201-2087
(515) 382-7241 | mjaynes@storycountyiowa.gov
www.storycountyiowa.gov

From: Jerry L. Moore
Sent: Monday, April 27, 2020 5:46 PM
To: Darren R. Moon <DMoon@storycountyiowa.gov>; Margaret C. Jaynes <MJaynes@storycountyiowa.gov>; Scott T. Wall <SWall@storycountyiowa.gov>; Ethan P. Anderson <EAnderson@storycountyiowa.gov>; Wayne V. Schwickerath <WSchwickerath@storycountyiowa.gov>; Dina M. McKenna <DMcKenna@storycountyiowa.gov>; Leanna J. Ellis <LEllis@storycountyiowa.gov>; Michael D. Cox <MCox@storycountyiowa.gov>
Subject: Ames Urban Fringe Plan Discussion with Planning and Zoning Commission and Board of Supervisors

Hello everyone,

Planning and Development Department staff are having an initial discussion with the Planning and Zoning Commission members at their May 6 meeting about the Ames Urban Fringe Plan. This discussion will be a part of many future discussions regarding possible amendments to policies and the map within the Plan.

Please share any observations and/or concerns your department staff have experienced due to development, growth, and/or changes within the two mile area outside of Ames' city limits.

Please respond by Friday, May 1, 2020. Your responses will be shared with the Planning and Zoning Commission members and the Board of Supervisors.

Thank you,

Jerry Moore
Planning and Development Director
Story County
900 6th Street
Nevada, IA 50201
515-382-7246