

Planning Memorandum

To: Sunfish Lake Planning Commission

From: Ryan Krzos, AICP, City Planner

Date: August 12, 2020
City Planning Commission Meeting August 19, 2020

Re: 1 Sunfish Lane – Major Site Plan Amendment Review and Interim Use Permit
WSB Project No. 13724-000

GENERAL INFORMATION

Applicant/
Property Owner: John Johansson

Project Location: 1 Sunfish Lane, PID# 38-11850-01-020

Existing Land Use / Residential; Zoned Single-Family Residential Zoning District, R-1
With Shoreland Overlay District

Surrounding Land Use/Zoning:

North:	Residential; Zoned Single-Family Residential District, R-1 with Shoreland Overlay District
East:	Residential; Zoned Single-Family Residential District, R-1 with Shoreland Overlay District
South:	Sunfish Lake
West:	Residential; Zoned Single-Family Residential District, R-1 with Shoreland Overlay District

Comprehensive Plan: The City of Sunfish Lake (2020) Comprehensive Plan guides this property for Rural Residential land use.

Deadline for Agency Action:

Application Date:	07-24-2020
60 Days:	09-22-2020
Extension Letter Mailed:	N/A
120 Days:	11-21-2020

CONSIDERATIONS RELATED TO THE REQUEST

1. Overview.

John Johansson is requesting an amendment to the previously approved major site plan review for 1 Sunfish Lane. The amendment proposes modifications to the grading and drainage and stormwater management plan. Requests for amended site and building plan review are administered in a manner similar to the requirements for a new site and building plan approval, which requires Planning Commission review and City Council approval.

Additionally, the applicant is requesting an interim use permit to allow the pumping of water from Sunfish Lake for irrigation of the site. Interim Use permits are reviewed in the manner

prescribed for conditional use permits which requires a public hearing, review and recommendation from the Planning Commission followed by review and consideration by the City Council.

2. General Review

The applicant is requesting approval of revised civil design plans modifying stormwater management facilities previously approved in 2019 in conjunction with review of the new home. Those approved civil design plans proposed two surface stormwater management basins. The first basin previously was in the area just north of the attached garage of the new home. This basin requires modification due to State regulations which prohibit infiltration basins within 50 feet of a water well. The primary well for the new home is located nearby the north side of the new garage. Accordingly, in place of the surface basin an underground system is proposed consisting of a perforated pipe laid within a bed of gravel to allow for infiltration.

The underground infiltration conveyance pipe would empty into a surface infiltration and storage basin to the rear of the residential structure. This surface basin is located in roughly the same location as the surface basin identified in the approved 2019 plans. However, the new design proposes a shift in the southern portion of the surface basin away from large, mature white pine trees adjoining the basin. Based feedback from the City Forrester, the applicant shifted the surface basin roughly ten feet further north to shift grading from the root structure of the white pines.

Additional modifications to the overall plan include installing underground pipe to collect water from the gutters on the house and routing them to the southern basin.

With regard to water pumping, the applicant proposes to install a submersible pump in the lake to supply water for an irrigation system. The landscape irrigation system would be fed off well water in addition to the lake water pump. The irrigated areas on the property would be divided between the two irrigation systems. The irrigation water from the lake pump would irrigate the southern portion of the site (approximately) 1.5 acres nearest to the lake.

The water pump would be a 7.5 Horsepower pump manufactured by Flint & Walling which would be installed adjacent to the dock serving the property. In the proposed dock location, the pump would be at least 150 feet from the adjoining lakefront property on both the east and west sides of the property. The pump would be placed in the lake in the Spring and removed in the Fall. Noise from the pump is anticipated to be minimal given the submersible style of pump. However, it should be noted that the zoning ordinance requirements related to noise require continual compliance.

The pump would initially be operated every day while the turf area is establishing. Once the lawn is established the pump would likely be operated every other day or alternatively everyday with half the duration. The lake pump would operate roughly 100 sprinkler heads. The heads are generally rated to utilize 2.5 gallons of water per minute. The typical sprinkler head operation duration is 40 minutes per day – which would be shortened upon establishment of the lawn. When the turf is established, typical watering schedules call for irrigation every other day or less based upon natural rainfall events. It should be noted that 100 sprinkler heads at 2.5 gpm for 40 minutes could approach 10,000 gallons per day or one million gallons in a year. If this amount is pumped every day the activity would require a DNR dewatering permit.

Pursuant to requirements related to DNR notification for Zoning Permits in the Shoreland Over District area, staff provided notice to the Area Hydrologist. The DNR's water appropriations team provided the following comments based on the applicant's submittal:

"If the two irrigation systems in Sunfish Lake are not connected then they do not need to have a DNR Water Appropriation Permit. However, if they do connect the systems, then they need a DNR Water Appropriation Permit.

If they are using the well for the water supply of the home, this could push the well over the volume that is needed for the DNR Water Appropriation Permit. The plumbing Code states that a luxury home needs to have a water supply capable of supplying 150 gallons of water per day per person. If we consider an average household to be about 2.7 people, then the addition 148,000 gallons of house hold water use would push them over 1.0 million gallons per year to 1.149 million gallons per year.

If they're constructing two wells, we would ask them for a "Water Use Data Statement" for the use of the lake water and wells."

It should be noted that staff recommends conditions for any and all approvals requiring compliance with all applicable State and Federal rules, and that all applicable permits be obtained.

3. Ordinance Authority

SECTION 1107.02 WATER USE PERMIT REQUIRED states that a water use permit must be obtained from the City Council to engage in pumping of any lake, stream, wetland or natural or man-made pond.

SECTION 1107.03 INTERIM USE states that water use permits are considered as an interim use.

SECTION 1205.02 INTERIM USE PROCEDURES states that interim use requests are to be processed according to the standards and procedures for a conditional use permit as established by Section 1204.

SECTION 1204.02 CONDITIONAL USE PERMIT PROCEDURES provides the process for review of a conditional use permit which requires public notice and notification, a public hearing, and review and recommendation by the Planning Commission, followed by review and consideration by the City Council.

SECTION 1208.06 AMENDED SITE PLAN APPROVAL PROCEDURES state an amended site and building plan may be applied for and administered in a manner similar to the requirement for a new site and building plan approval.

4. Site Plan Review Criteria

The Planning Commission, as its basis of recommendation, and the City Council, as its basis for decision on major projects, shall evaluate the effects of the proposed site and building plans. This review shall include, but is not limited to the following, with staff's comments provided in *italics*:

A. Whether the proposed improvements are compatible and in harmony with the existing structures in the surrounding community.

The proposed modified stormwater facilities would not conflict with the appearance of structures and residential property in the vicinity.

B. Whether the proposed improvements preserve the character and nature of the surrounding community, including the natural landscape and woodland characteristics of the community.

The proposed amended site plan does not impact the residential structure or accessory structures. The proposed modified improvements aid in the preservation of several existing significant trees and do not result in the removal of any additional trees.

C. Whether the proposed improvements are not constructed of unsightly, improper or unsuitable materials.

The proposed plan modification would not result in any changes to the building. Proposed stormwater conveyance facilities associated with this request will be located underground, and thus will not be visible. Surface infiltration basins will be modified in size and location, but would not be constructed out of unsightly or improper materials.

D. Whether the proposed improvements will not materially adversely affect any natural resources in the community, except when there is no feasible and prudent alternative to the proposed location of the improvements. For purposes of this clause, "natural resources" shall include, but not be limited to, all mineral, animal, botanical, air, water, land, timber, soil, quietude, recreational, historical, scenic and aesthetic resources.

The proposed improvements were adjusted to aid in the preservation of a number of existing significant white pines trees in the project area

E. Whether the proposed site and improvements shall have an appearance that will not have an adverse effect upon adjacent residential properties.

The proposed revisions to the drainage and stormwater facilities will be largely imperceptible to adjoining property and thus are likely to have minimal visual impact.

F. Whether the proposed site improvement complies with drainage requirements, as provided in Section 1216.04 of this Ordinance.

Compliance with the City's drainage standards is achieved with the revised stormwater management design.

G. Whether the proposed site and improvements are consistent with the purposes of this Ordinance and the Property Owner Reference & Development Guide Manual, as established by City Council resolution.

The purpose of the Zoning Ordinance is to protect the health, safety, and general welfare of the community. Modification of the previously approved plans to accommodate the modified stormwater design is not anticipated to have negative impact on health, safety, or general welfare of the community.

5. Interim Use Approval Criteria

The Interim Use permit section of Ordinance requires proposed new uses to comply with the following criteria with staff's comments provided in *italics*:

New Uses

1. Conforms to all zoning regulations as otherwise applicable.

The proposed water pump and pumping activities would conform to applicable Zoning Ordinance provisions provided the equipment is screened from view. Noise from the pump is not anticipated to exceed Ordinance standards due to the type of pump being utilized, and the proximity to adjoining properties.

2. The date or event that will terminate the use can be identified with certainty.

The proposed water pumping use would occur indefinitely or until irrigation is no longer needed. Staff is recommending conditions of approval requiring that the pumping cease when lake levels are below the Ordinary High Water Level, and that the use is subject to annual renewal.

3. The existence of the use will not impose additional costs on the public if it is necessary for the public to take the property in the future; and

The proposed water pump is a temporary site element that is to be removed during winter months. Accordingly, the use would not result in additional cost should the public take the property in the future.

4. The user agrees to any conditions that the City Council deems appropriate for permission of the use.

Agreement from the applicant to adhere to the conditions of approval is a recommended condition of this request.

New and Existing Uses

1. Shall maintain harmony and compatibility with surrounding uses and with the architectural character and design standards of existing uses and development.

The proposed water pumping would be compatible with surrounding residential land uses provided the pump is adequately screened as is required by code, and the equipment maintains compliance with noise limitations prescribed by the Zoning Ordinance. The water drawn pump is to be used for lawn irrigation. Lawn irrigation systems are commonplace in residential settings.

2. Conforms with all performance standards contained in this Ordinance (i.e., parking, noise, etc.).

The proposed water pumping use is anticipated to comply with all applicable performance standards contained in the Zoning Ordinance including provisions primarily related to noise, odor, dust, and lighting. Continual compliance with these provisions is required.

3. Shall have no detrimental effect upon the property values or the general health, safety, and welfare of the surrounding uses and property owners.

Staff is recommending conditions of approval requiring the cessation of pumping when the lake level is below the Ordinary High Water Level or when there is no outflow from the lake outlet. This will ensure that the activity does not contribute to excessive draw on the lake in periods of low lake levels. Persistent low lake level creates the potential for erosion of property values, which are generally correlated to the amount and quality of lake frontage.

The proposed water pumping is not likely to have a detrimental effect on the health, safety, or welfare of surrounding residents.

4. Traffic generated by the use does not overburden or exceed the capabilities of streets and other public services and facilities, including parks, schools, streets and utilities serving the area.

The proposed water pumping use would have no impact on traffic or other public services.

RECOMMENDATION

Based on the foregoing considerations and applicable ordinances staff recommends conditional approval of the amended site and building plan and Interim Use Permit for water pumping subject to the following findings of fact and conditions of approval:

Findings of Fact:

1. The address of the subject property is as follows:

1 SUNFISH LANE
SUNFISH LAKE, MN 55118
2. A request for a major site and building plan review was review by the City Council and conditionally approved by Resolution Number 19-17 on July 9, 2019.
3. The applicant has submitted applications for an amended site plan and an interim use permit for the pumping of water from Sunfish Lake.
4. The planning report detailing the applicant's proposal for an amended site plan and interim use dated August 12, 2020 prepared by WSB is incorporated herein by reference.
5. A request for an amended site and building plan review may be applied for and administered in a manner similar to that required for a new site and building plan approval, which requires Planning Commission review and City Council approval.
6. Interim Use Permit requests may be applied for and administered in a manner similar to that required for a Conditional Use Permit, which requires Planning Commission review and City Council approval
7. The Sunfish Lake Planning Commission reviewed the applicant's request for an amended major site and building plan and interim use permit approval and conducted public hearings at the August 19, 2020 Planning Commission meeting.
8. Upon review of the planning report and application information, the Planning Commission found that the proposed amended site and building plan request meets Ordinance requirements. The following findings support the Planning Commission's recommendation for approval:
 - a. The subject property and proposed development meet R-1 and Shoreland Overlay District requirements, and impervious surface standards.
 - b. The proposed development addresses Ordinance requirements pertaining to grading, drainage and stormwater management, landscaping, and screening.
 - c. The development meets other applicable Zoning Ordinance criteria.
9. Upon review of the planning report and application information, the Planning Commission found that the proposed interim use permit request meets Ordinance requirements. The following finding support the Planning Commission's Recommendation for approval:
 - a. The proposed water pumping conforms to all zoning regulations as otherwise applicable as presented.
 - b. The date or event that will terminate the use can be identified with certainty.

- c. The existence of the use will not impose additional costs on the public if it is necessary for the public to take the property in the future; and
- d. The user agrees to any conditions that the City Council deems appropriate for permission of the use.
- e. The use maintains harmony and compatibility with surrounding uses and with the architectural character and design standards of existing uses and development.
- f. The use conforms with all performance standards contained in this Ordinance.
- g. The use will have no detrimental effect upon the property values or the general health, safety, and welfare of the surrounding uses and property owners.
- h. No traffic is generated by the use and it does not overburden or exceed the capabilities of streets and other public services and facilities, including parks, schools, streets and utilities serving the area.

Conditions of Approval:

- 1. Construction shall occur in conformance with the plans presented at the August 19, 2020 Planning Commission meeting.
- 2. There shall be no use of bobcats, graders or other similar machinery within 100 feet of the lakeshore, without prior engineering and forestry approval in writing.
- 3. Vegetation within the buffer zone established by ordinance from the lakeshore shall remain as is. Removal of invasive species in the buffer zone may occur with written approval from the City provided a sufficient plantings and stabilization measures approved by the City Engineer and City Forrester are immediately implemented.
- 4. As required in Section 1243.04(A)(2), mowed lawns within 100 feet of the ordinary high water mark may only be permitted in an area which encompasses up to twenty (20) percent of the shore impact zone.
- 5. Water Pumping shall occur in accordance with the information presented at the August 19, 2020 Planning Commission meeting.
- 6. All water pumping equipment shall be screened from view to the greatest extent possible.
- 7. The Interim Use Permit shall be subject to annual renewal.
- 8. No water pumping shall occur when the lake level is below the Ordinary High Water Level or when there is no outflow from the lake outlet. The City Engineer and/or their designee shall be consulted to determine if and when these conditions occur
- 9. The conditions of the Site and Building and Conditional Use Permit approvals granted by City Council on July 9, 2019 established in Resolution number 19-17 shall remain in effect where not superseded by this approval.
- 10. The applicant must obtain all other permits as may be required.
- 11. The applicant shall comply with all applicable federal, state, and local laws, rules and ordinances.
- 12. The applicant must adhere to and remain in compliance with the requirements of this Resolution, applicable performance standards, and such other requirements as may apply.
- 13. All conditions of the site plan review and Interim Use Permit must be complied with, shall run with the land, and shall not in any way be affected by the subsequent sale, lease or other change from current ownership of the Property.
- 14. This Resolution is subject to the condition that all representations, written and oral, made by the Applicant and its agents and representatives to the City contained in and concerning the Applicant's application for the site plan review must have been true, complete and accurate at the time they were made, and that they remain true and accurate for the duration of the development.
- 15. By undertaking the activities approved by the requests, the applicant agrees to all conditions.

Subject Site



CITY OF *Sunfish Lake* MINNESOTA

**Planning Commission
Findings of Fact &
Recommendation
(Approval)**

Applicant's Name: John Johansson

Request: City approval of an amendment to a major site and building plan and Interim Use Permit approval at 1 Sunfish Lane.

Planning Commission Meeting Date: August 19, 2020

Findings of Fact: Based on review of the application and evidence received, the Sunfish Lake Planning Commission now makes the following findings of fact and recommendation:

1. The address of the subject property is as follows:

1 SUNFISH LANE
SUNFISH LAKE, MN 55118
2. A request for a major site and building plan review was review by the City Council and conditionally approved by Resolution Number 19-17 on July 9, 2019.
3. The applicant has submitted applications for an amended site plan and an interim use permit for the pumping of water from Sunfish Lake.
4. The planning report detailing the applicant's proposal for an amended site plan and interim use dated August 12, 2020 prepared by WSB is incorporated herein by reference.
5. A request for an amended site and building plan review may be applied for and administered in a manner similar to that required for a new site and building plan approval, which requires Planning Commission review and City Council approval.
6. Interim Use Permit requests may be applied for and administered in a manner similar to that required for a Conditional Use Permit, which requires Planning Commission review and City Council approval
7. The Sunfish Lake Planning Commission reviewed the applicant's request for an amended major site and building plan and interim use permit approval and conducted public hearings at the August 19, 2020 Planning Commission meeting.
8. Upon review of the planning report and application information, the Planning Commission found that the proposed amended site and building plan request

meets Ordinance requirements. The following findings support the Planning Commission's recommendation for approval:

- a. The subject property and proposed development meet R-1 and Shoreland Overlay District requirements, and impervious surface standards.
 - b. The proposed development addresses Ordinance requirements pertaining to grading, drainage and stormwater management, landscaping, and screening.
 - c. The development meets other applicable Zoning Ordinance criteria.
9. Upon review of the planning report and application information, the Planning Commission found that the proposed interim use permit request meets Ordinance requirements. The following finding support the Planning Commission's Recommendation for approval:
- a. The proposed water pumping conforms to all zoning regulations as otherwise applicable as presented.
 - b. The date or event that will terminate the use can be identified with certainty.
 - c. The existence of the use will not impose additional costs on the public if it is necessary for the public to take the property in the future; and
 - d. The user agrees to any conditions that the City Council deems appropriate for permission of the use.
 - e. The use maintains harmony and compatibility with surrounding uses and with the architectural character and design standards of existing uses and development.
 - f. The use conforms with all performance standards contained in this Ordinance.
 - g. The use will have no detrimental effect upon the property values or the general health, safety, and welfare of the surrounding uses and property owners.
 - h. No traffic is generated by the use and it does not overburden or exceed the capabilities of streets and other public services and facilities, including parks, schools, streets and utilities serving the area.

Recommendation:

Based on the foregoing considerations and applicable ordinances, the Planning Commission recommends approval of the applicant's amended major site and building plans and Interim use permit.

Approved, subject to the following conditions:

1. Construction shall occur in conformance with the plans presented at the August 19, 2020 Planning Commission meeting.
2. There shall be no use of bobcats, graders or other similar machinery within 100 feet of the lakeshore, without prior engineering and forestry approval in writing.
3. Vegetation within the buffer zone established by ordinance from the lakeshore shall remain as is. Removal of invasive species in the buffer zone may occur with written approval from the City provided a sufficient plantings and

stabilization measures approved by the City Engineer and City Forrester are immediately implemented.

4. As required in Section 1243.04(A)(2), mowed lawns within 100 feet of the ordinary high water mark may only be permitted in an area which encompasses up to twenty (20) percent of the shore impact zone.
5. Water Pumping shall occur in accordance with the information presented at the August 19, 2020 Planning Commission meeting.
6. All water pumping equipment shall be screened from view to the greatest extent possible.
7. The Interim Use Permit shall be subject to annual renewal.
8. No water pumping shall occur when the lake level is below the Ordinary High Water Level or when there is no outflow from the lake outlet. The City Engineer and/or their designee shall be consulted to determine if and when these conditions occur
9. The conditions of the Site and Building and Conditional Use Permit approvals granted by City Council on July 9, 2019 established in Resolution number 19-17 shall remain in effect where not superseded by this approval.
10. The applicant must obtain all other permits as may be required.
11. The applicant shall comply with all applicable federal, state, and local laws, rules and ordinances.
12. The applicant must adhere to and remain in compliance with the requirements of this Resolution, applicable performance standards, and such other requirements as may apply.
13. All conditions of the site plan review and Interim Use Permit must be complied with, shall run with the land, and shall not in any way be affected by the subsequent sale, lease or other change from current ownership of the Property.
14. This Resolution is subject to the condition that all representations, written and oral, made by the Applicant and its agents and representatives to the City contained in and concerning the Applicant's application for the site plan review must have been true, complete and accurate at the time they were made, and that they remain true and accurate for the duration of the development.
15. By undertaking the activities approved by the requests, the applicant agrees to all conditions.

Adopted by the Sunfish Lake Planning Commission this 19th day of August 2020.

City of Sunfish Lake

By: _____
Tom Hendrickson
Planning Commission Chair

ATTEST

Catherine Iago, City Clerk

Narrative – Irrigation pumping form Sunfish Lake

This narrative supplements the Interim Use permit application for the proposed irrigation of portions of the property at 1 Sunfish Lane with water drawn from Sunfish Lake.

The applicant proposes to install a submersible pump in the lake. The pump would be a high quality 7.5 HP pump manufactured by Flint & Walling. The pump would be installed adjacent to, and perhaps under, the dock serving the property. The pump would be placed in the lake in the Spring and removed in the Fall to be stored in a heated environment over the winter.

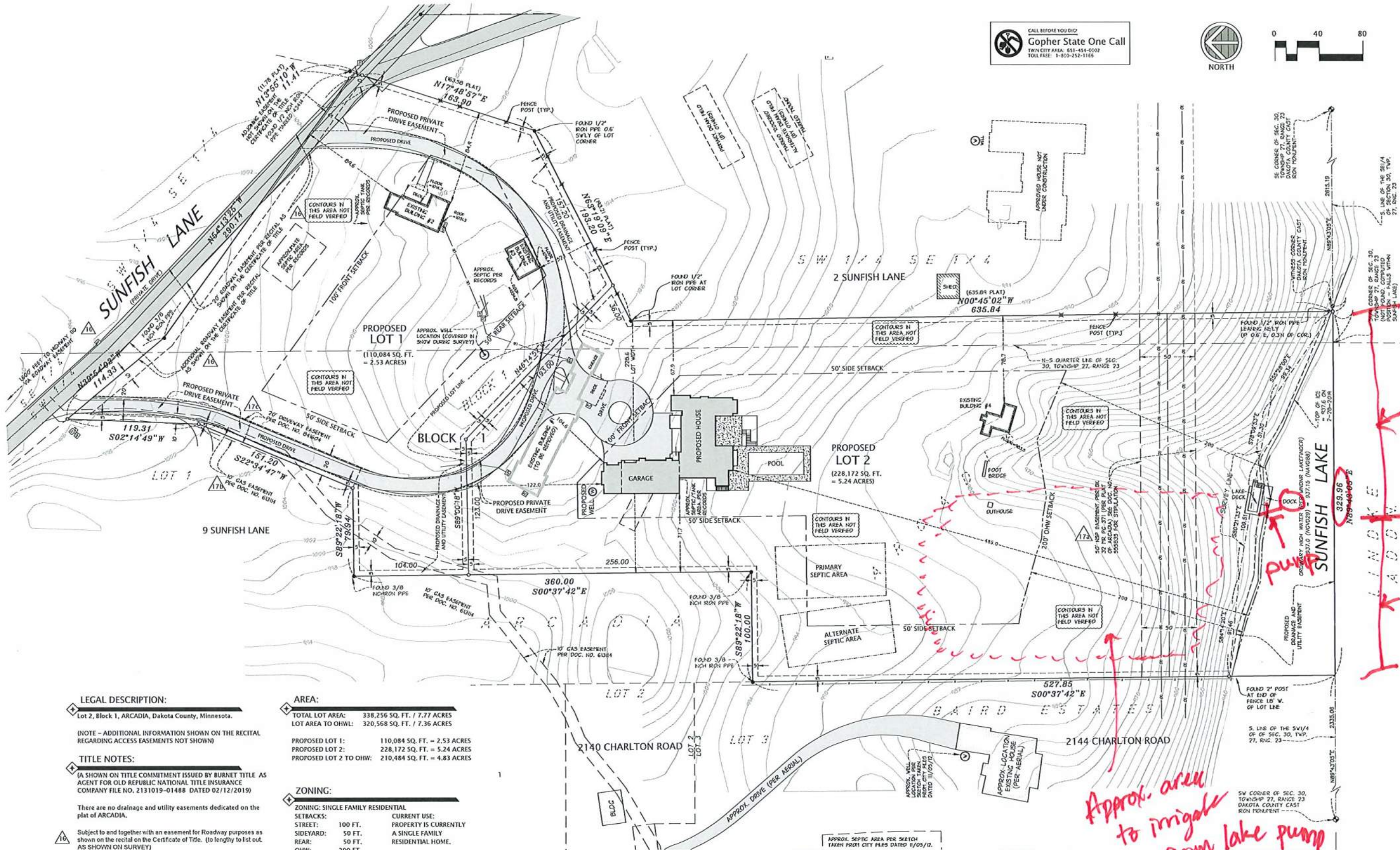
Because the pump would be entirely submersed in the lake, the noise from the pump would be virtually imperceptible. For reference, the dock is located approximately in the middle of the subject property – which has a lake frontage of 329 lineal feet. As such, the pump would be at least 150 feet from the adjoining lakefront property on both the east and west sides of the property. Even though there would be virtually no audible noise from the pump, there is added protection in that the pump would be installed a significant distance from any adjoining property owner.

Upon installing new grass and sod, the pump would initially be operated everyday – for a duration that would vary based upon natural rainfall events. Upon the establishment of the grass and sod, the pump would likely be operated every other day. Alternatively, the applicant could operate the pump every day but for roughly a 50% duration – as the sprinkled areas could be zoned and irrigated on opposing, alternating days.

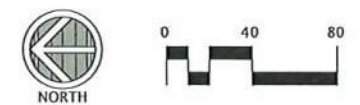
The applicant is also installing a landscape irrigation system within the new home – to be fed off the newly drilled water well. This well water will be treated for iron removal prior to irrigation use. The irrigated areas on the property would be divided between the two irrigation systems. The irrigation water from the lake pump would irrigate the southern portion of the site- nearest to the lake. It is estimated that the ground area to be irrigated by lake water is in the range of 1.5 acres of irrigation land area. The irrigation system fed by the well would likewise irrigate roughly 1.5 acres of irrigation land area.

The lake pump would operate roughly 100 sprinkler heads. The heads are generally rated to utilize 2.5 gallons of water per minute. The longest a sprinkler head is typically operated per day is 40 minutes – to be adjusted to shorter duration upon establishment of the newly planted turf areas. When the turf is established, typical watering schedules call for irrigation on every other day – or less based upon natural rainfall events.

It is also of note that the applicant is planning on installing a turf grass in the area to be irrigated by lake water that is primarily a natural fescue-based grass. There are some areas that are primarily in the shade – and thus the combination of the fescue grasses, and shade varieties can aid in reducing irrigation volume once the turf is established.



CALL BEFORE YOU DIG!
Gopher State One Call
TWINCITY AREA: 651-455-0002
TOLL FREE: 1-800-232-1166



1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

CONTACT:
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Welsh Companies/Colliers
International
4350 Baker Road, Suite 400
Minnetonka, MN 55343
952-897-7750 - phone
612-817-2302 - cell
John.Johannson@colliers.com
JJohannson@welshco.com

COUNTY/CITY:
DAKOTA COUNTY
CITY OF SUNFISH LAKE

REVISIONS:

DATE	REVISION
2-21-19	PRELIMINARY
2-28-19	ISSUED
3-04-19	REVISED
3-27-19	ADD SEPTIC/WELL
4-05-19	PRELIM PLAT ISSUE

CERTIFICATION:
I hereby certify that this plan was prepared by me, or under my direct supervision, and that I am a duly Licensed Land Surveyor under the laws of the state of Minnesota.
Daniel L. Thurnes
Daniel L. Thurnes Registration Number: 25718
Date: 02-21-19

PROJECT LOCATION:
1 SUNFISH LANE
PID#38-03000-83-020

Suite #200
1970 Northwestern Ave.
Stillwater, MN 55082
Phone 651.275.8969
dan@cssurvey.net

CORNERSTONE
LAND SURVEYING, INC.

PRELIMINARY PLAT
JOHANNSON ADDITION

LEGAL DESCRIPTION:

Lot 2, Block 1, ARCADIA, Dakota County, Minnesota.

(NOTE - ADDITIONAL INFORMATION SHOWN ON THE RECITAL REGARDING ACCESS EASEMENTS NOT SHOWN)

TITLE NOTES:

(A SHOWN ON TITLE COMMITMENT ISSUED BY BURNET TITLE AS AGENT FOR OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY FILE NO. 2131019-01488 DATED 02/12/2019)

There are no drainage and utility easements dedicated on the plat of ARCADIA.

Subject to and together with an easement for Roadway purposes as shown on the recital on the Certificate of Title. (to length to list out AS SHOWN ON SURVEY)

Easement in favor of Northern States Power Company per Book 32 of M.R. Page 371. Subject to Stipulation & Order Filed January 3, 2005 as Document No. T555835 Stipulation for Dismissal with Prejudice and Order for Entry of Judgment and Partial Judgment Northern States Power Company, PPL VS Paul and Shannon Burke, et al Dfs. (AS SHOWN ON SURVEY)

Gas Line Easement per Document No. 613114. (AS SHOWN ON SURVEY)

Driveway easement per Document No. 841604. (AS SHOWN ON SURVEY)

BENCHMARKS

ELEVATIONS BASED ON INFORMATION AS SHOWN ON THE MNDOT GEODETIC WEBSITE. SURVEY DISK 1918 K WITH AN ELEVATION OF 931.83 WAS USED TO ESTABLISH VERTICAL CONTROL FOR THIS SURVEY (NAVD 88)

AREA:

TOTAL LOT AREA: 338,256 SQ. FT. / 7.77 ACRES
LOT AREA TO OHWL: 320,568 SQ. FT. / 7.36 ACRES

PROPOSED LOT 1: 110,084 SQ. FT. = 2.53 ACRES
PROPOSED LOT 2: 228,172 SQ. FT. = 5.24 ACRES
PROPOSED LOT 2 TO OHWL: 210,484 SQ. FT. = 4.83 ACRES

ZONING:

ZONING: SINGLE FAMILY RESIDENTIAL
SETBACKS:
STREET: 100 FT.
SIDEYARD: 50 FT.
REAR: 50 FT.
OHWL: 200 FT.
CURRENT USE:
PROPERTY IS CURRENTLY A SINGLE FAMILY RESIDENTIAL HOME.

SURVEY NOTES:

- BEARINGS ARE BASED ON COORDINATES SUPPLIED BY THE DAKOTA COUNTY SURVEYORS OFFICE. BEARINGS ARE DIFFERENT THAN SHOWN ON THE RECORDED PLAT OF ARCADIA. ALL INTERIOR ANGLES MATCH THE RECORDED PLAT ANGLES OR REFLECT MEASURED DISTANCES TO FOUND IRON MONUMENTS.
- UNDERGROUND UTILITIES SHOWN WERE NOT RESEARCHED OR LOCATED AS PART OF THIS SURVEY. THERE MAY BE SOME UNDERGROUND UTILITIES, GAS, ELECTRIC, ETC. NOT SHOWN OR LOCATED.
- ELEVATIONS IN EXISTING AROUND EXISTING IMPROVEMENTS AND PROPOSED IMPROVEMENT AREAS ARE BASED ON FIELD MEASUREMENT. SUPPLEMENTAL CONTOURS SHOWN OUTSIDE OF THESE AREAS ARE BASED ON LIDAR DATA ACQUIRED FROM THE MNTOPD WEBSITE AND WERE NOT FIELD VERIFIED.
- EXCESSIVE SNOW AND ICE AT THE TIME OF THIS SURVEY MAY HAVE HINDERED OUR ABILITY TO LOCATE OBVIOUS IMPROVEMENTS.
- TREE LOCATION/ID WILL BE PROVIDED AS A SEPARATE DOCUMENT UPON TREE ID AFTER SPRING LEAF OUT.

UNDERGROUND UTILITIES NOTES:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THIS SURVEY HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. GOPHER STATE ONE CALL LOCATE TICKET NUMBER(S) 190570762 SOME MAPS WERE RECEIVED, WHILE OTHER UTILITIES DID NOT RESPOND TO THE LOCATE REQUEST. ADDITIONAL UTILITIES OF WHICH WE ARE UNAWARE MAY EXIST.

FLOOD INFORMATION:

THIS PROPERTY LIES WITHIN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON NON-PRINTED FEMA FLOOD INSURANCE RATE MAP NUMBER 27037C0040E HAVING AN EFFECTIVE DATE OF 12/02/2011.

EXISTING IMPROVEMENT AREAS:

(IN SQUARE FEET)
BUILDING #1 = 3,675
DECK/STAIRS = 414
BUILDING #2 = 1,206
DECK/STAIRS = 278
BUILDING #3 = 660
BUILDING #4 = 574
FOOT BRIDGE = 29
OUTHOUSE = 18
LAKE DECK/STAIRS = 383
DOCK = 130
BITUMINOUS DRIVEWAY = 14,446
PAVERS/MISC = 269
TOTAL IMPROVEMENTS = 22,082 SQ.FT. = 6.89% (% OF OHWL AREA)

LEGEND

- FOUND CAST IRON MONUMENT
- FOUND MONUMENT (AS NOTED)
- SET IRON PIPE MARKED WITH MN LICENSE NO. 25718
- CABLE TV FEDESTAL
- ELECTRIC METER
- ELECTRIC TRANSFORMER
- GUY WIRE
- POWER POLE
- GAS METER
- TELEPHONE FEDESTAL
- SANITARY CLEANOUT
- WATER WELL
- MAIL BOX
- BITUMINOUS SURFACE
- CONCRETE SURFACE
- UNDERGROUND TELEPHONE
- OVERHEAD UTILITY
- UNDERGROUND GAS
- FENCE
- TREES

EASEMENT DETAIL

DRAINAGE AND UTILITY EASEMENTS ARE SHOWN THUS: (NOT TO SCALE)

Being 10.00 feet in width and adjoining public ways and being 5.00 feet in width and adjoining lot lines and boundary lines, unless otherwise shown on this plat.

Narrative – refined stormwater plan

Please find attached the refined stormwater plans and utility drawings for 1 Sunfish Lane, prepared by Pierce Pini and Associates, Inc – the engineer of record for this project. These plans have been refined to address site specific items – while still satisfying all municipal and state standards as to treatment, retention, and volume control for Stormwater. These refined plans actually greatly exceed some of the required capacities as to volume and capacity.

The underlying approved drawings from November 2019 identified two surface basins. The first such basin was planned to be a surface storm basin in the area just north of the newly constructed attached garage of the new home. This basin requires refinement due to State regulations which prohibit infiltration basins within 50' of a water well. The primary well for the new home is located nearby the north side of the new garage. As such, this northern surface basin has now been designed to lie outside of the prohibited radius of 50' from the well – and is set as an underground system consisting of a 100 lineal foot section of 36" perforated HDPE pipe laid within a cavity bed of gravel to allow for infiltration.

This initial section of perforated infiltration pipe then connects in a solid pipe running along the east side of the home, through the mandated 50' clearance from the water well, to a second subterranean section of 190 lineal feet of perforated HDPE pipe laid into a cavity bed of gravel to allow for an additional infiltration field.

Finally, the underground infiltration pipe empties into a large surface infiltration and storage basin in the backyard of the new home (south of the new structure). This surface basin is located in nearly the same location as the surface basin identified in the approved plans from November 2019. There is a slight shift in the southern extremity of the surface basin away from large, mature white pine trees adjoining the basin. Based upon a tour and feedback from the City of Sunfish Lake Forrester, the applicant has agreed to shift the surface basin roughly 10' further north to shift primary grading activity and grade cuts away from the root structure of these magnificent, historic white pines. Photos of these majestic trees are attached.

The overflow and rate control out of this southern basin is designed to the same engineering standards as the plans approved in November 2019.

Some other enhancements of the overall plan include installing underground pipe to collect water from the gutters on the house and routing them to the southern basin.

The other components of the underlying approved drawings remain intact – including the installation of catch basins on the north side of the house to collect storm water from within the access driveways and main drive area serving the garage for the house. The plan has also been refined to identify the retaining walls within the property – such walls were identified previously – but the refined plan more accurately depicts their exact location.

The ability to protect and retain roughly 7 large white pines is a very welcome result of the refined plan. Additionally, disbursing some of the required infiltration in multiple locations around the property is beneficial in that it encourages infiltration over a wider geographic area – rather than concentrating on

only one isolated area entirely within the larger southern surface basin. The clay-based soils which are typical to Sunfish Lake can prove slow to infiltrate and thus can result in periods of storm basins remaining wet following rain events.

The applicant can painfully represent that these refinements are not an effort to shave cost out of the project. On the contrary, these refinements result in substantial additional cost. The benefit is that this plan results in a more appropriate, functional, and reliable system.

Thank you for your consideration.

John Johansson

612-817-2302.



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JOHANNSON RESIDENCE
1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

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For: PIERCE PINI & ASSOCIATES, INC.

By: RHONDA S. PIERCE
Name: Rhonda S. Pierce
Date: 09/20/2019 Reg. No. 41333

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PERMIT DRAWINGS

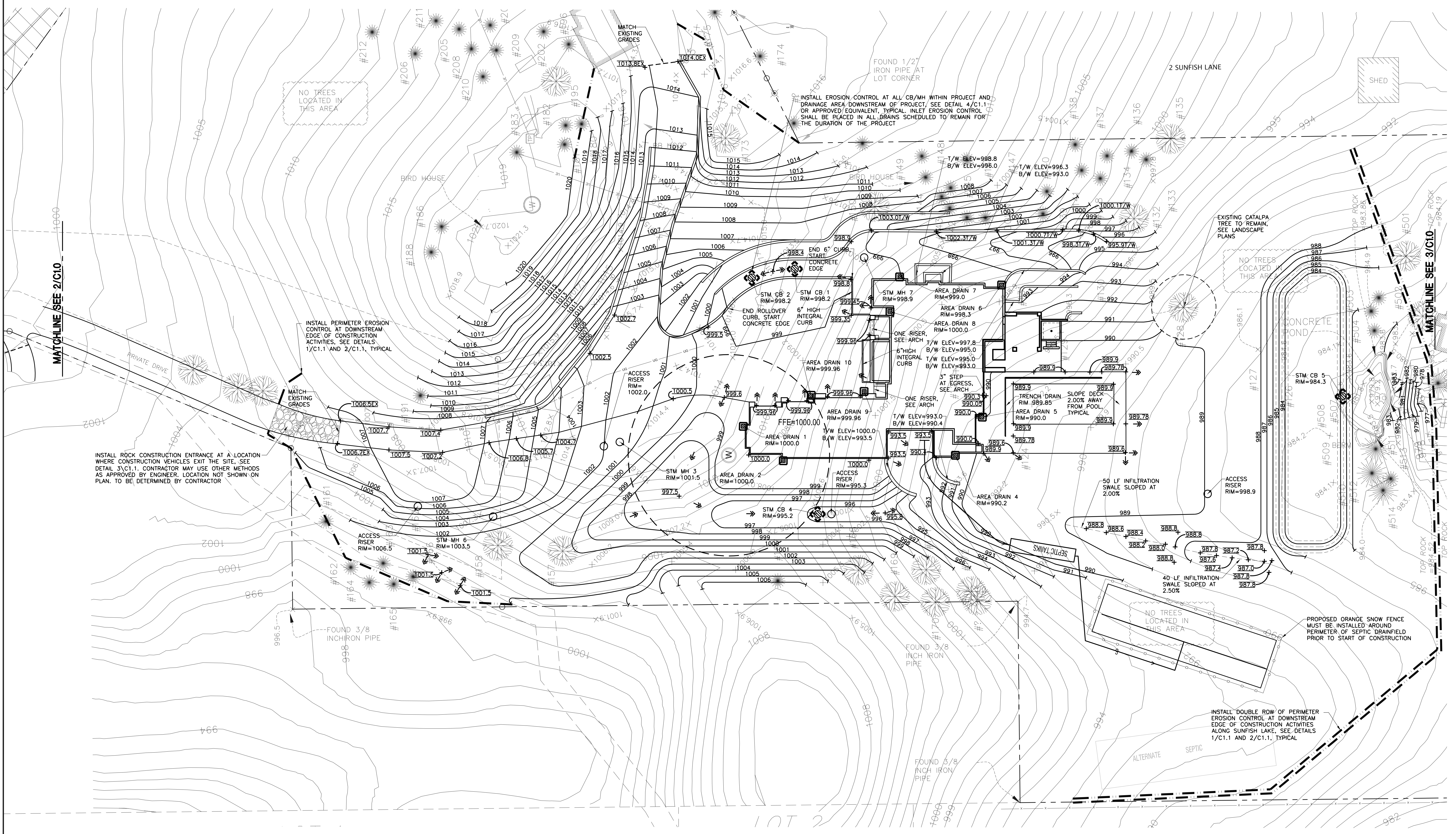
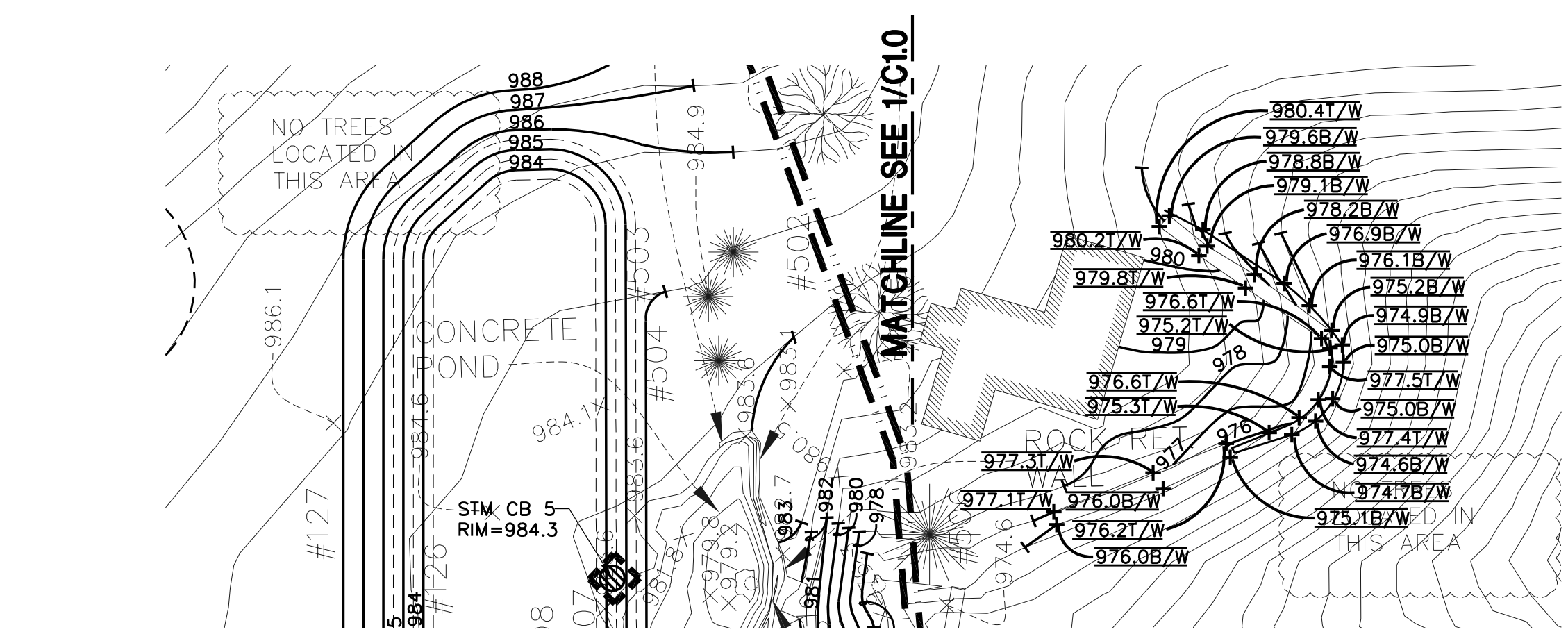
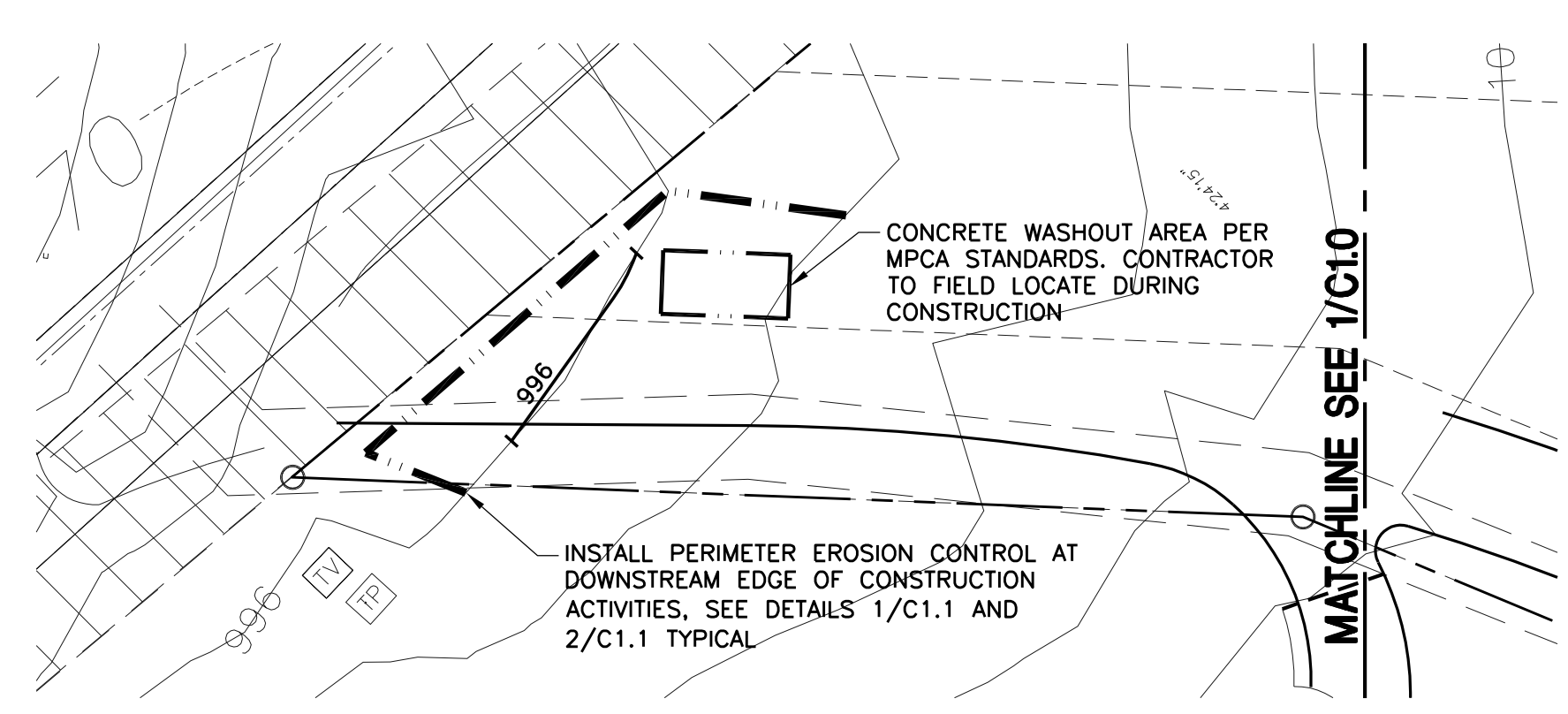
Drawing Title

GRADING, DRAINAGE AND
EROSION CONTROL PLAN

C1.0

2 GRADING AND DRAINAGE PLAN — NORTH DRIVEWAY
C1.0
0 20' 40' 60'
1"=20'

3 GRADING AND DRAINAGE PLAN — SOUTHERN CABIN
C1.0
0 20' 40' 60'
1"=20'



1 GRADING, DRAINAGE AND EROSION CONTROL PLAN
C1.0
0 20' 40' 60'
1"=20'

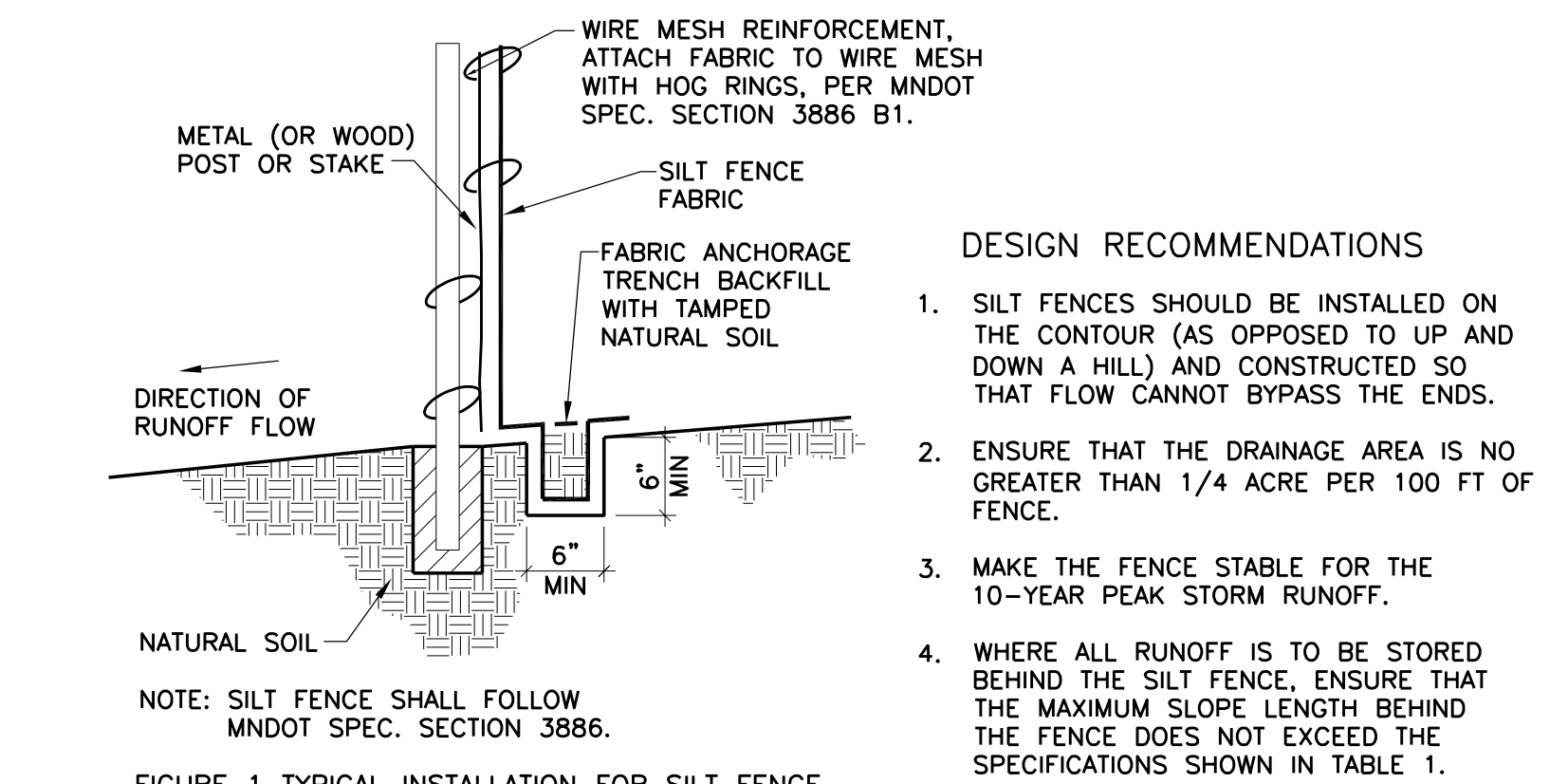
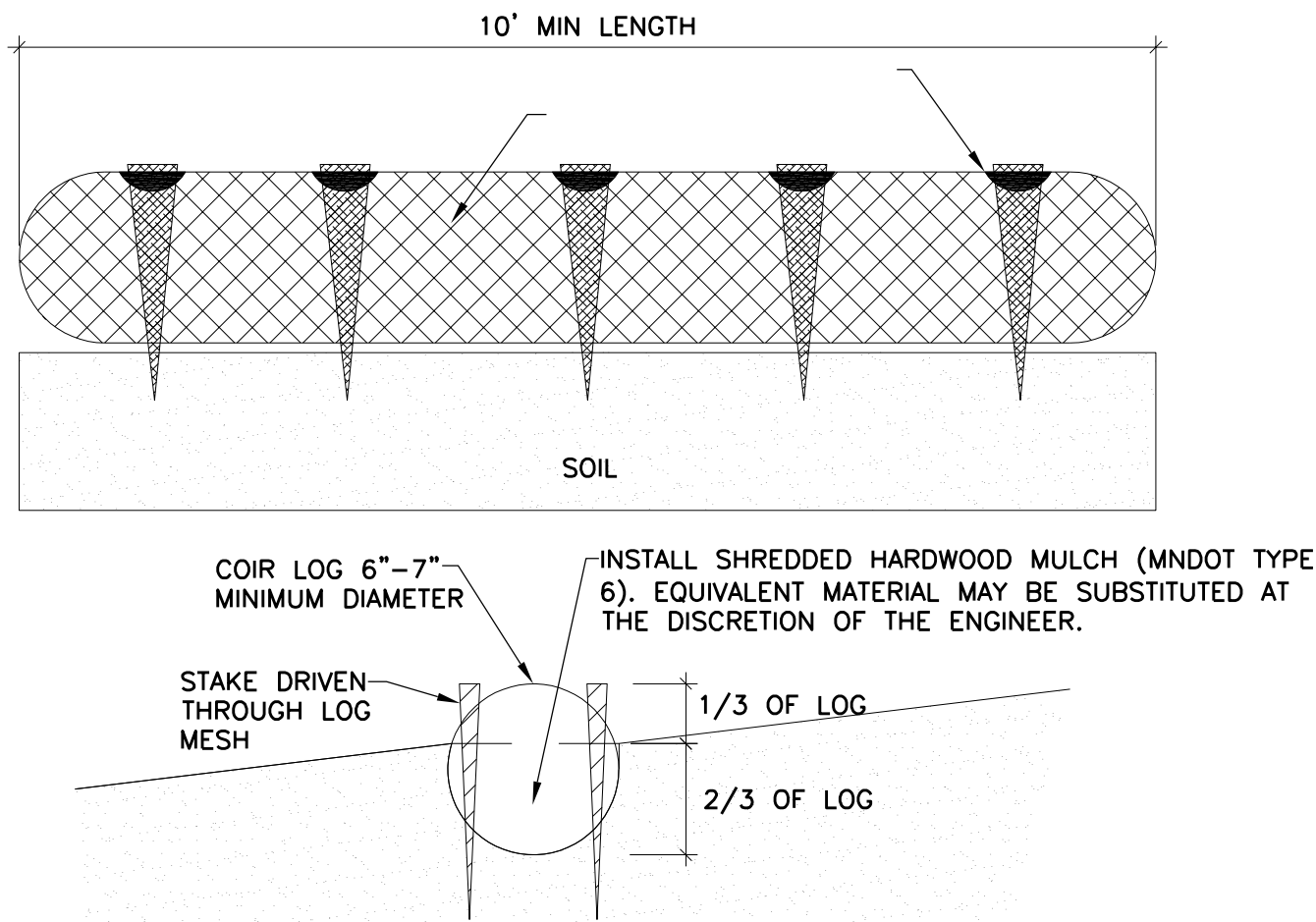


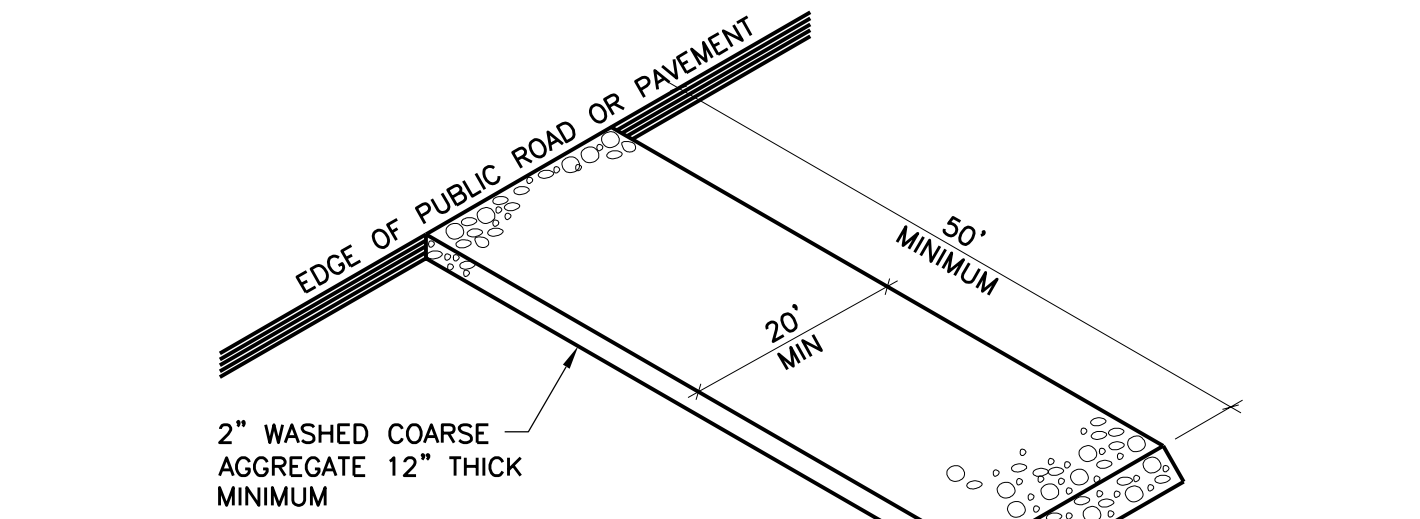
TABLE 1 MAXIMUM SLOPE LENGTH AND SLOPE FOR WHICH SILT FENCE IS APPLICABLE

SLOPE H:V	PERCENT	BY CALCULATION		BY ACCEPTED DESIGN PRACTICES
		SILT FENCE STORAGE EQUALS 2 FT FOR A 100-YEAR EVENT	SILT FENCE STORAGE EQUALS 2 FT FOR A 2-YEAR EVENT OR 3 FT FOR A 100-YEAR EVENT	
100:1	1%	400 FT	900 FT	100 FT
50:1	2%	200 FT	450 FT	75 FT
25:1	4%	100 FT	225 FT	75 FT
20:1	5%	80 FT	180 FT	75-50 FT
17:1	6%	67 FT	150 FT	50 FT
12.5:1	8%	50 FT	112 FT	50 FT
10:1	10%	40 FT	90 FT	50-25 FT
5:1	20%	20 FT	45 FT	25-15 FT
4:1	25%	16 FT	36 FT	15 FT
3:1	33%	12 FT	27 FT	15 FT
2:1	50%	8 FT	18 FT	15 FT

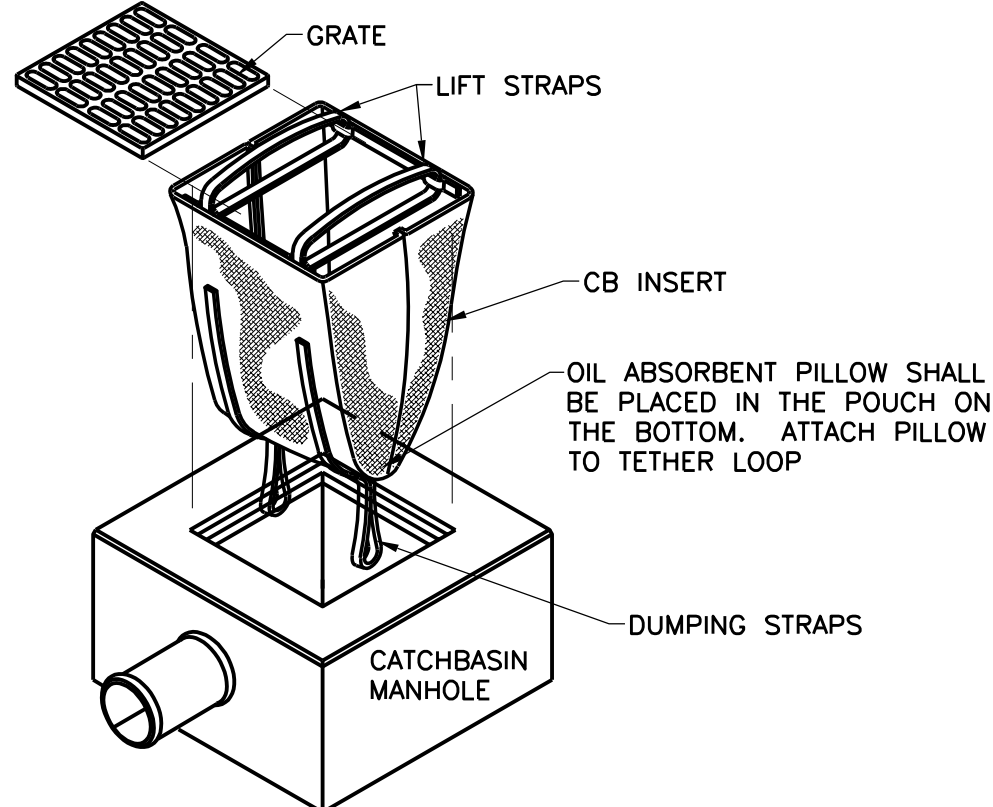
1 HEAVY DUTY SILT FENCE DETAIL
C1.1 NO SCALE



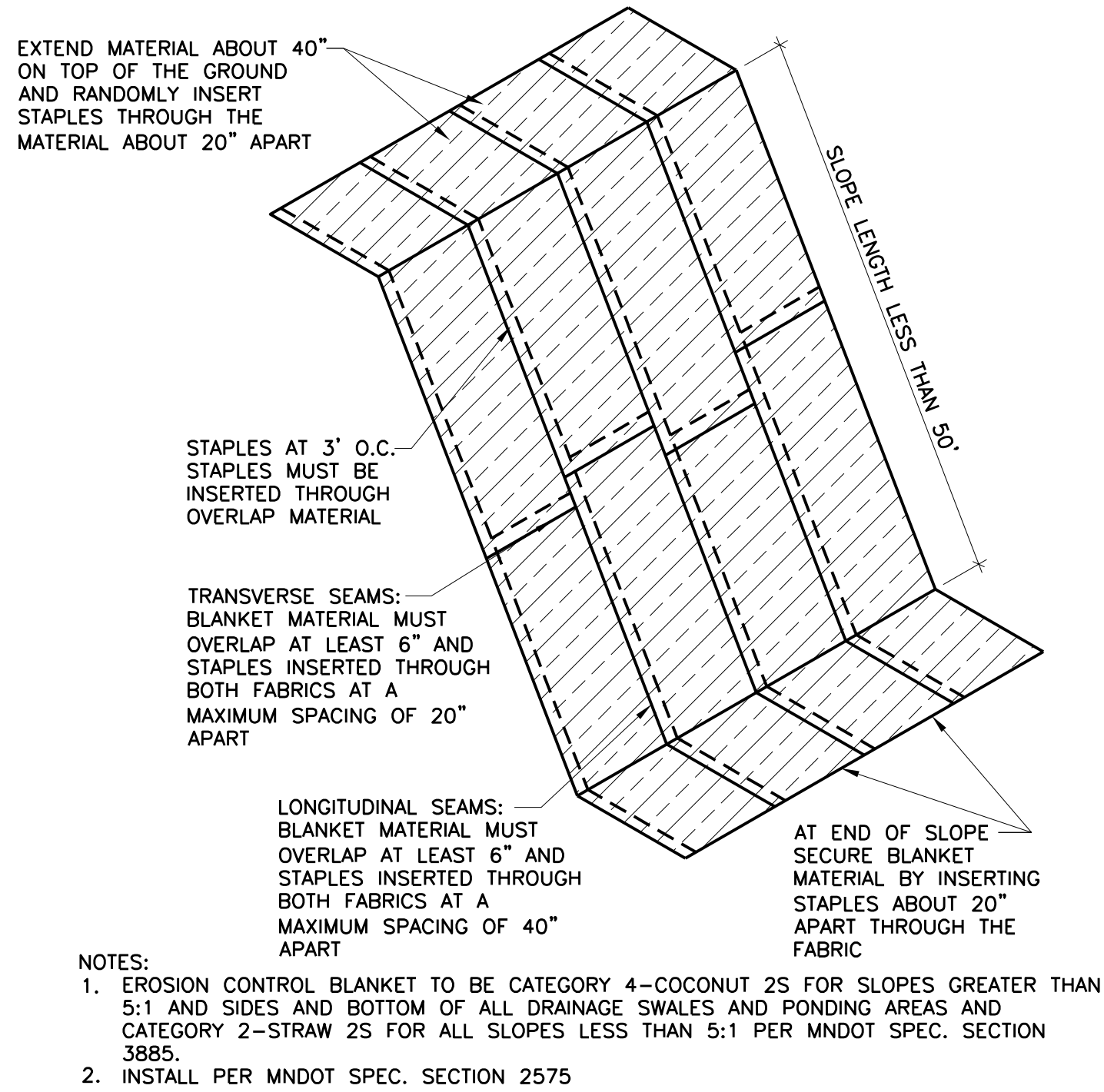
2 COIR LOG
C1.1 NO SCALE



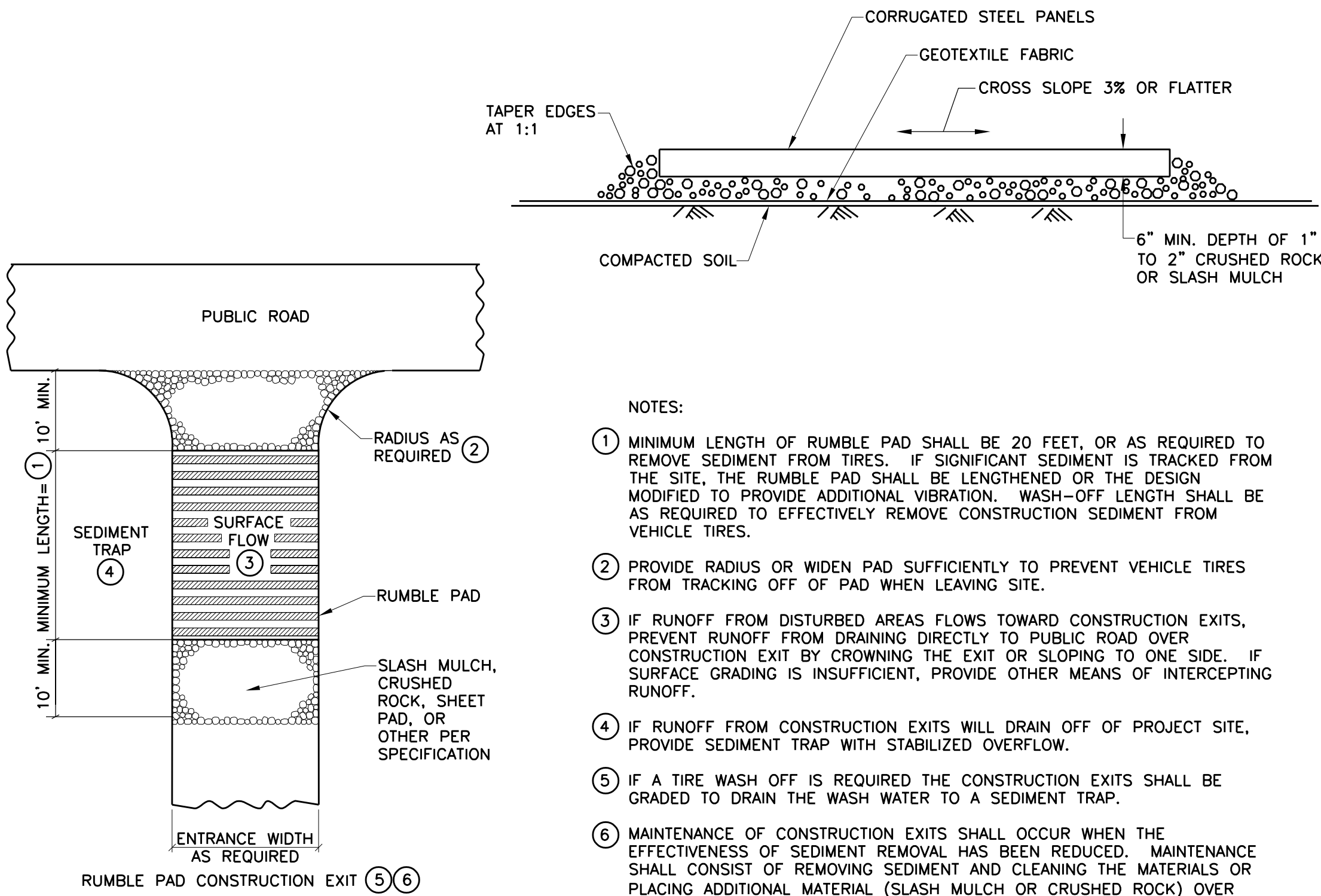
3 GRAVEL CONSTRUCTION ENTRANCE
C1.1 NO SCALE



4 CB INSERT EROSION CONTROL
C1.1 NO SCALE

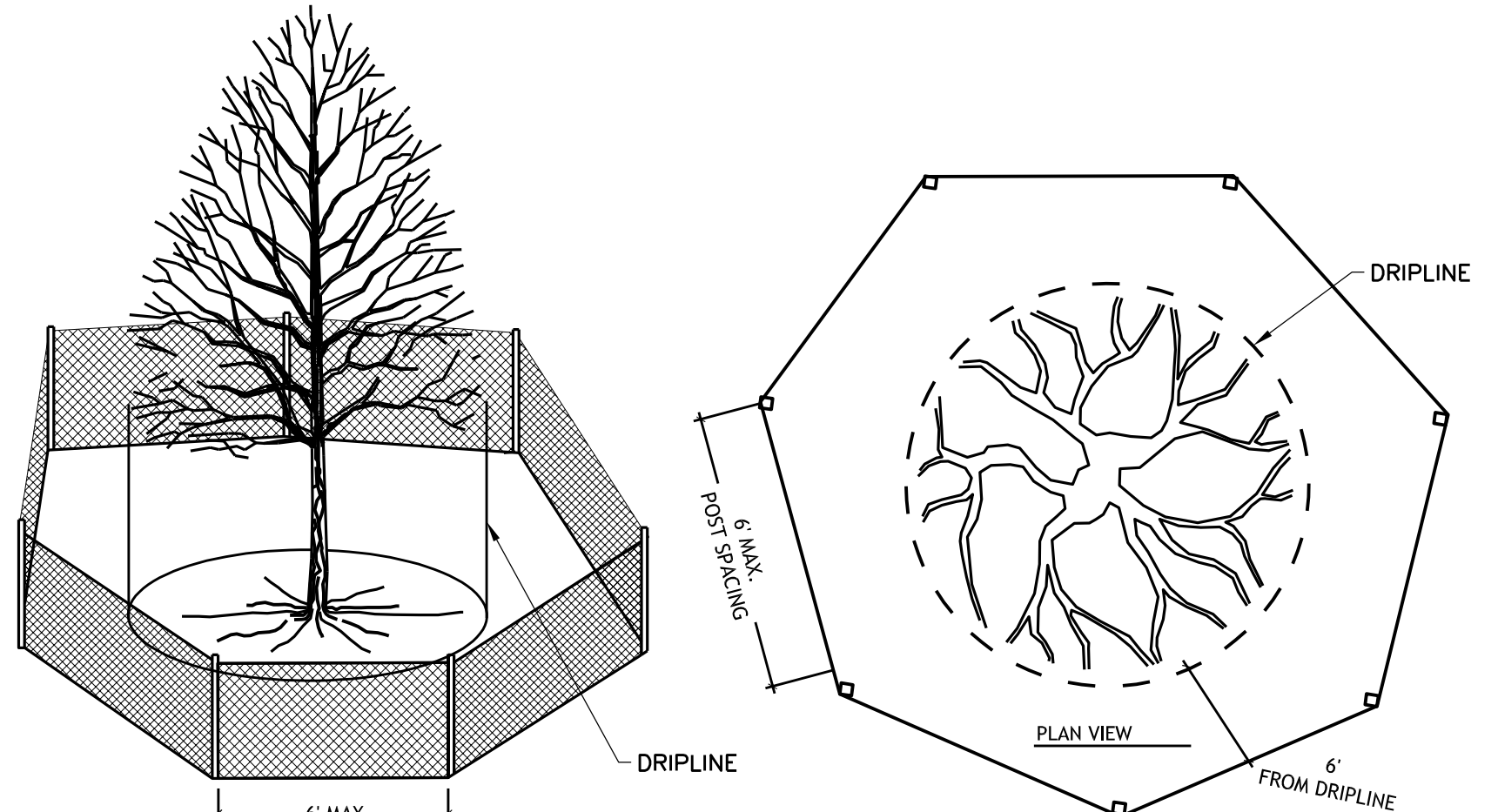


5 EROSION CONTROL BLANKET
C1.1 NO SCALE



6 RUMBLE PAD CONSTRUCTION EXIT
C1.1 NO SCALE

- TREE PROTECTION NOTES:
- 1) ALL TREE PROTECTION FENCING AND EROSION CONTROL FENCING SHALL BE INSTALLED ACCORDING TO THE PLANS PRIOR TO ANY DEMOLITION, AFTER DEMOLITION OR AS NECESSARY, TREE PROTECTION FENCING MAY BE RELOCATED WITH APPROVAL FROM THE LANDSCAPE ARCHITECT. ALL TREE PROTECTION FENCING AND EROSION CONTROL DEVICES SHALL BE MAINTAINED FOR THE DURATION OF THE CONSTRUCTION PERIOD.
 - 2) CONTRACTOR SHALL NOT STORE ANY MATERIALS OR PARK ANY VEHICLES IN TREE PROTECTION ZONES. THE FENCE SHALL PREVENT TRAFFIC MOVEMENT AND THE PLACEMENT OF TEMPORARY FACILITIES, EQUIPMENT, STOCKPILES AND SUPPLIES FROM HARMING VEGETATION WITHIN THE LIMITS OF PROTECTION.
 - 3) THE CONTRACTOR SHALL CLEANLY CUT ALL ROOTS EXPOSED BY GRADING AS DIRECTED BY THE LANDSCAPE ARCHITECT.
 - 4) THE CONTRACTOR SHALL USE DESIGNATED CONSTRUCTION ENTRANCES AND STAGING AREAS.



7 TREE PROTECTION DETAIL
C1.1 NO SCALE

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JOHANNSON RESIDENCE
1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

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For PIERCE PINI & ASSOCIATES, INC.

By RHONDA S. PIERCE
Name Rhonda S. Pierce
Date 09/20/2019 Reg. No. 41333

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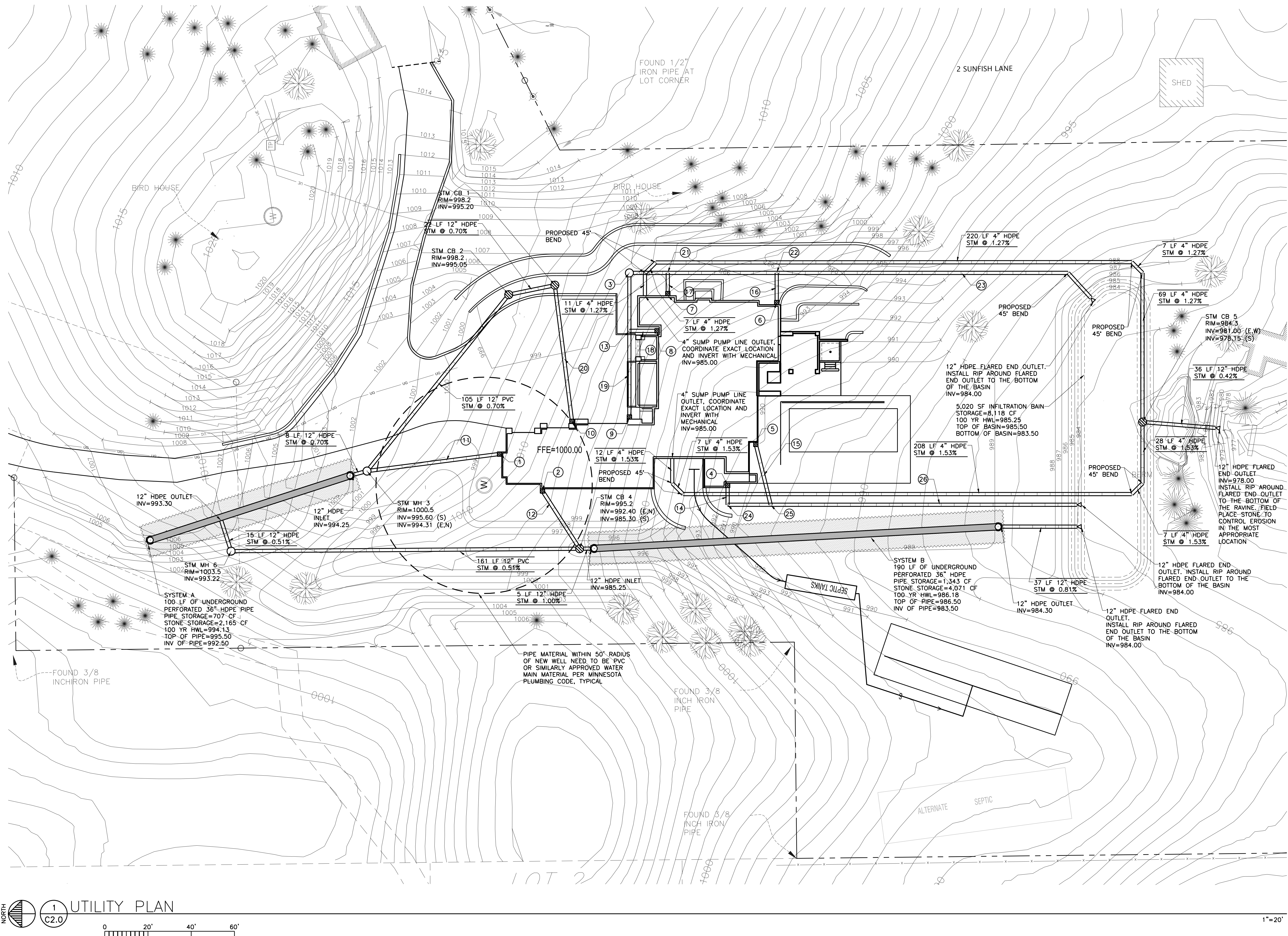
PERMIT DRAWINGS

Drawing Title

EROSION CONTROL
DETAILS

C1.1

JOHANNSSON RESIDENCE
1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA



NOTES:

1. BUILDING ROOF DRAINS TO CONNECT TO SITE STORM SEWER, AREA DRAINS MUST BE ROUTED TO INFILTRATION SYSTEMS, COORDINATE EXACT LOCATION OF ROOF DRAINS WITH ARCHITECT (ROOF DRAINS SHOWN ON PLAN ARE APPROXIMATE LOCATIONS)
2. AREA DRAINS SHALL TEE INTO STORM SEWER.

KEY NOTES:

- 1 AREA DRAIN 1
RIM=1000.0
INV=999.00
- 2 AREA DRAIN 2
RIM=1000.0
INV=999.00
- 3 STM MH 7
RIM=998.9
INV=999.00 (W)
INV=994.90 (S)
- 4 AREA DRAIN 4
RIM=990.2
INV=989.20
- 5 AREA DRAIN 5
RIM=990.0
INV=989.00
- 6 AREA DRAIN 6
RIM=998.3
INV=997.30
- 7 AREA DRAIN 7
RIM=999.0
INV=998.00
- 8 AREA DRAIN 8
RIM=1000.0
INV=999.00
- 9 AREA DRAIN 9
RIM=999.00
INV=998.96
- 10 AREA DRAIN 10
RIM=999.96
INV=998.96
- 11 62 LF 8" PVC STORM
SEWER SLOPE @ 5.48%
- 12 32 LF 8" PVC STORM
SEWER SLOPE @ 21.23%
- 13 8" HDPE STORM SEWER
INV=997.10
- 14 9 LF 8" HDPE STORM
SEWER SLOPE @ 12.22%
- 15 30 LF 8" HDPE STORM
SEWER SLOPE @ 4.67%
- 16 14 LF 8" HDPE STORM
SEWER SLOPE @ 41.07%
- 17 10 LF 8" HDPE STORM
SEWER SLOPE @ 40.00%
- 18 13 LF 8" HDPE STORM
SEWER SLOPE @ 14.62%
- 19 67 LF 8" HDPE STORM
SEWER SLOPE @ 4.57%
- 20 64 LF 8" HDPE STORM
SEWER SLOPE @ 5.88%
- 21 12" HDPE STORM SEWER
INV=994.00
- 22 12" HDPE STORM SEWER
INV=991.55
- 23 221 LF 12" HDPE STORM
SEWER SLOPE @ 4.93%
- 24 12" HDPE STORM SEWER
INV=988.10
- 25 12" HDPE STORM SEWER
INV=987.60
- 26 164 LF 12" HDPE STORM
SEWER SLOPE @ 2.50%

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For PIERCE PINI & ASSOCIATES, INC.

For PIERCE PINI & ASSOCIATES, INC.

By RHONDA S. PIERCE

Name Rhonda S. Price

Date 09/20/2019 **Reg. No.** 41333

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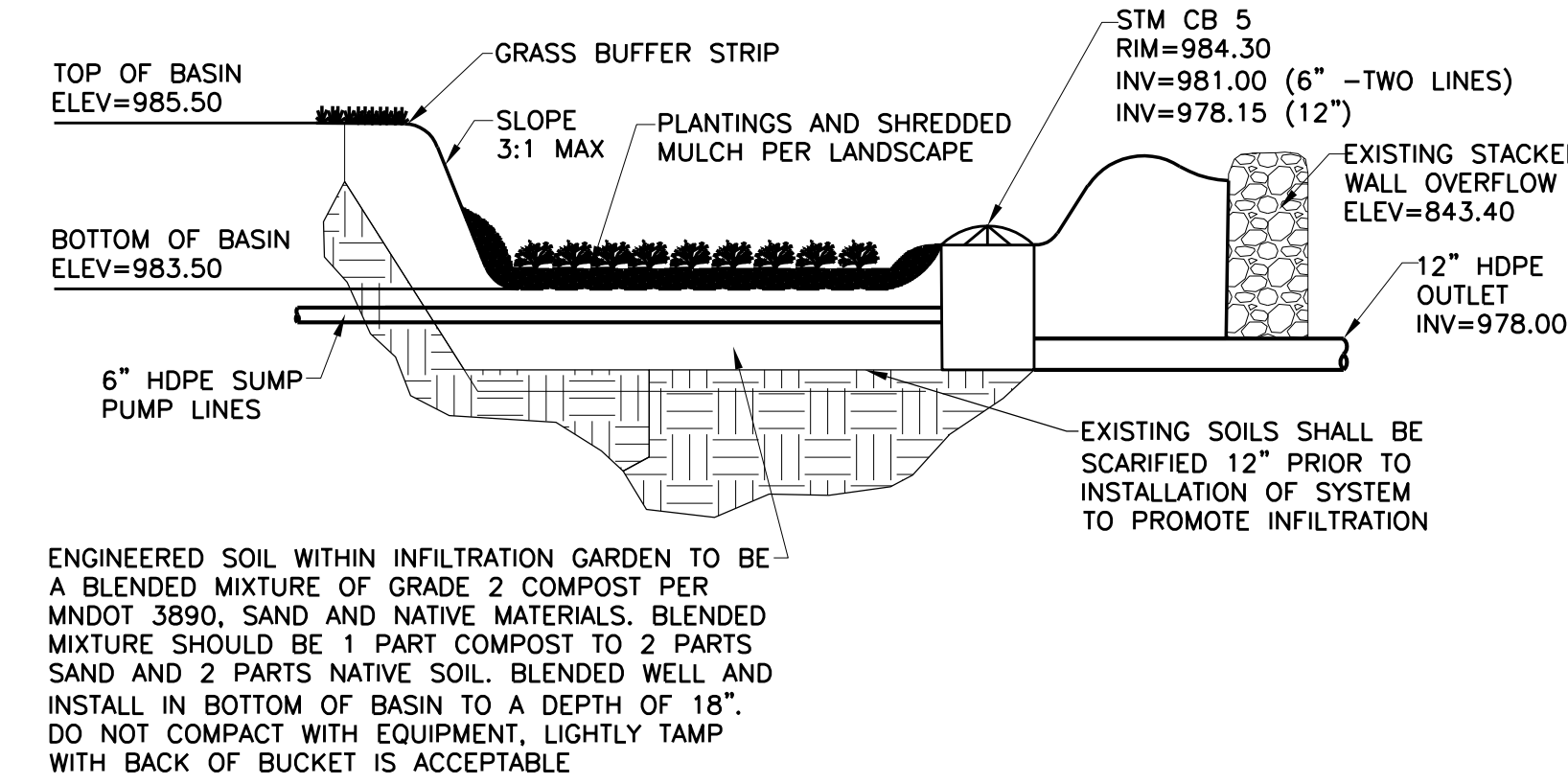
Date **09/20/2019**

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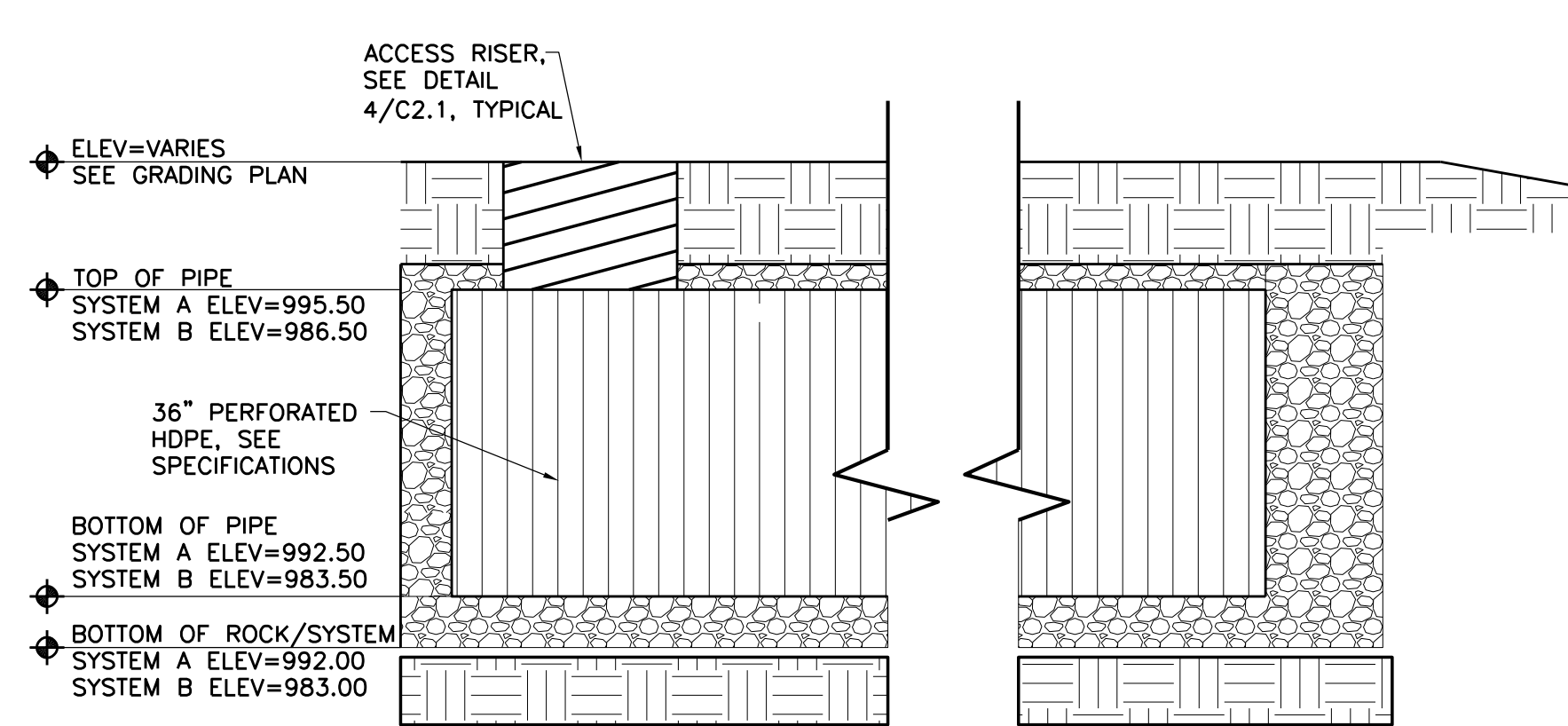
Drawing Title

UTILITY PLAN

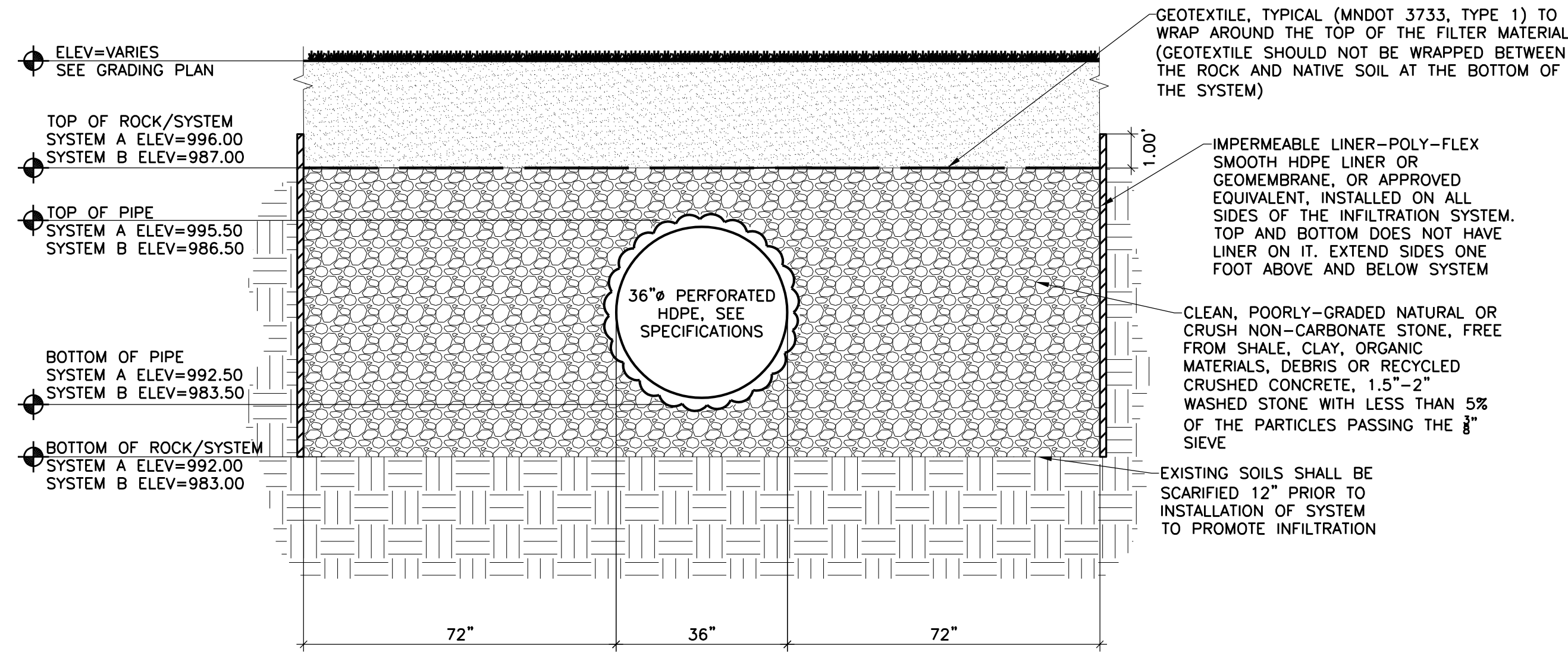
C2.0



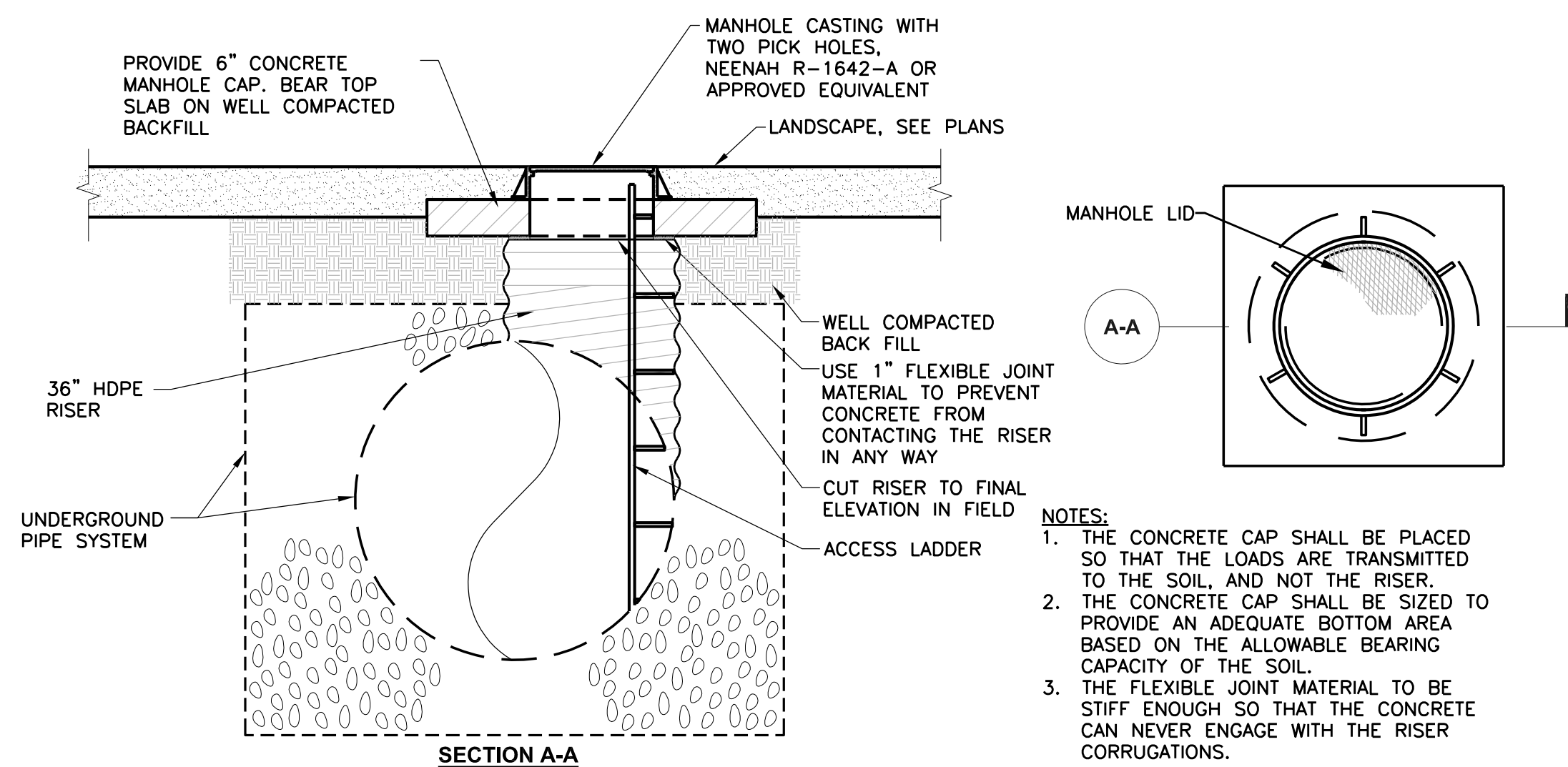
1 SOUTH INFILTRATION BASIN
C2.1 NO SCALE



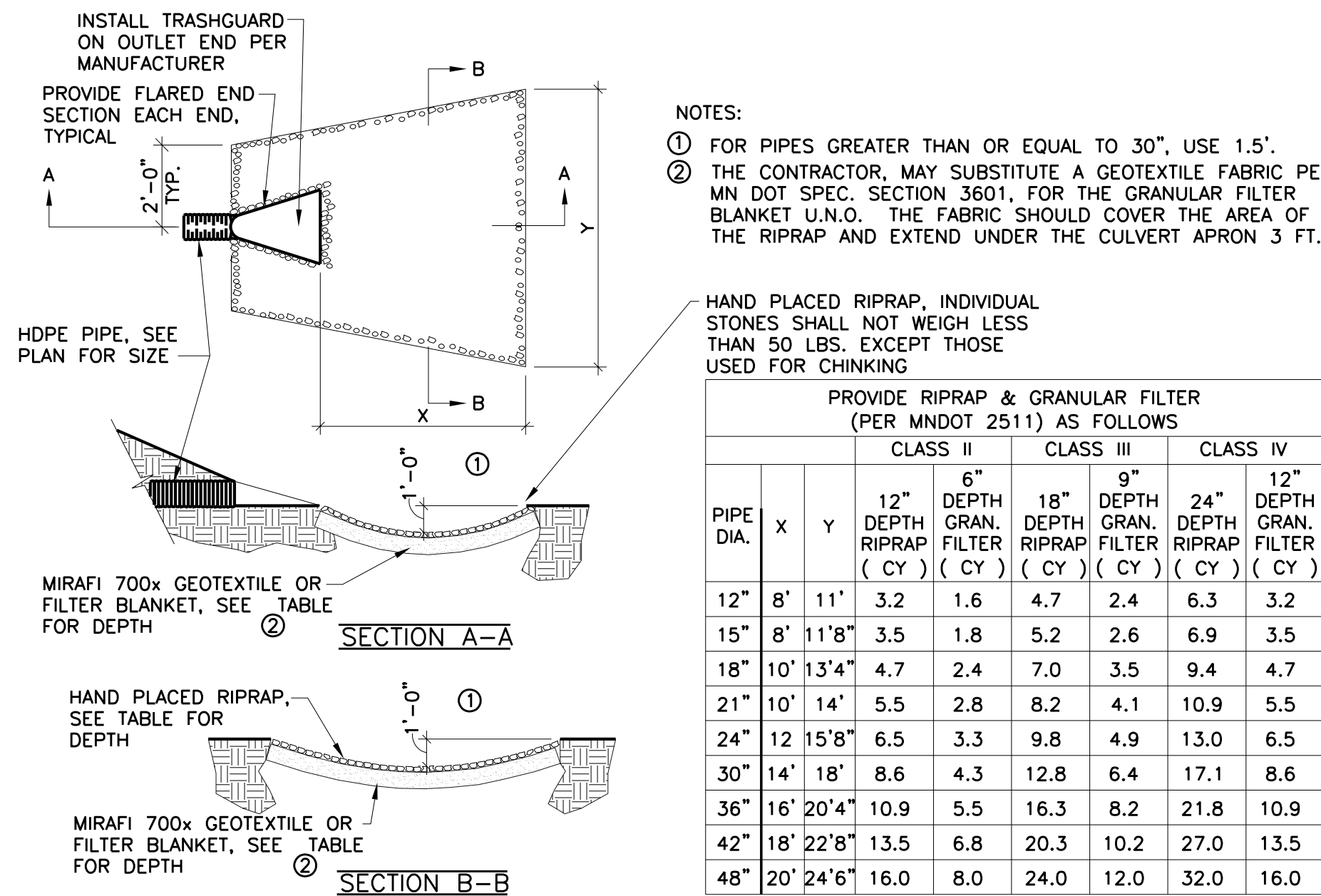
2 STORMWATER INFILTRATION SYSTEM SECTION
C2.1 NOTE: RISERS, INLET AND OUTLET PIPES ARE SHOWN IN PROFILE VIEW FOR REFERENCE ONLY. SEE PLAN VIEW FOR ACTUAL LOCATIONS AND NUMBER OF RISERS AND PIPES. NO SCALE



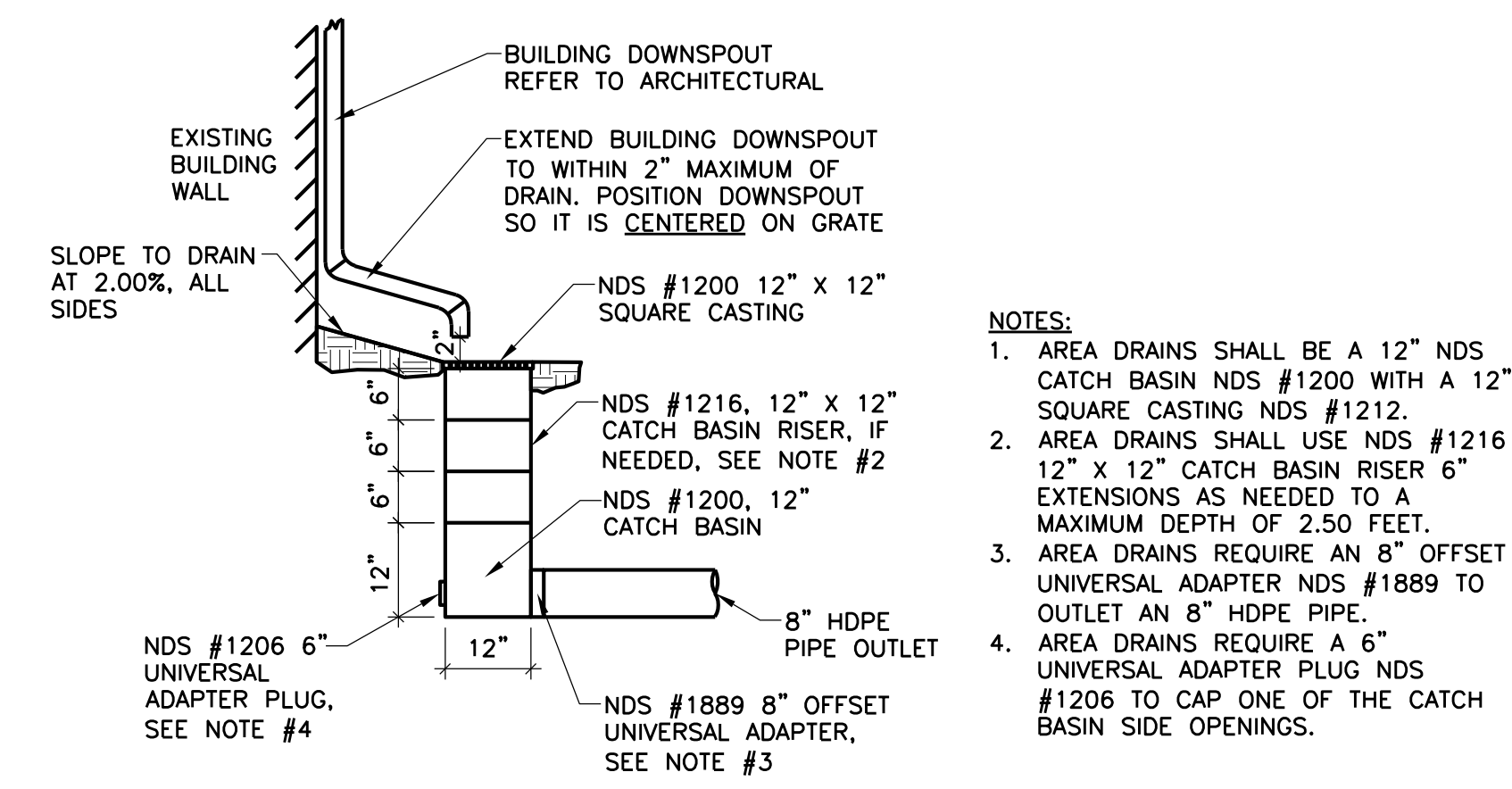
3 STORMWATER INFILTRATION SYSTEM CROSS SECTION
C2.1 NO SCALE



4 RISER DETAIL
C2.1 NO SCALE



5 RIPRAP AT HDPE OUTLET
C2.1 NO SCALE



6 AREA DRAIN AT DOWNSPOUT
C2.1 NO SCALE

PIERCE PINI &
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JOHANNSON RESIDENCE
1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

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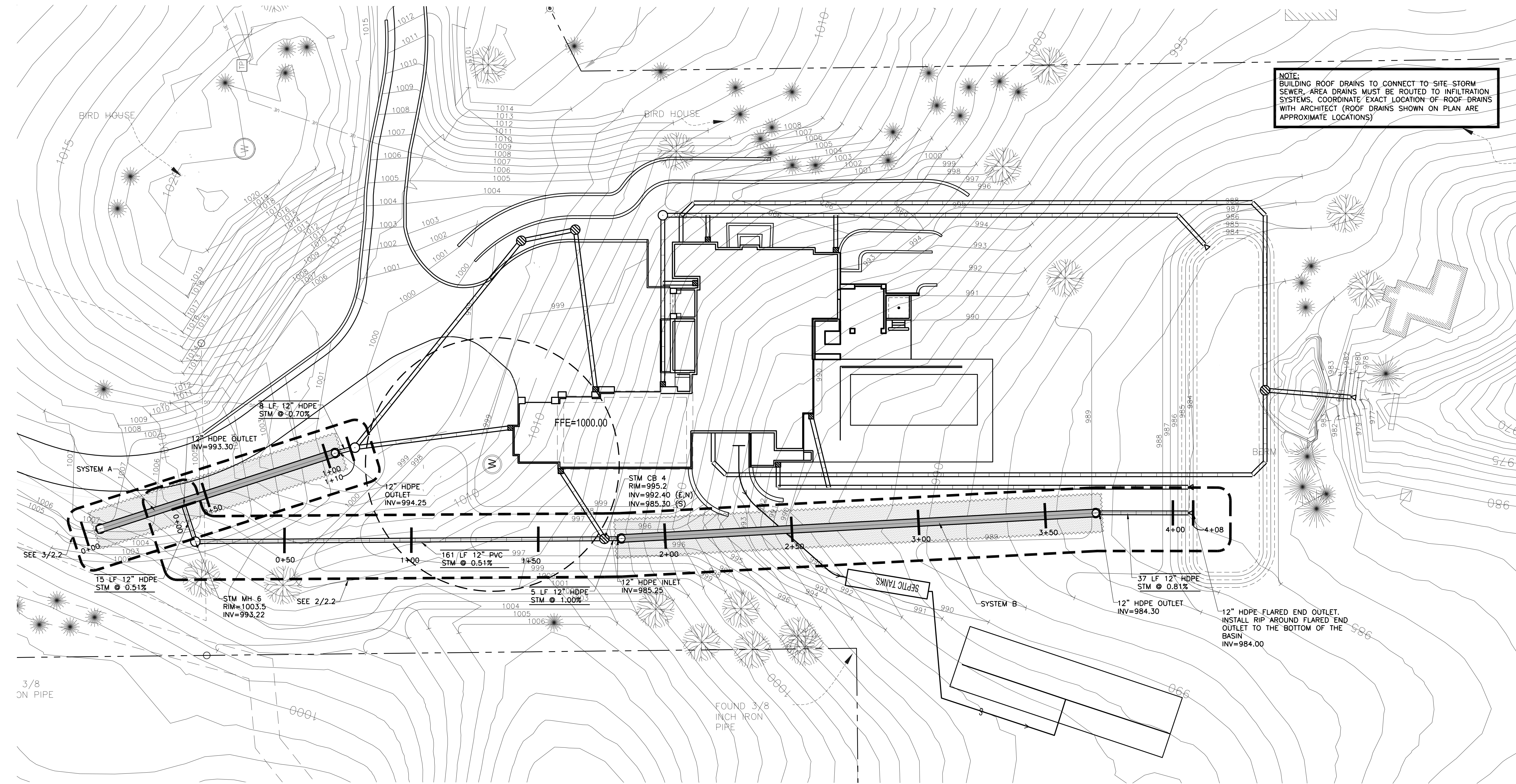
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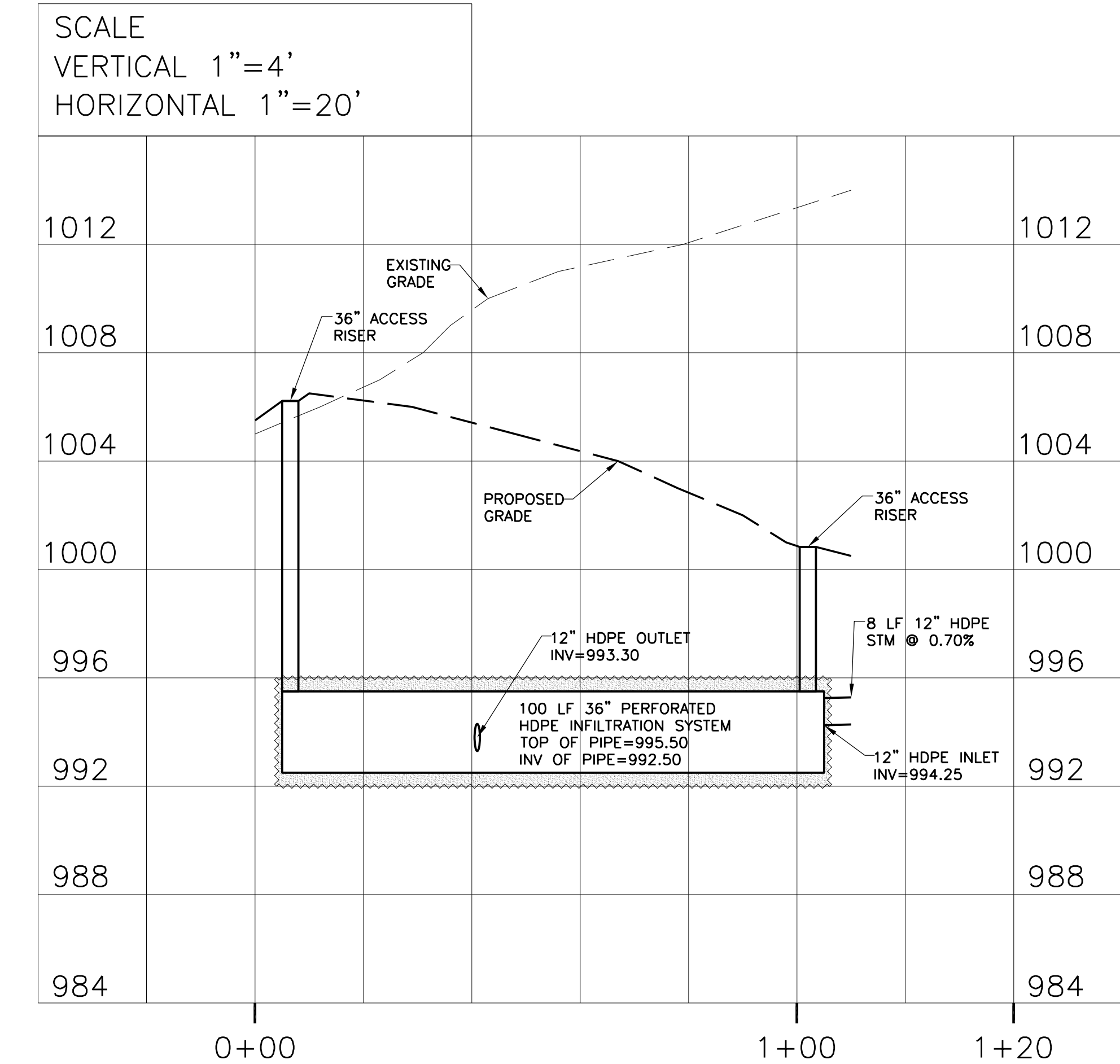
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C2.1

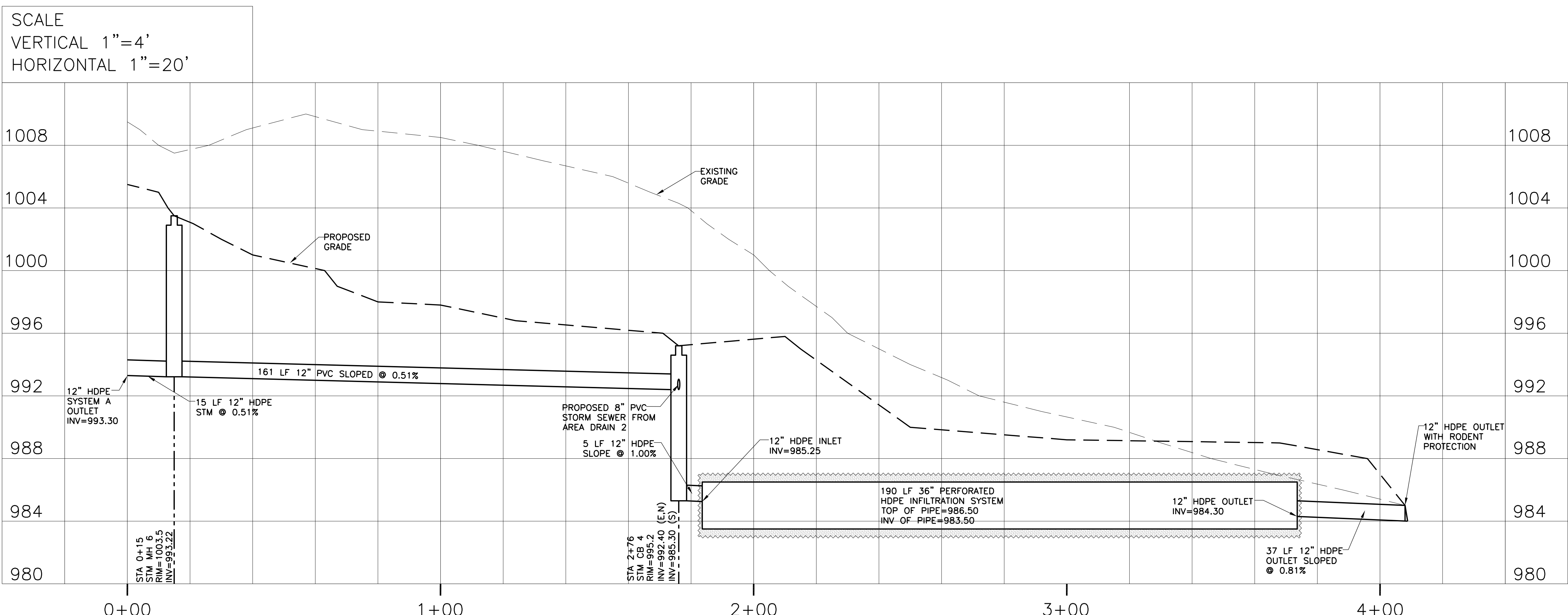


NOTE:
BUILDING ROOF DRAINS TO CONNECT TO SITE STORM
SEWER. AREA DRAINS MUST BE ROUTED TO INFILTRATION
SYSTEMS. COORDINATE EXACT LOCATION OF ROOF DRAINS
WITH ARCHITECT (ROOF DRAINS SHOWN ON PLAN ARE
APPROXIMATE LOCATIONS)

1 STORMWATER PLAN AND PROFILE



2 STORM SEWER PROFILE - SYSTEM A



3 STORM SEWER PROFILE - SYSTEM B

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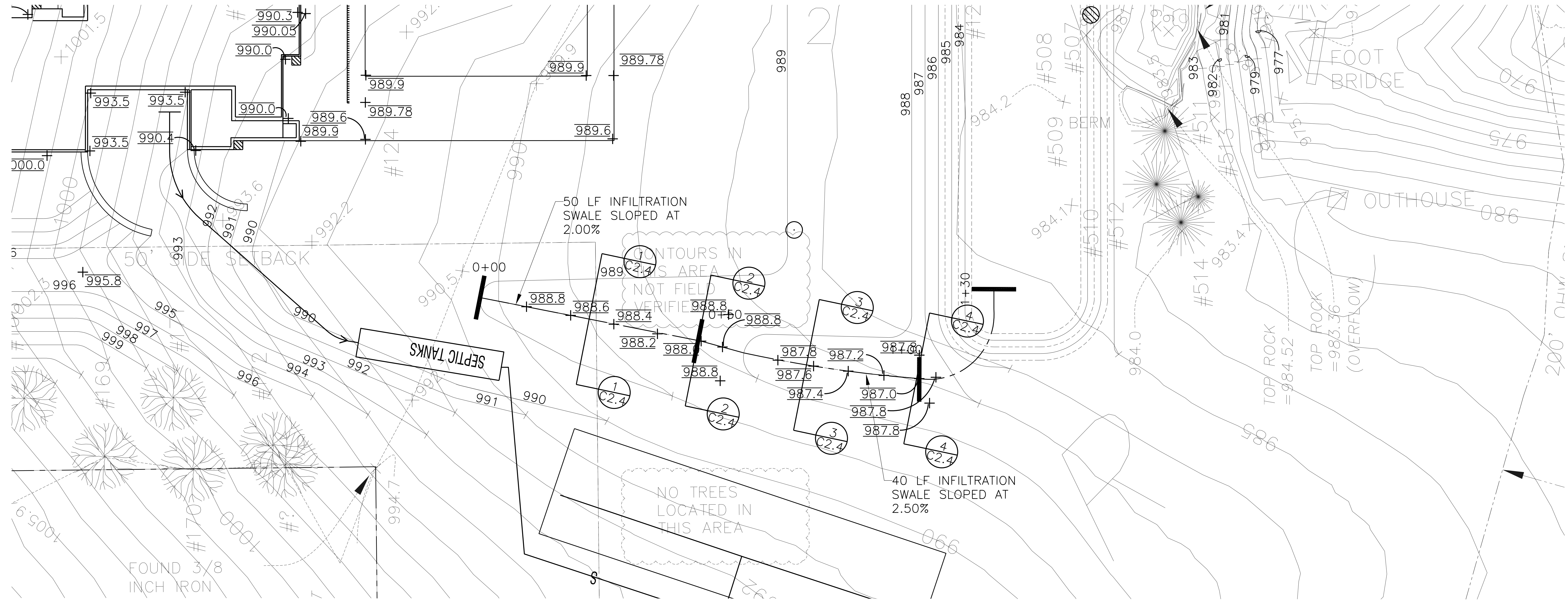
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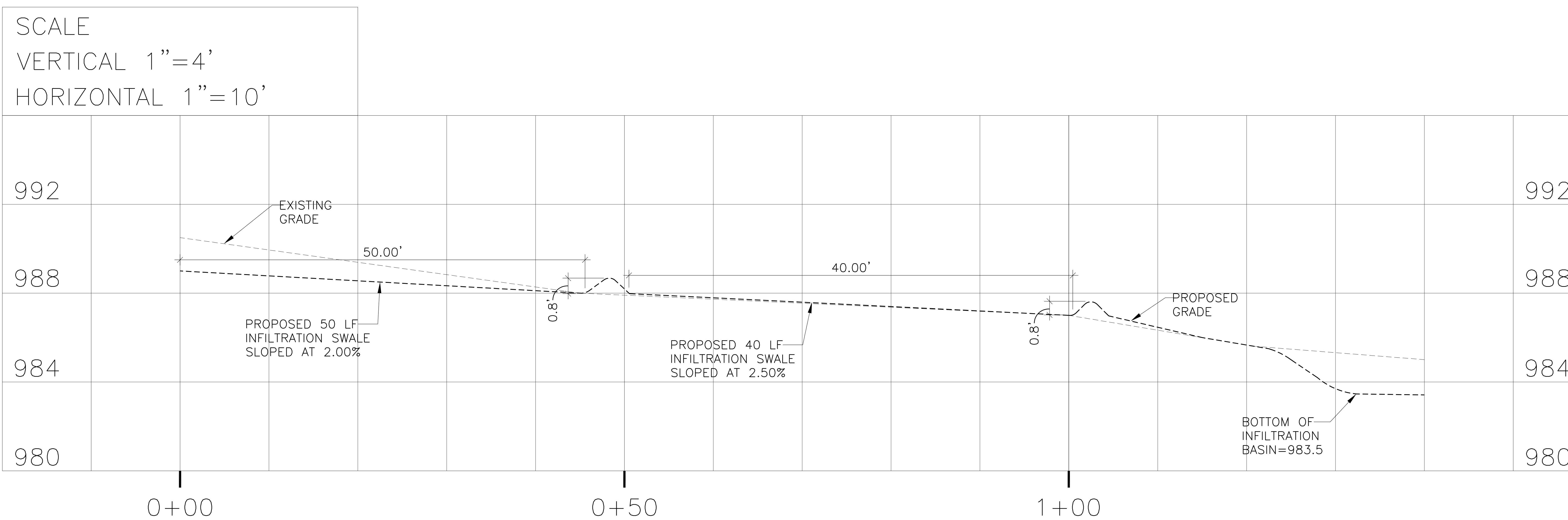
Drawing Title

STORMWATER PLAN
AND PROFILE

C2.2



1 INFILTRATION SWALE PLAN AND PROFILE
1"=10'



2 INFILTRATION SWALE PLAN AND PROFILE
1"=10'

PIERCE PINI & ASSOCIATES

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JOHANNSON RESIDENCE
1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

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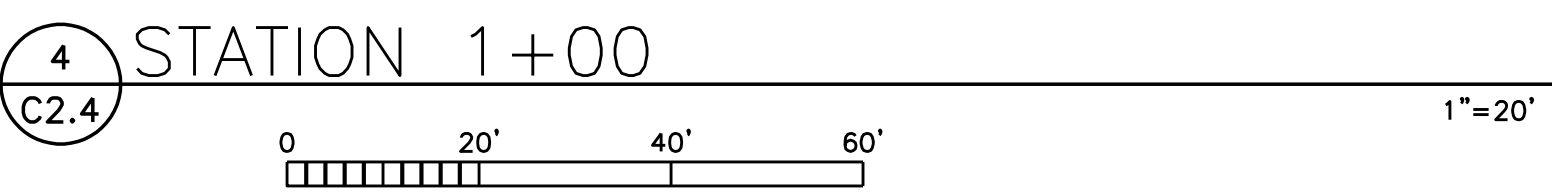
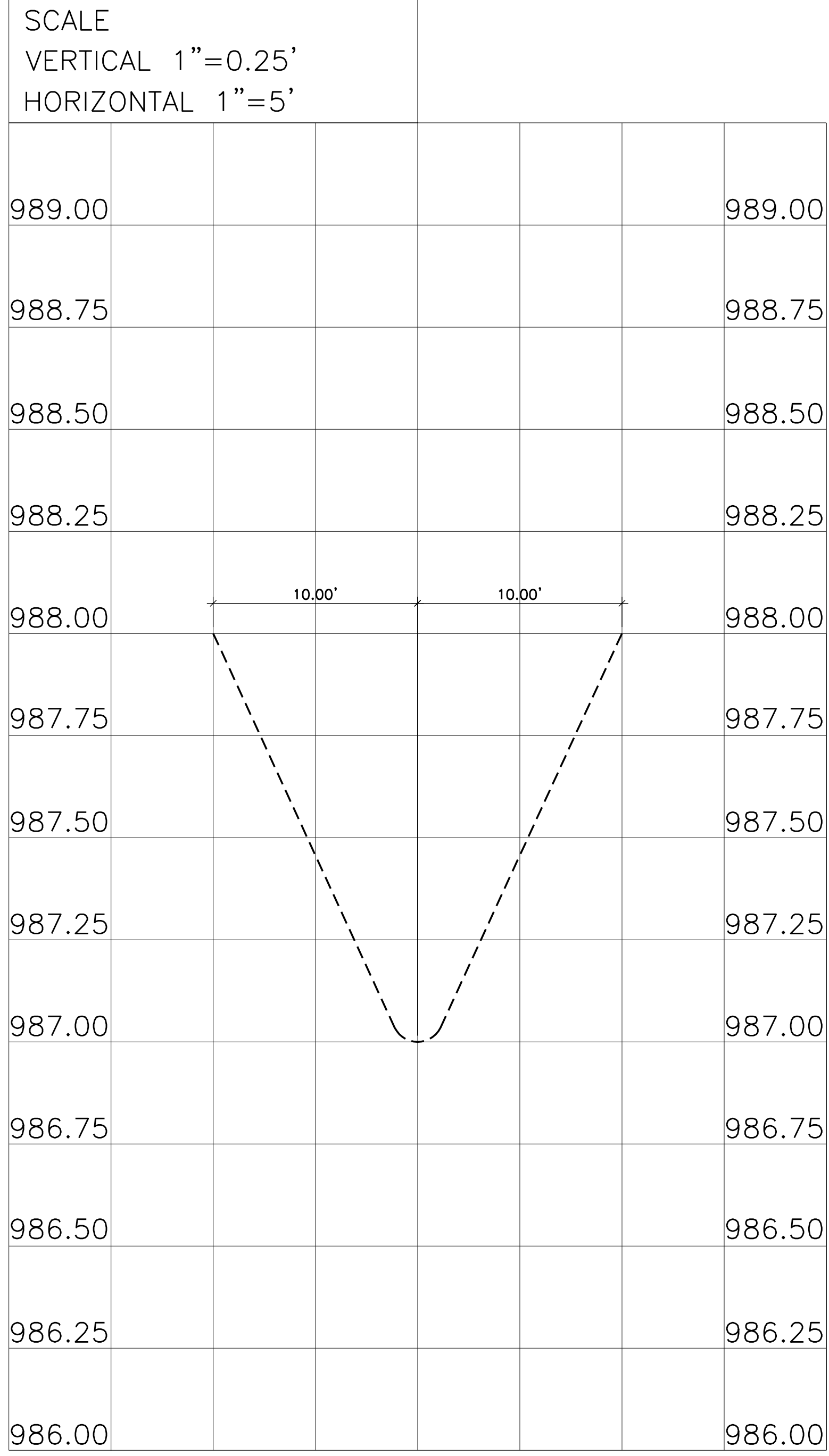
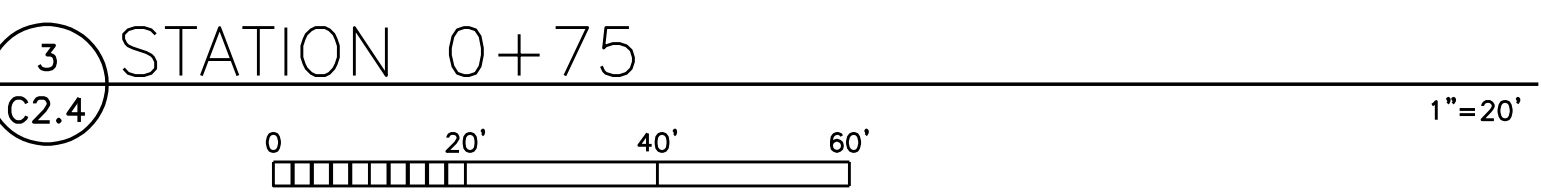
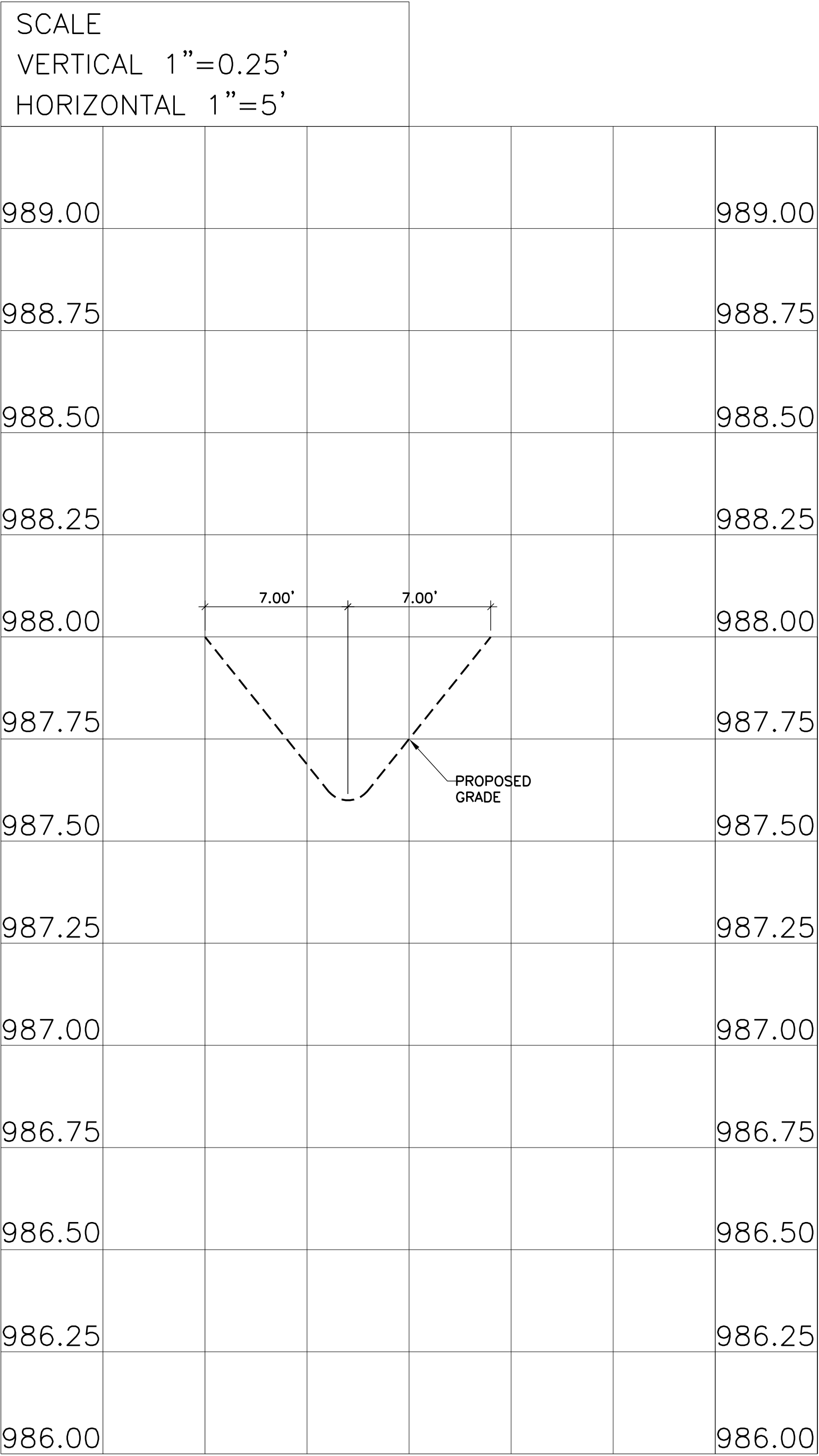
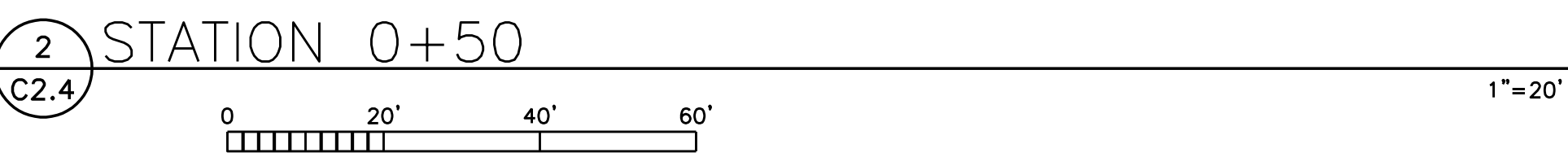
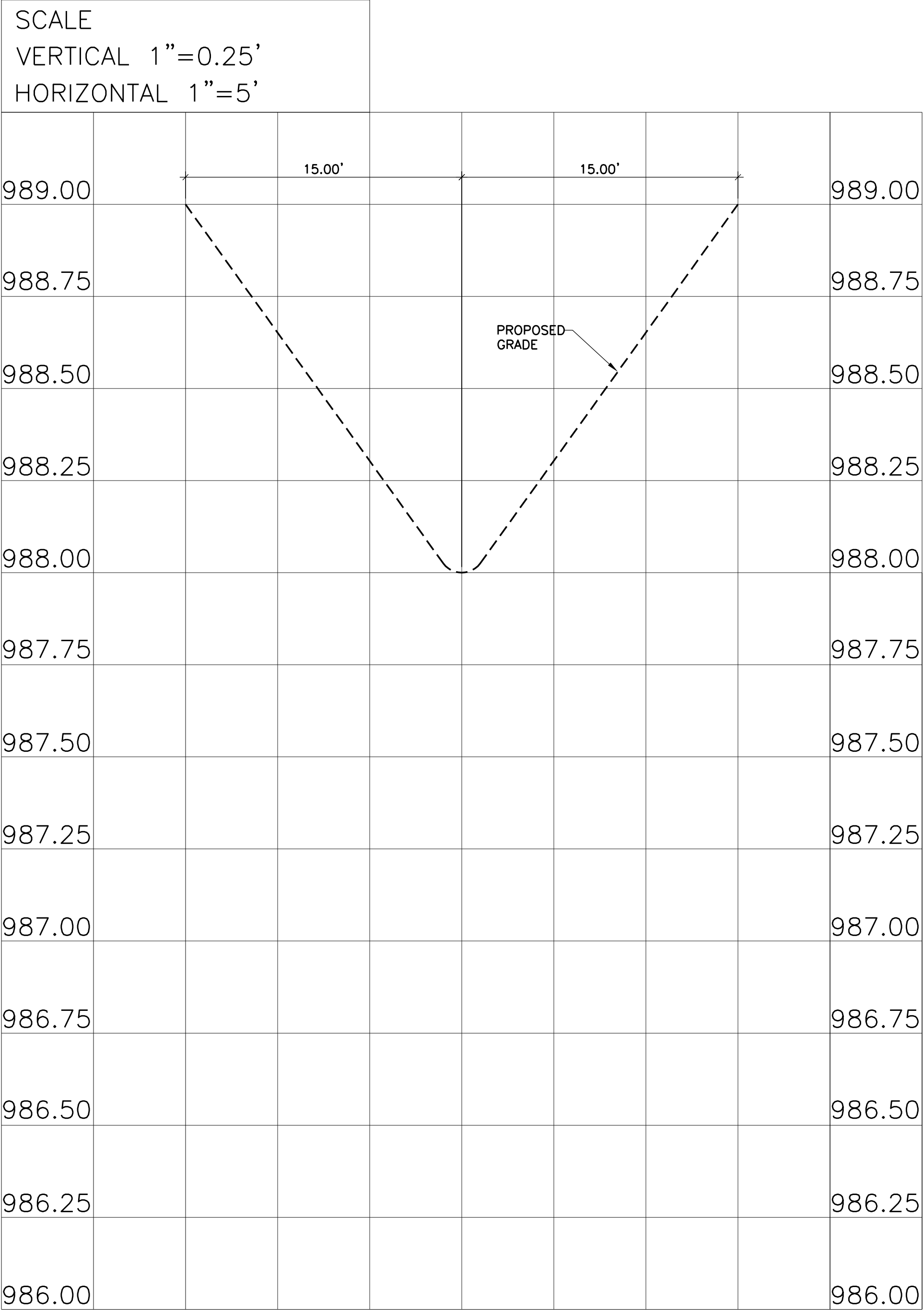
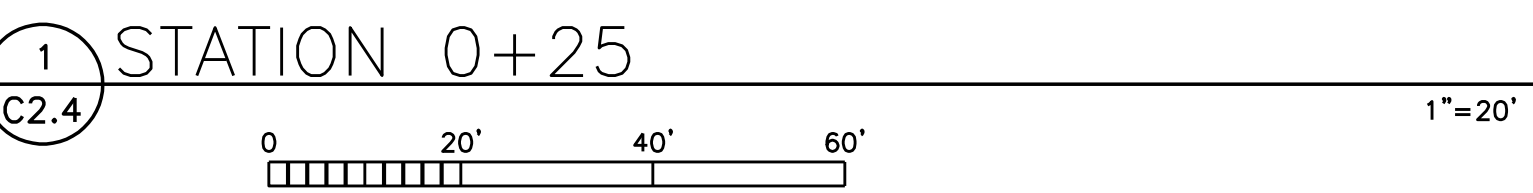
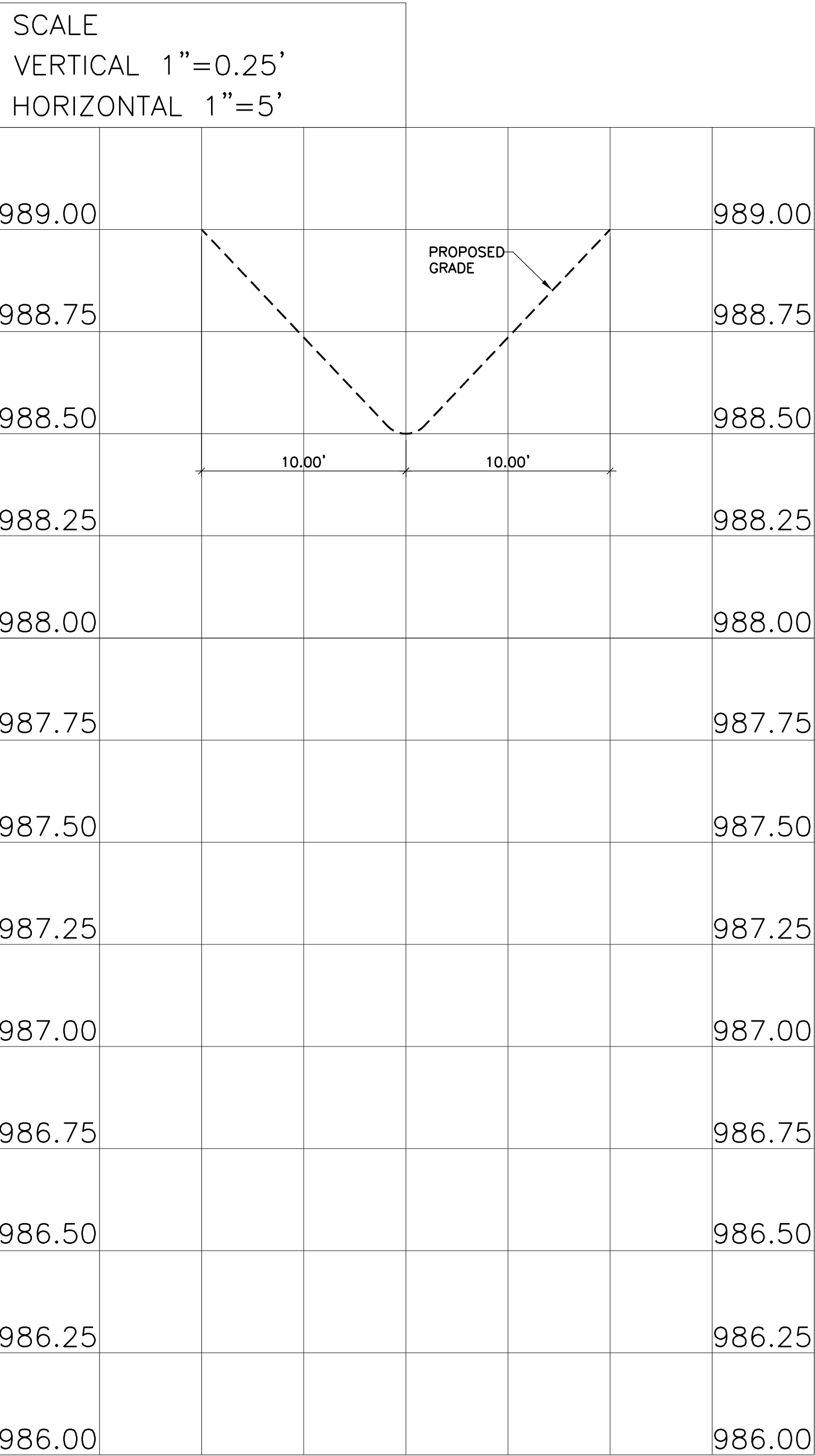
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PERMIT DRAWINGS

Drawing Title

**INFILTRATION SWALE
PLAN AND PROFILE**

C2.3



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JOHANNSON RESIDENCE

1 SUNFISH LANE
SUNFISH LAKE, MINNESOTA

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PERMIT DRAWINGS

Drawing Title

INFILTRATION SWALE
PLAN AND PROFILE

C2.4

PIERCE, PINI & ASSOCIATES, INC.
CONSULTING CIVIL ENGINEERS

STORMWATER CALCULATIONS

FOR

JOHANNSON RESIDENCE

1 Sunfish Lane
Sunfish Lake, MN 55118

November 5, 2019
Revised June 22, 2020

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR
UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL
ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

Rhonda S. Pierce

41333

11/05/2019

Name: RHONDA S. PIERCE

LICENSE NO.

DATE

INDEX

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2. STORMWATER CALCULATIONS
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STORMWATER MANGEMENT NARRATIVE

Existing Conditions

The subject property is a 7.76-acre residential parcel on the north side of Sunfish Lake. The disturbed area is limited to 2.34 acres. The existing property currently has a house with a detached garage, driveway and deck. The existing property within the disturbance area has 0.24 acres of impervious surface. The site drains almost entirely south to the lake and there is currently no stormwater management features on the property.

Proposed Conditions

The project includes the removal of the existing house and driveway and the construction of a new house with an attached garage, swimming pool, terrace and new driveway. The proposed work will disturb approximately 2.34 acres and will result in 0.50 acres of total impervious area. This results in a net increase of 0.26 acres of impervious area.

Soil Analysis

The NRCS soil map has been pulled for the project site and is included in this report. The vast majority of the site is categorized as Kingsley sandy loam. This soil type corresponds to Hydrologic Soil Group 'C'. Since a formal geotechnical report has not been completed to date for the site, the design for the stormwater management system will utilize infiltration and filtration practices due to the uncertain nature of infiltration feasibility.

Stormwater Management

The local government unit for stormwater is the City of Sunfish Lake. The City stormwater management plan requires a water quality treatment volume of 1.0" from the new or disturbed net increase of impervious area of the disturbed area on site. An infiltration pipe system and infiltration basin are proposed to provide the stormwater needs for the project. The site will be graded into various catch basins to collect and route runoff into two infiltration system. A small portion will runoff to the north of the site without being treated. A summary of the infiltration requirements are below.

Treatment Amount	Net Increase Impervious Area (SF)	Required Volume (CF)
1.0"	11,342	945
Treatment System	Volume Provided (CF)	Total Excess Volume (CF)
North Pipe (2AP)	886	-59
South Pipe (2BP)	1670	1,611
Basin (1P)	2794	4,405

The proposed infiltration systems must also maintain or reduce the peak rate for the 2, 10, and 100-year storm events from the existing conditions. The systems must also maintain or reduce

the volume runoff for the 2, 10 and 100-year storm events from existing conditions. A summary of the existing conditions and proposed conditions for discharge rates and volume is below.

Rate Summary Table				
Storm Event	Existing North Rate (cfs)	Proposed North Rate (cfs)	Existing Sunfish Lake Rate (cfs)	Proposed Sunfish Lake Rate (cfs)
2-Year Event	1.41	0.32	1.50	0.07
10-Year Event	2.72	0.65	3.42	1.11
100-Year Event	6.06	1.47	8.75	6.66

Volume Summary Table				
Storm Event	Existing North Volume (ac-ft)	Proposed North Volume (ac-ft)	Existing Sunfish Lake Volume (ac-ft)	Proposed Sunfish Lake Volume (ac-ft)
2-Year Event	0.063	0.017	0.118	0.004
10-Year Event	0.123	0.035	0.254	0.144
100-Year Event	0.282	0.081	0.643	0.635

A hydraulic model has been established for the site. The hydrograph method uses NRCS TR-20 modeling. All modeling analysis uses the most current rainfall frequencies based on NOAA Atlas 14 rainfall data.

Infiltration BMPs are required to provide a drawdown time within 48 hours for surface features. The basins have a maximum depth of 0.8' between the bottom and the water quality overflow outlet. There is a 24" section of imported filter media sand with an infiltration rate of 0.8 inches per hour or greater between the bottom of the basin and the underlying soils.

Floodplain Mitigation

The construction of the new residence will not impact the existing floodplain and does not propose to fill anything within the FEMA floodplain.

Sediment and Erosion Control

Silt fence, catchbasin inserts and biologs will need to be placed along the perimeter of the disturbed construction area prior to construction to prevent silting of the adjacent lake. A rock construction entrance will need to be established and site street sweeping performed throughout the construction phase. Soils stockpiles shall be covered when not used for more than 48 hours or temporarily seeded to prevent windblown sediment from transporting off-site.

Permanent erosion control will consist of sod and paved sidewalks and roads. Slopes and swales will be stabilized with a heavy duty erosion control mat designed for the intended area. A Storm Water Pollution Prevention Plan has prepared and will be implemented for the project.

Johannson Residence**PN: 19-037****Date: 6/22/20**

Existing Conditions						
Drainage Area	Pervious Area [SF]	CN Value	Impervious Area [SF]	CN Value	Total Area [SF]	CN Value
EX1	475	74	368	98	843	84
EX2	19607	74	7735	98	27342	81
EX3	71363	74	2558	98	73921	75
Total	91445	74	10661	98	102106	77

Existing Conditions Rates			
Drainage Area	2-Year Event (cfs)	10-Year Event (cfs)	100-Year Event (cfs)
EX1	0.05	0.09	0.19
EX2	1.36	2.64	5.87
EX3	1.50	3.42	8.75

North Runoff
Sunfish Lake Runoff

Proposed Conditions						
Drainage Area	Pervious Area [SF]	CN Value	Impervious Area [SF]	CN Value	Total Area [SF]	CN Value
P1	520	74	323	98	843	83
P2	6054	74	1534	98	7588	79
P3A	22801	74	9761	98	32562	81
P3B	6289	74	1019	98	7308	77
P4	5391	74	786	98	6177	77
P5	21652	74	8513	98	30165	81
P6	14712	74	67	98	14779	74
P7	2684	74	0	98	2684	74
Total	80103	74	22003	98	102106	79

Proposed Conditions Rates			
Drainage Area	2-Year Event (cfs)	10-Year Event (cfs)	100-Year Event (cfs)
P1	0.04	0.07	0.16
P2	0.28	0.58	1.32
P7	0.07	0.17	0.42
1P (P3-P6)	0.00	1.08	6.43

North Runoff
Sunfish Lake Runoff

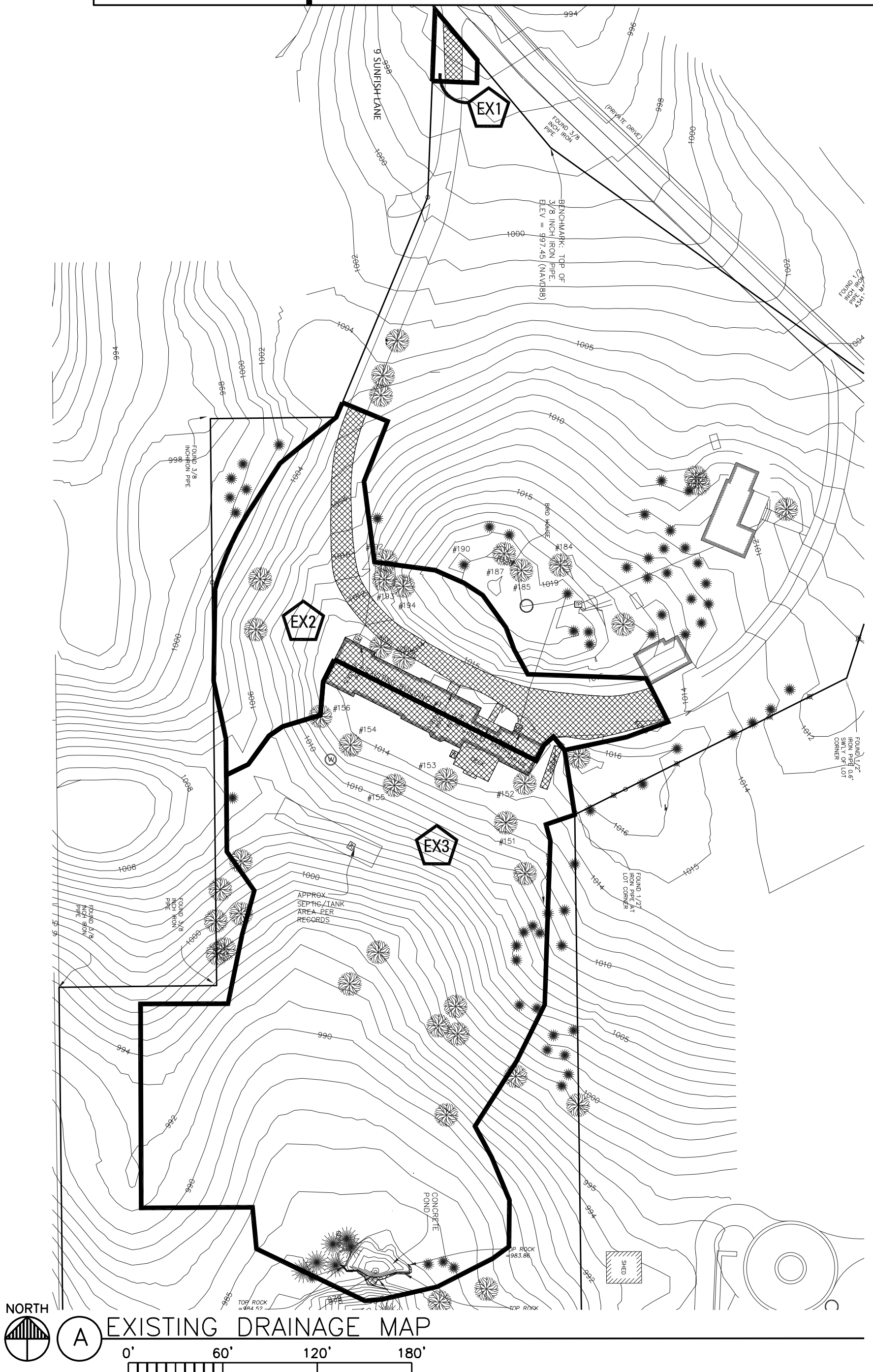
Rate Summary Table				
Storm Event	Ex. North Rate (cfs)	Pr. North Rate (cfs)	Ex. Sunfish Rate (cfs)	Pr. Sunfish Rate (cfs)
2-Year	1.41	0.32	1.50	0.07
10-Year	2.72	0.65	3.42	1.11
100-Year	6.06	1.47	8.75	6.66

Volume Summary Table				
Storm Event	Ex. North Volume (ac-ft)	Pr. North Volume (ac-ft)	Ex. Sunfish Lake Volume (ac-ft)	Pr. Sunfish Lake Volume (ac-ft)
2-Year	0.063	0.017	0.118	0.004
10-Year	0.123	0.035	0.254	0.144
100-Year	0.282	0.081	0.643	0.635

Treatment Amount	Net Increase Impervious Area (SF)	Required Volume (CF)
1.0"	11,342	945
Treatment System	Volume Provided (CF)	Total Excess Volume (CF)
North Pipe (2AP)	886	-59
South Pipe (2BP)	1670	1,611
Basin	2794	4,405

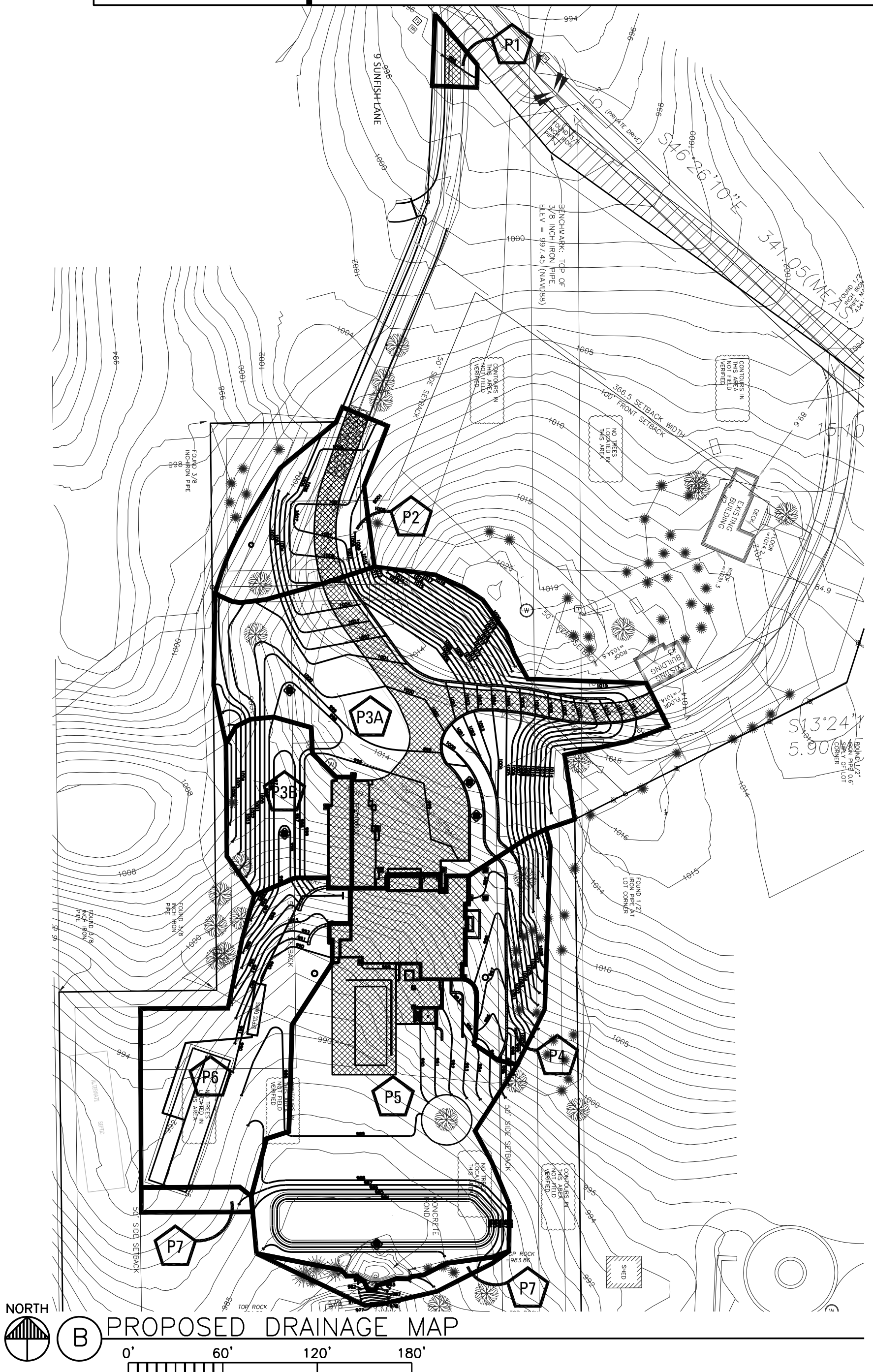
9298 CENTRAL AVENUE,
SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

PPA PROJECT: 19-037
DATE: 06.22.20
DRAWN BY: DPM

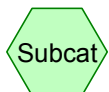
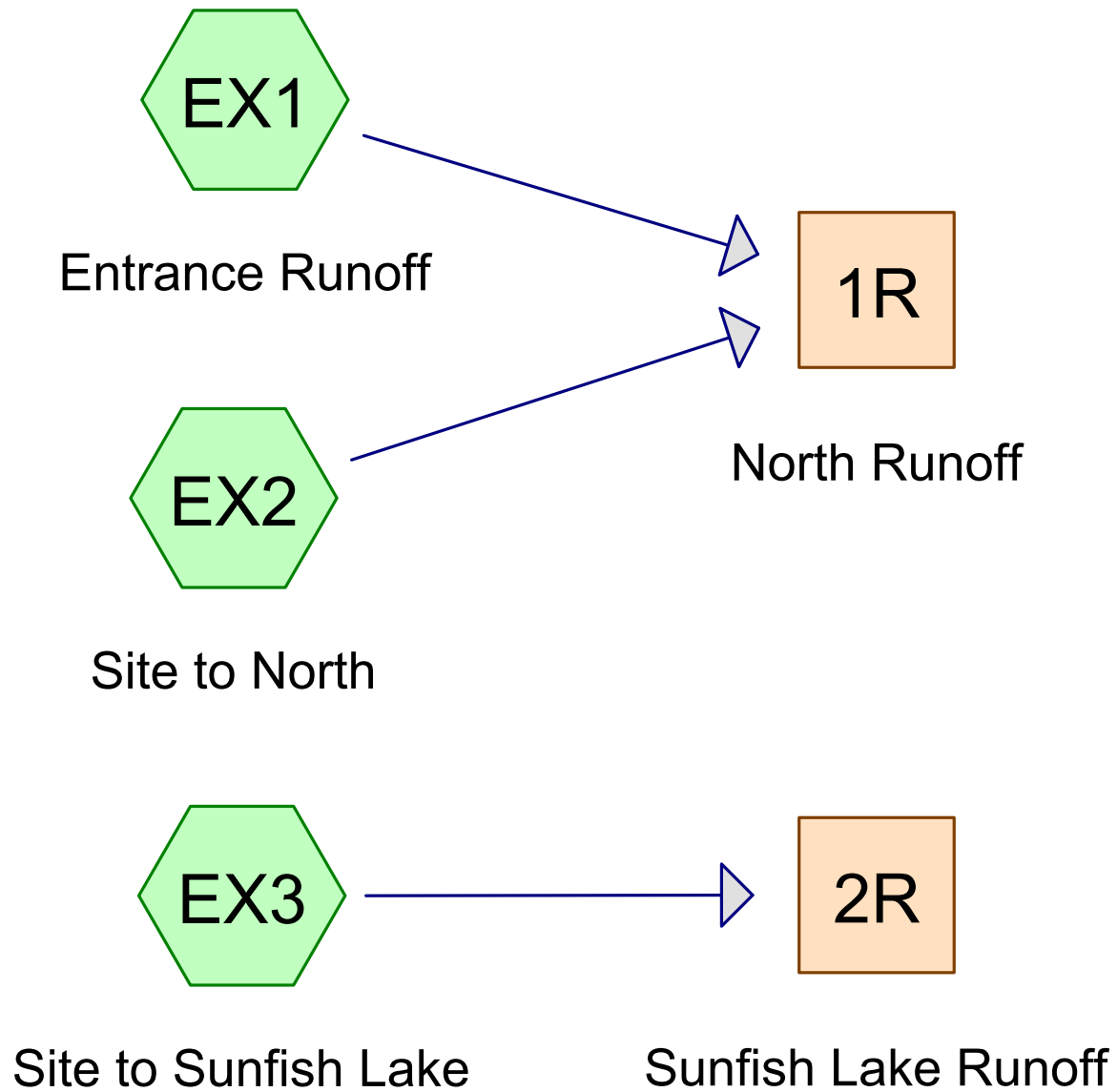


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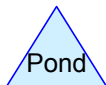
Existing Conditions



Subcat



Reach



Pond



Link

Routing Diagram for Existing Conditions

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.099	74	>75% Grass cover, Good, HSG C (EX1, EX2, EX3)
0.245	98	Paved parking, HSG C (EX1, EX2, EX3)
2.344	77	TOTAL AREA

Existing Conditions

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.344	HSG C	EX1, EX2, EX3
0.000	HSG D	
0.000	Other	
2.344		TOTAL AREA

Existing Conditions

MSE 24-hr 3 2-Year Event Rainfall=2.80"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: Entrance Runoff

Runoff Area=843 sf 43.65% Impervious Runoff Depth=1.35"
Tc=6.0 min CN=84 Runoff=0.05 cfs 0.002 af

SubcatchmentEX2: Site to North

Runoff Area=27,342 sf 28.29% Impervious Runoff Depth=1.16"
Tc=6.0 min CN=81 Runoff=1.36 cfs 0.061 af

SubcatchmentEX3: Site to Sunfish Lake

Runoff Area=73,921 sf 3.46% Impervious Runoff Depth=0.83"
Flow Length=360' Slope=0.1000 '/' Tc=19.5 min CN=75 Runoff=1.50 cfs 0.118 af

Reach 1R: North Runoff

Inflow=1.41 cfs 0.063 af
Outflow=1.41 cfs 0.063 af

Reach 2R: Sunfish Lake Runoff

Inflow=1.50 cfs 0.118 af
Outflow=1.50 cfs 0.118 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.181 af Average Runoff Depth = 0.92"
89.56% Pervious = 2.099 ac 10.44% Impervious = 0.245 ac

Existing Conditions

MSE 24-hr 3 2-Year Event Rainfall=2.80"

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Summary for Subcatchment EX1: Entrance Runoff

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.002 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
475	74	>75% Grass cover, Good, HSG C
368	98	Paved parking, HSG C
843	84	Weighted Average
475		56.35% Pervious Area
368		43.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX2: Site to North

Runoff = 1.36 cfs @ 12.14 hrs, Volume= 0.061 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
19,607	74	>75% Grass cover, Good, HSG C
7,735	98	Paved parking, HSG C
27,342	81	Weighted Average
19,607		71.71% Pervious Area
7,735		28.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX3: Site to Sunfish Lake

Runoff = 1.50 cfs @ 12.31 hrs, Volume= 0.118 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
71,363	74	>75% Grass cover, Good, HSG C
2,558	98	Paved parking, HSG C
73,921	75	Weighted Average
71,363		96.54% Pervious Area
2,558		3.46% Impervious Area

Existing Conditions

MSE 24-hr 3 2-Year Event Rainfall=2.80"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	300	0.1000	0.26		Sheet Flow, Grass: Dense n= 0.240 P2= 2.80"
0.2	60	0.1000	4.74		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.5	360	Total			

Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.647 ac, 28.75% Impervious, Inflow Depth = 1.17" for 2-Year Event event
Inflow = 1.41 cfs @ 12.14 hrs, Volume= 0.063 af
Outflow = 1.41 cfs @ 12.14 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.697 ac, 3.46% Impervious, Inflow Depth = 0.83" for 2-Year Event event
Inflow = 1.50 cfs @ 12.31 hrs, Volume= 0.118 af
Outflow = 1.50 cfs @ 12.31 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Existing Conditions

MSE 24-hr 3 10-Year Event Rainfall=4.17"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: Entrance Runoff

Runoff Area=843 sf 43.65% Impervious Runoff Depth=2.52"
Tc=6.0 min CN=84 Runoff=0.09 cfs 0.004 af

SubcatchmentEX2: Site to North

Runoff Area=27,342 sf 28.29% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=81 Runoff=2.64 cfs 0.118 af

SubcatchmentEX3: Site to Sunfish Lake

Runoff Area=73,921 sf 3.46% Impervious Runoff Depth=1.80"
Flow Length=360' Slope=0.1000 '/' Tc=19.5 min CN=75 Runoff=3.42 cfs 0.254 af

Reach 1R: North Runoff

Inflow=2.72 cfs 0.123 af
Outflow=2.72 cfs 0.123 af

Reach 2R: Sunfish Lake Runoff

Inflow=3.42 cfs 0.254 af
Outflow=3.42 cfs 0.254 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.376 af Average Runoff Depth = 1.93"
89.56% Pervious = 2.099 ac 10.44% Impervious = 0.245 ac

Existing Conditions

MSE 24-hr 3 10-Year Event Rainfall=4.17"

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Summary for Subcatchment EX1: Entrance Runoff

Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.004 af, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.17"

Area (sf)	CN	Description
475	74	>75% Grass cover, Good, HSG C
368	98	Paved parking, HSG C
843	84	Weighted Average
475		56.35% Pervious Area
368		43.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX2: Site to North

Runoff = 2.64 cfs @ 12.13 hrs, Volume= 0.118 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.17"

Area (sf)	CN	Description
19,607	74	>75% Grass cover, Good, HSG C
7,735	98	Paved parking, HSG C
27,342	81	Weighted Average
19,607		71.71% Pervious Area
7,735		28.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX3: Site to Sunfish Lake

Runoff = 3.42 cfs @ 12.29 hrs, Volume= 0.254 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.17"

Area (sf)	CN	Description
71,363	74	>75% Grass cover, Good, HSG C
2,558	98	Paved parking, HSG C
73,921	75	Weighted Average
71,363		96.54% Pervious Area
2,558		3.46% Impervious Area

Existing Conditions

MSE 24-hr 3 10-Year Event Rainfall=4.17"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	300	0.1000	0.26		Sheet Flow, Grass: Dense n= 0.240 P2= 2.80"
0.2	60	0.1000	4.74		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.5	360	Total			

Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.647 ac, 28.75% Impervious, Inflow Depth = 2.27" for 10-Year Event event
 Inflow = 2.72 cfs @ 12.13 hrs, Volume= 0.123 af
 Outflow = 2.72 cfs @ 12.13 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.697 ac, 3.46% Impervious, Inflow Depth = 1.80" for 10-Year Event event
 Inflow = 3.42 cfs @ 12.29 hrs, Volume= 0.254 af
 Outflow = 3.42 cfs @ 12.29 hrs, Volume= 0.254 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Existing Conditions

MSE 24-hr 3 100-Year Event Rainfall=7.45"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: Entrance Runoff

Runoff Area=843 sf 43.65% Impervious Runoff Depth=5.57"
Tc=6.0 min CN=84 Runoff=0.19 cfs 0.009 af

SubcatchmentEX2: Site to North

Runoff Area=27,342 sf 28.29% Impervious Runoff Depth=5.23"
Tc=6.0 min CN=81 Runoff=5.87 cfs 0.273 af

SubcatchmentEX3: Site to Sunfish Lake

Runoff Area=73,921 sf 3.46% Impervious Runoff Depth=4.55"
Flow Length=360' Slope=0.1000 '/' Tc=19.5 min CN=75 Runoff=8.75 cfs 0.643 af

Reach 1R: North Runoff

Inflow=6.06 cfs 0.282 af
Outflow=6.06 cfs 0.282 af

Reach 2R: Sunfish Lake Runoff

Inflow=8.75 cfs 0.643 af
Outflow=8.75 cfs 0.643 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.925 af Average Runoff Depth = 4.74"
89.56% Pervious = 2.099 ac 10.44% Impervious = 0.245 ac

Existing Conditions

MSE 24-hr 3 100-Year Event Rainfall=7.45"

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Summary for Subcatchment EX1: Entrance Runoff

Runoff = 0.19 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.45"

Area (sf)	CN	Description
475	74	>75% Grass cover, Good, HSG C
368	98	Paved parking, HSG C
843	84	Weighted Average
475		56.35% Pervious Area
368		43.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX2: Site to North

Runoff = 5.87 cfs @ 12.13 hrs, Volume= 0.273 af, Depth= 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.45"

Area (sf)	CN	Description
19,607	74	>75% Grass cover, Good, HSG C
7,735	98	Paved parking, HSG C
27,342	81	Weighted Average
19,607		71.71% Pervious Area
7,735		28.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment EX3: Site to Sunfish Lake

Runoff = 8.75 cfs @ 12.29 hrs, Volume= 0.643 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.45"

Area (sf)	CN	Description
71,363	74	>75% Grass cover, Good, HSG C
2,558	98	Paved parking, HSG C
73,921	75	Weighted Average
71,363		96.54% Pervious Area
2,558		3.46% Impervious Area

Existing Conditions

MSE 24-hr 3 100-Year Event Rainfall=7.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	300	0.1000	0.26		Sheet Flow, Grass: Dense n= 0.240 P2= 2.80"
0.2	60	0.1000	4.74		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.5	360	Total			

Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.647 ac, 28.75% Impervious, Inflow Depth = 5.24" for 100-Year Event event
 Inflow = 6.06 cfs @ 12.13 hrs, Volume= 0.282 af
 Outflow = 6.06 cfs @ 12.13 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

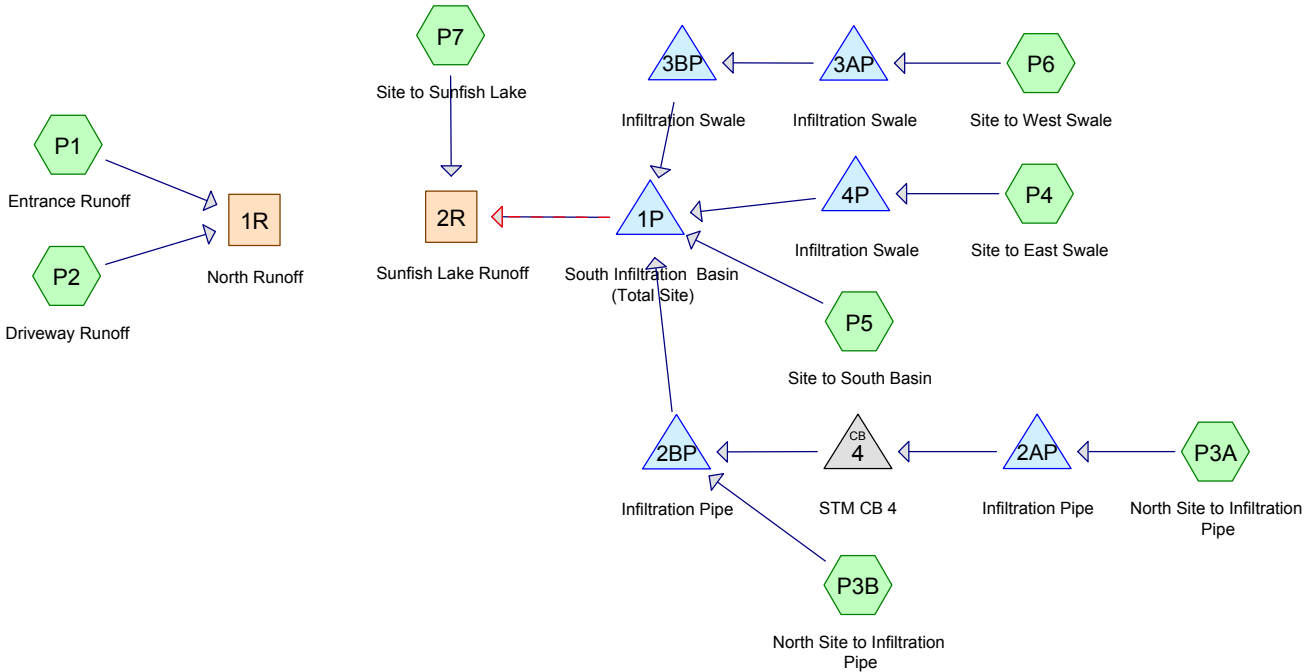
Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.697 ac, 3.46% Impervious, Inflow Depth = 4.55" for 100-Year Event event
 Inflow = 8.75 cfs @ 12.29 hrs, Volume= 0.643 af
 Outflow = 8.75 cfs @ 12.29 hrs, Volume= 0.643 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Routing Diagram for Proposed Conditions

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.839	74	>75% Grass cover, Good, HSG C (P1, P2, P3A, P3B, P4, P5, P6, P7)
0.505	98	Paved parking, HSG C (P1, P2, P3A, P3B, P4, P5, P6)
2.344	79	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.344	HSG C	P1, P2, P3A, P3B, P4, P5, P6, P7
0.000	HSG D	
0.000	Other	
2.344		TOTAL AREA

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Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: Entrance Runoff Runoff Area=843 sf 38.32% Impervious Runoff Depth=1.29"
Tc=10.0 min CN=83 Runoff=0.04 cfs 0.002 af

SubcatchmentP2: Driveway Runoff Runoff Area=7,588 sf 20.22% Impervious Runoff Depth=1.04"
Tc=10.0 min CN=79 Runoff=0.28 cfs 0.015 af

SubcatchmentP3A: North Site to Runoff Area=32,562 sf 29.98% Impervious Runoff Depth=1.16"
Tc=10.0 min CN=81 Runoff=1.35 cfs 0.072 af

SubcatchmentP3B: North Site to Runoff Area=7,308 sf 13.94% Impervious Runoff Depth=0.93"
Tc=10.0 min CN=77 Runoff=0.24 cfs 0.013 af

SubcatchmentP4: Site to East Swale Runoff Area=6,177 sf 12.72% Impervious Runoff Depth=0.93"
Tc=10.0 min CN=77 Runoff=0.20 cfs 0.011 af

SubcatchmentP5: Site to South Basin Runoff Area=30,165 sf 28.22% Impervious Runoff Depth=1.16"
Tc=10.0 min CN=81 Runoff=1.25 cfs 0.067 af

SubcatchmentP6: Site to West Swale Runoff Area=14,779 sf 0.45% Impervious Runoff Depth=0.78"
Tc=10.0 min CN=74 Runoff=0.39 cfs 0.022 af

SubcatchmentP7: Site to Sunfish Lake Runoff Area=2,684 sf 0.00% Impervious Runoff Depth=0.78"
Tc=10.0 min CN=74 Runoff=0.07 cfs 0.004 af

Reach 1R: North Runoff Inflow=0.32 cfs 0.017 af
Outflow=0.32 cfs 0.017 af

Reach 2R: Sunfish Lake Runoff Inflow=0.07 cfs 0.004 af
Outflow=0.07 cfs 0.004 af

Pond 1P: South Infiltration Basin (Total Site) Peak Elev=984.21' Storage=2,464 cf Inflow=1.25 cfs 0.073 af
Discarded=0.02 cfs 0.073 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.073 af

Pond 2AP: Infiltration Pipe Peak Elev=993.72' Storage=1,217 cf Inflow=1.35 cfs 0.072 af
Discarded=0.01 cfs 0.028 af Primary=0.54 cfs 0.044 af Outflow=0.55 cfs 0.072 af

Pond 2BP: Infiltration Pipe Peak Elev=984.38' Storage=1,782 cf Inflow=0.65 cfs 0.057 af
Discarded=0.01 cfs 0.051 af Primary=0.02 cfs 0.006 af Outflow=0.03 cfs 0.057 af

Pond 3AP: Infiltration Swale Peak Elev=988.59' Storage=735 cf Inflow=0.39 cfs 0.022 af
Discarded=0.01 cfs 0.022 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.022 af

Pond 3BP: Infiltration Swale Peak Elev=987.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4: STM CB 4 Peak Elev=985.73' Inflow=0.54 cfs 0.044 af
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 ' /' Outflow=0.54 cfs 0.044 af

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Pond 4P: Infiltration Swale

Peak Elev=995.16' Storage=283 cf Inflow=0.20 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.207 af Average Runoff Depth = 1.06"
78.45% Pervious = 1.839 ac 21.55% Impervious = 0.505 ac

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Summary for Subcatchment P1: Entrance Runoff

Runoff = 0.04 cfs @ 12.18 hrs, Volume= 0.002 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
520	74	>75% Grass cover, Good, HSG C
323	98	Paved parking, HSG C
843	83	Weighted Average
520		61.68% Pervious Area
323		38.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P2: Driveway Runoff

Runoff = 0.28 cfs @ 12.18 hrs, Volume= 0.015 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
6,054	74	>75% Grass cover, Good, HSG C
1,534	98	Paved parking, HSG C
7,588	79	Weighted Average
6,054		79.78% Pervious Area
1,534		20.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3A: North Site to Infiltration Pipe

Runoff = 1.35 cfs @ 12.18 hrs, Volume= 0.072 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
22,801	74	>75% Grass cover, Good, HSG C
9,761	98	Paved parking, HSG C
32,562	81	Weighted Average
22,801		70.02% Pervious Area
9,761		29.98% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3B: North Site to Infiltration Pipe

Runoff = 0.24 cfs @ 12.18 hrs, Volume= 0.013 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
6,289	74	>75% Grass cover, Good, HSG C
1,019	98	Paved parking, HSG C
7,308	77	Weighted Average
6,289		86.06% Pervious Area
1,019		13.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P4: Site to East Swale

Runoff = 0.20 cfs @ 12.18 hrs, Volume= 0.011 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
5,391	74	>75% Grass cover, Good, HSG C
786	98	Paved parking, HSG C
6,177	77	Weighted Average
5,391		87.28% Pervious Area
786		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P5: Site to South Basin

Runoff = 1.25 cfs @ 12.18 hrs, Volume= 0.067 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

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Area (sf)	CN	Description
21,652	74	>75% Grass cover, Good, HSG C
8,513	98	Paved parking, HSG C
30,165	81	Weighted Average
21,652		71.78% Pervious Area
8,513		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P6: Site to West Swale

Runoff = 0.39 cfs @ 12.19 hrs, Volume= 0.022 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
14,712	74	>75% Grass cover, Good, HSG C
67	98	Paved parking, HSG C
14,779	74	Weighted Average
14,712		99.55% Pervious Area
67		0.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P7: Site to Sunfish Lake

Runoff = 0.07 cfs @ 12.19 hrs, Volume= 0.004 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year Event Rainfall=2.80"

Area (sf)	CN	Description
2,684	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
2,684	74	Weighted Average
2,684		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

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Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.194 ac, 22.03% Impervious, Inflow Depth = 1.07" for 2-Year Event event
 Inflow = 0.32 cfs @ 12.18 hrs, Volume= 0.017 af
 Outflow = 0.32 cfs @ 12.18 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.150 ac, 21.51% Impervious, Inflow Depth = 0.02" for 2-Year Event event
 Inflow = 0.07 cfs @ 12.19 hrs, Volume= 0.004 af
 Outflow = 0.07 cfs @ 12.19 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: South Infiltration Basin (Total Site)

Inflow Area = 2.089 ac, 22.14% Impervious, Inflow Depth = 0.42" for 2-Year Event event
 Inflow = 1.25 cfs @ 12.18 hrs, Volume= 0.073 af
 Outflow = 0.02 cfs @ 20.64 hrs, Volume= 0.073 af, Atten= 99%, Lag= 507.4 min
 Discarded = 0.02 cfs @ 20.64 hrs, Volume= 0.073 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 984.21' @ 20.64 hrs Surf.Area= 3,781 sf Storage= 2,464 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 1,410.7 min (2,248.7 - 838.0)

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	8,118 cf	Infiltration Basin (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	3,130	0	0
984.00	3,580	1,678	1,678
984.50	4,050	1,908	3,585
985.00	4,530	2,145	5,730
985.50	5,020	2,388	8,118
Device	Routing	Invert	Outlet Devices
#1	Discarded	983.50'	0.200 in/hr Exfiltration over Surface area
#2	Primary	978.10'	12.0" Round Culvert L= 25.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 978.10' / 978.00' S= 0.0040 '/' Cc= 0.900

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#3	Device 2	984.30'	n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf 16.0" Horiz. Overflow CB Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	985.20'	20.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 20.64 hrs HW=984.21' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=983.50' TW=0.00' (Dynamic Tailwater)

↑ **2=Culvert** (Passes 0.00 cfs of 8.37 cfs potential flow)

↑ **3=Overflow CB Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=983.50' TW=0.00' (Dynamic Tailwater)

↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2AP: Infiltration Pipe

Inflow Area =	0.748 ac, 29.98% Impervious, Inflow Depth = 1.16" for 2-Year Event event
Inflow =	1.35 cfs @ 12.18 hrs, Volume= 0.072 af
Outflow =	0.55 cfs @ 12.38 hrs, Volume= 0.072 af, Atten= 59%, Lag= 11.8 min
Discarded =	0.01 cfs @ 11.56 hrs, Volume= 0.028 af
Primary =	0.54 cfs @ 12.38 hrs, Volume= 0.044 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 993.72' @ 12.38 hrs Surf.Area= 1,530 sf Storage= 1,217 cf

Plug-Flow detention time= 523.5 min calculated for 0.072 af (100% of inflow)

Center-of-Mass det. time= 523.7 min (1,344.3 - 820.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	992.00'	2,165 cf	15.00"W x 102.00'L x 4.00'H Field A 6,120 cf Overall - 707 cf Embedded = 5,413 cf x 40.0% Voids
#2A	992.50'	707 cf	CMP Round 36 x 5 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L
		2,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	992.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	993.30'	12.0" Round Culvert L= 86.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 993.30' / 992.90' S= 0.0047 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

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Discarded OutFlow Max=0.01 cfs @ 11.56 hrs HW=992.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.54 cfs @ 12.38 hrs HW=993.72' TW=985.73' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 0.54 cfs @ 2.53 fps)

Summary for Pond 2BP: Infiltration Pipe

Inflow Area = 0.915 ac, 27.04% Impervious, Inflow Depth = 0.75" for 2-Year Event event
Inflow = 0.65 cfs @ 12.36 hrs, Volume= 0.057 af
Outflow = 0.03 cfs @ 15.67 hrs, Volume= 0.057 af, Atten= 95%, Lag= 198.6 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.051 af
Primary = 0.02 cfs @ 15.67 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 984.38' @ 15.74 hrs Surf.Area= 2,880 sf Storage= 1,782 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 1,145.3 min (1,989.8 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	983.00'	4,071 cf	15.00'W x 192.00'L x 4.00'H Field A 11,520 cf Overall - 1,343 cf Embedded = 10,177 cf x 40.0% Voids
#2A	983.50'	1,343 cf	CMP Round 36 x 9 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L Row Length Adjustment= +10.00' x 7.07 sf x 1 rows
		5,414 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	983.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	984.30'	12.0" Round Culvert L= 37.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 984.30' / 984.00' S= 0.0081 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=983.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 15.67 hrs HW=984.38' TW=984.15' (Dynamic Tailwater)

↑**2=Culvert** (Outlet Controls 0.02 cfs @ 1.03 fps)

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Summary for Pond 3AP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 0.78" for 2-Year Event event
Inflow = 0.39 cfs @ 12.19 hrs, Volume= 0.022 af
Outflow = 0.01 cfs @ 11.96 hrs, Volume= 0.022 af, Atten= 99%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.96 hrs, Volume= 0.022 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 988.59' @ 20.33 hrs Surf.Area= 1,250 sf Storage= 735 cf

Plug-Flow detention time= 1,253.1 min calculated for 0.022 af (100% of inflow)
Center-of-Mass det. time= 1,253.2 min (2,091.9 - 838.8)

Volume	Invert	Avail.Storage	Storage Description
#1	988.00'	1,250 cf	25.00'W x 50.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	988.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	988.80'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 11.96 hrs HW=988.01' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=988.00' TW=987.00' (Dynamic Tailwater)

↑**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 3BP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 0.00" for 2-Year Event event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 987.00' @ 0.00 hrs Surf.Area= 1,000 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	987.00'	1,000 cf	25.00'W x 40.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	987.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	987.80'	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

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Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=987.00' (Free Discharge)

↑**1=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=987.00' TW=983.50' (Dynamic Tailwater)

↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4: STM CB 4

[57] Hint: Peaked at 985.73' (Flood elevation advised)

Inflow Area = 0.748 ac, 29.98% Impervious, Inflow Depth = 0.71" for 2-Year Event event
Inflow = 0.54 cfs @ 12.38 hrs, Volume= 0.044 af
Outflow = 0.54 cfs @ 12.38 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.38 hrs, Volume= 0.044 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 985.73' @ 12.38 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	985.30'	12.0" Round Culvert L= 5.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 985.30' / 985.25' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 12.38 hrs HW=985.73' TW=983.36' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 0.54 cfs @ 2.45 fps)

Summary for Pond 4P: Infiltration Swale

Inflow Area = 0.142 ac, 12.72% Impervious, Inflow Depth = 0.93" for 2-Year Event event
Inflow = 0.20 cfs @ 12.18 hrs, Volume= 0.011 af
Outflow = 0.01 cfs @ 12.16 hrs, Volume= 0.011 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 995.16' @ 15.07 hrs Surf.Area= 1,725 sf Storage= 283 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 368.2 min (1,198.9 - 830.8)

Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	6,900 cf	15.00'W x 115.00'L x 4.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	995.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	995.40'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

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Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=995.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=995.00' TW=983.50' (Dynamic Tailwater)

↑**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

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Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: Entrance Runoff	Runoff Area=843 sf 38.32% Impervious Runoff Depth=2.46" Tc=10.0 min CN=83 Runoff=0.07 cfs 0.004 af
SubcatchmentP2: Driveway Runoff	Runoff Area=7,588 sf 20.22% Impervious Runoff Depth=2.13" Tc=10.0 min CN=79 Runoff=0.58 cfs 0.031 af
SubcatchmentP3A: North Site to	Runoff Area=32,562 sf 29.98% Impervious Runoff Depth=2.29" Tc=10.0 min CN=81 Runoff=2.66 cfs 0.143 af
SubcatchmentP3B: North Site to	Runoff Area=7,308 sf 13.94% Impervious Runoff Depth=1.97" Tc=10.0 min CN=77 Runoff=0.51 cfs 0.028 af
SubcatchmentP4: Site to East Swale	Runoff Area=6,177 sf 12.72% Impervious Runoff Depth=1.97" Tc=10.0 min CN=77 Runoff=0.43 cfs 0.023 af
SubcatchmentP5: Site to South Basin	Runoff Area=30,165 sf 28.22% Impervious Runoff Depth=2.29" Tc=10.0 min CN=81 Runoff=2.47 cfs 0.132 af
SubcatchmentP6: Site to West Swale	Runoff Area=14,779 sf 0.45% Impervious Runoff Depth=1.74" Tc=10.0 min CN=74 Runoff=0.92 cfs 0.049 af
SubcatchmentP7: Site to Sunfish Lake	Runoff Area=2,684 sf 0.00% Impervious Runoff Depth=1.74" Tc=10.0 min CN=74 Runoff=0.17 cfs 0.009 af
Reach 1R: North Runoff	Inflow=0.65 cfs 0.035 af Outflow=0.65 cfs 0.035 af
Reach 2R: Sunfish Lake Runoff	Inflow=1.11 cfs 0.144 af Outflow=1.11 cfs 0.144 af
Pond 1P: South Infiltration Basin (Total Site)	Peak Elev=984.48' Storage=3,523 cf Inflow=2.47 cfs 0.220 af Discarded=0.02 cfs 0.085 af Primary=1.09 cfs 0.135 af Secondary=0.00 cfs 0.000 af Outflow=1.11 cfs 0.220 af
Pond 2AP: Infiltration Pipe	Peak Elev=994.26' Storage=1,642 cf Inflow=2.66 cfs 0.143 af Discarded=0.01 cfs 0.029 af Primary=2.13 cfs 0.113 af Outflow=2.14 cfs 0.143 af
Pond 2BP: Infiltration Pipe	Peak Elev=984.83' Storage=2,453 cf Inflow=2.57 cfs 0.141 af Discarded=0.01 cfs 0.054 af Primary=0.86 cfs 0.087 af Outflow=0.87 cfs 0.141 af
Pond 3AP: Infiltration Swale	Peak Elev=988.83' Storage=1,037 cf Inflow=0.92 cfs 0.049 af Discarded=0.01 cfs 0.029 af Primary=0.25 cfs 0.020 af Outflow=0.25 cfs 0.049 af
Pond 3BP: Infiltration Swale	Peak Elev=987.73' Storage=725 cf Inflow=0.25 cfs 0.020 af Discarded=0.00 cfs 0.020 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.020 af
Pond 4: STM CB 4	Peak Elev=986.28' Inflow=2.13 cfs 0.113 af 12.0" Round Culvert n=0.012 L=5.0' S=0.0100 ' /' Outflow=2.13 cfs 0.113 af

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Pond 4P: Infiltration Swale

Peak Elev=995.40' Storage=696 cf Inflow=0.43 cfs 0.023 af
Discarded=0.01 cfs 0.023 af Primary=0.01 cfs 0.001 af Outflow=0.02 cfs 0.023 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.419 af Average Runoff Depth = 2.14"
78.45% Pervious = 1.839 ac 21.55% Impervious = 0.505 ac

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Summary for Subcatchment P1: Entrance Runoff

Runoff = 0.07 cfs @ 12.18 hrs, Volume= 0.004 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
520	74	>75% Grass cover, Good, HSG C
323	98	Paved parking, HSG C
843	83	Weighted Average
520		61.68% Pervious Area
323		38.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P2: Driveway Runoff

Runoff = 0.58 cfs @ 12.18 hrs, Volume= 0.031 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
6,054	74	>75% Grass cover, Good, HSG C
1,534	98	Paved parking, HSG C
7,588	79	Weighted Average
6,054		79.78% Pervious Area
1,534		20.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3A: North Site to Infiltration Pipe

Runoff = 2.66 cfs @ 12.18 hrs, Volume= 0.143 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
22,801	74	>75% Grass cover, Good, HSG C
9,761	98	Paved parking, HSG C
32,562	81	Weighted Average
22,801		70.02% Pervious Area
9,761		29.98% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3B: North Site to Infiltration Pipe

Runoff = 0.51 cfs @ 12.18 hrs, Volume= 0.028 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
6,289	74	>75% Grass cover, Good, HSG C
1,019	98	Paved parking, HSG C
7,308	77	Weighted Average
6,289		86.06% Pervious Area
1,019		13.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P4: Site to East Swale

Runoff = 0.43 cfs @ 12.18 hrs, Volume= 0.023 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
5,391	74	>75% Grass cover, Good, HSG C
786	98	Paved parking, HSG C
6,177	77	Weighted Average
5,391		87.28% Pervious Area
786		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P5: Site to South Basin

Runoff = 2.47 cfs @ 12.18 hrs, Volume= 0.132 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

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Area (sf)	CN	Description
21,652	74	>75% Grass cover, Good, HSG C
8,513	98	Paved parking, HSG C
30,165	81	Weighted Average
21,652		71.78% Pervious Area
8,513		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P6: Site to West Swale

Runoff = 0.92 cfs @ 12.18 hrs, Volume= 0.049 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
14,712	74	>75% Grass cover, Good, HSG C
67	98	Paved parking, HSG C
14,779	74	Weighted Average
14,712		99.55% Pervious Area
67		0.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P7: Site to Sunfish Lake

Runoff = 0.17 cfs @ 12.18 hrs, Volume= 0.009 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year Event Rainfall=4.20"

Area (sf)	CN	Description
2,684	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
2,684	74	Weighted Average
2,684		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

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Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.194 ac, 22.03% Impervious, Inflow Depth = 2.16" for 10-Year Event event
 Inflow = 0.65 cfs @ 12.18 hrs, Volume= 0.035 af
 Outflow = 0.65 cfs @ 12.18 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.150 ac, 21.51% Impervious, Inflow Depth = 0.80" for 10-Year Event event
 Inflow = 1.11 cfs @ 12.65 hrs, Volume= 0.144 af
 Outflow = 1.11 cfs @ 12.65 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: South Infiltration Basin (Total Site)

Inflow Area = 2.089 ac, 22.14% Impervious, Inflow Depth = 1.26" for 10-Year Event event
 Inflow = 2.47 cfs @ 12.18 hrs, Volume= 0.220 af
 Outflow = 1.11 cfs @ 12.66 hrs, Volume= 0.220 af, Atten= 55%, Lag= 28.8 min
 Discarded = 0.02 cfs @ 12.66 hrs, Volume= 0.085 af
 Primary = 1.09 cfs @ 12.66 hrs, Volume= 0.135 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 984.48' @ 12.66 hrs Surf.Area= 4,036 sf Storage= 3,523 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 627.2 min (1,453.4 - 826.1)

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	8,118 cf	Infiltration Basin (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	3,130	0	0
984.00	3,580	1,678	1,678
984.50	4,050	1,908	3,585
985.00	4,530	2,145	5,730
985.50	5,020	2,388	8,118

Device	Routing	Invert	Outlet Devices
#1	Discarded	983.50'	0.200 in/hr Exfiltration over Surface area
#2	Primary	978.10'	12.0" Round Culvert L= 25.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 978.10' / 978.00' S= 0.0040 '/' Cc= 0.900

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#3 Device 2 984.30' n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
16.0" Horiz. Overflow CB Grate C= 0.600
Limited to weir flow at low heads
#4 Secondary 985.20' **20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.66 hrs HW=984.48' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.09 cfs @ 12.66 hrs HW=984.48' TW=0.00' (Dynamic Tailwater)

↑ **2=Culvert** (Passes 1.09 cfs of 9.17 cfs potential flow)

↑ **3=Overflow CB Grate** (Weir Controls 1.09 cfs @ 1.41 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=983.50' TW=0.00' (Dynamic Tailwater)

↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2AP: Infiltration Pipe

Inflow Area = 0.748 ac, 29.98% Impervious, Inflow Depth = 2.29" for 10-Year Event event
Inflow = 2.66 cfs @ 12.18 hrs, Volume= 0.143 af
Outflow = 2.14 cfs @ 12.24 hrs, Volume= 0.143 af, Atten= 20%, Lag= 3.8 min
Discarded = 0.01 cfs @ 10.80 hrs, Volume= 0.029 af
Primary = 2.13 cfs @ 12.24 hrs, Volume= 0.113 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 994.26' @ 12.24 hrs Surf.Area= 1,530 sf Storage= 1,642 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 277.2 min (1,083.8 - 806.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	992.00'	2,165 cf	15.00"W x 102.00'L x 4.00'H Field A 6,120 cf Overall - 707 cf Embedded = 5,413 cf x 40.0% Voids
#2A	992.50'	707 cf	CMP Round 36 x 5 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L
		2,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	992.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	993.30'	12.0" Round Culvert L= 86.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 993.30' / 992.90' S= 0.0047 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

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Discarded OutFlow Max=0.01 cfs @ 10.80 hrs HW=992.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.13 cfs @ 12.24 hrs HW=994.26' TW=986.28' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 2.13 cfs @ 3.53 fps)

Summary for Pond 2BP: Infiltration Pipe

Inflow Area = 0.915 ac, 27.04% Impervious, Inflow Depth = 1.85" for 10-Year Event event
Inflow = 2.57 cfs @ 12.23 hrs, Volume= 0.141 af
Outflow = 0.87 cfs @ 12.53 hrs, Volume= 0.141 af, Atten= 66%, Lag= 17.8 min
Discarded = 0.01 cfs @ 11.93 hrs, Volume= 0.054 af
Primary = 0.86 cfs @ 12.53 hrs, Volume= 0.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 984.83' @ 12.55 hrs Surf.Area= 2,880 sf Storage= 2,453 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 525.1 min (1,346.5 - 821.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	983.00'	4,071 cf	15.00'W x 192.00'L x 4.00'H Field A 11,520 cf Overall - 1,343 cf Embedded = 10,177 cf x 40.0% Voids
#2A	983.50'	1,343 cf	CMP Round 36 x 9 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L Row Length Adjustment= +10.00' x 7.07 sf x 1 rows
		5,414 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	983.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	984.30'	12.0" Round Culvert L= 37.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 984.30' / 984.00' S= 0.0081 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 11.93 hrs HW=983.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.86 cfs @ 12.53 hrs HW=984.83' TW=984.46' (Dynamic Tailwater)

↑**2=Culvert** (Outlet Controls 0.86 cfs @ 2.96 fps)

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Summary for Pond 3AP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 1.74" for 10-Year Event event
Inflow = 0.92 cfs @ 12.18 hrs, Volume= 0.049 af
Outflow = 0.25 cfs @ 12.49 hrs, Volume= 0.049 af, Atten= 72%, Lag= 18.4 min
Discarded = 0.01 cfs @ 11.53 hrs, Volume= 0.029 af
Primary = 0.25 cfs @ 12.49 hrs, Volume= 0.020 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 988.83' @ 12.49 hrs Surf.Area= 1,250 sf Storage= 1,037 cf

Plug-Flow detention time= 997.5 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 997.7 min (1,818.3 - 820.6)

Volume	Invert	Avail.Storage	Storage Description
#1	988.00'	1,250 cf	25.00'W x 50.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	988.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	988.80'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 11.53 hrs HW=988.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.25 cfs @ 12.49 hrs HW=988.83' TW=987.05' (Dynamic Tailwater)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.56 fps)

Summary for Pond 3BP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 0.72" for 10-Year Event event
Inflow = 0.25 cfs @ 12.49 hrs, Volume= 0.020 af
Outflow = 0.00 cfs @ 12.44 hrs, Volume= 0.020 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.44 hrs, Volume= 0.020 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 987.73' @ 20.61 hrs Surf.Area= 1,000 sf Storage= 725 cf

Plug-Flow detention time= 1,468.4 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 1,468.5 min (2,330.6 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	987.00'	1,000 cf	25.00'W x 40.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	987.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	987.80'	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Proposed Conditions

MSE 24-hr 3 10-Year Event Rainfall=4.20"

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Discarded OutFlow Max=0.00 cfs @ 12.44 hrs HW=987.01' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=987.00' TW=983.50' (Dynamic Tailwater)

↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4: STM CB 4

[57] Hint: Peaked at 986.28' (Flood elevation advised)

Inflow Area = 0.748 ac, 29.98% Impervious, Inflow Depth = 1.82" for 10-Year Event event
Inflow = 2.13 cfs @ 12.24 hrs, Volume= 0.113 af
Outflow = 2.13 cfs @ 12.24 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.24 hrs, Volume= 0.113 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 986.28' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	985.30'	12.0" Round Culvert L= 5.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 985.30' / 985.25' S= 0.0100 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=2.13 cfs @ 12.24 hrs HW=986.28' TW=983.96' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 2.13 cfs @ 3.44 fps)

Summary for Pond 4P: Infiltration Swale

Inflow Area = 0.142 ac, 12.72% Impervious, Inflow Depth = 1.97" for 10-Year Event event
Inflow = 0.43 cfs @ 12.18 hrs, Volume= 0.023 af
Outflow = 0.02 cfs @ 14.79 hrs, Volume= 0.023 af, Atten= 96%, Lag= 156.7 min
Discarded = 0.01 cfs @ 12.00 hrs, Volume= 0.023 af
Primary = 0.01 cfs @ 14.79 hrs, Volume= 0.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 995.40' @ 14.79 hrs Surf.Area= 1,725 sf Storage= 696 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 841.0 min (1,655.6 - 814.6)

Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	6,900 cf	15.00'W x 115.00'L x 4.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	995.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	995.40'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Proposed Conditions

MSE 24-hr 3 10-Year Event Rainfall=4.20"

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Discarded OutFlow Max=0.01 cfs @ 12.00 hrs HW=995.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 14.79 hrs HW=995.40' TW=984.36' (Dynamic Tailwater)

↑**2=Sharp-Crested Rectangular Weir**(Weir Controls 0.01 cfs @ 0.20 fps)

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: Entrance Runoff Runoff Area=843 sf 38.32% Impervious Runoff Depth=5.41"
Tc=10.0 min CN=83 Runoff=0.16 cfs 0.009 af

SubcatchmentP2: Driveway Runoff Runoff Area=7,588 sf 20.22% Impervious Runoff Depth=4.95"
Tc=10.0 min CN=79 Runoff=1.32 cfs 0.072 af

SubcatchmentP3A: North Site to Runoff Area=32,562 sf 29.98% Impervious Runoff Depth=5.18"
Tc=10.0 min CN=81 Runoff=5.87 cfs 0.323 af

SubcatchmentP3B: North Site to Runoff Area=7,308 sf 13.94% Impervious Runoff Depth=4.73"
Tc=10.0 min CN=77 Runoff=1.22 cfs 0.066 af

SubcatchmentP4: Site to East Swale Runoff Area=6,177 sf 12.72% Impervious Runoff Depth=4.73"
Tc=10.0 min CN=77 Runoff=1.03 cfs 0.056 af

SubcatchmentP5: Site to South Basin Runoff Area=30,165 sf 28.22% Impervious Runoff Depth=5.18"
Tc=10.0 min CN=81 Runoff=5.44 cfs 0.299 af

SubcatchmentP6: Site to West Swale Runoff Area=14,779 sf 0.45% Impervious Runoff Depth=4.39"
Tc=10.0 min CN=74 Runoff=2.31 cfs 0.124 af

SubcatchmentP7: Site to Sunfish Lake Runoff Area=2,684 sf 0.00% Impervious Runoff Depth=4.39"
Tc=10.0 min CN=74 Runoff=0.42 cfs 0.023 af

Reach 1R: North Runoff Inflow=1.47 cfs 0.081 af
Outflow=1.47 cfs 0.081 af

Reach 2R: Sunfish Lake Runoff Inflow=6.66 cfs 0.635 af
Outflow=6.66 cfs 0.635 af

Pond 1P: South Infiltration Basin (Total Peak Elev=985.21' Storage=6,718 cf Inflow=10.15 cfs 0.702 af
Discarded=0.02 cfs 0.089 af Primary=6.42 cfs 0.612 af Secondary=0.10 cfs 0.001 af Outflow=6.55 cfs 0.702 af

Pond 2AP: Infiltration Pipe Peak Elev=995.72' Storage=2,699 cf Inflow=5.87 cfs 0.323 af
Discarded=0.01 cfs 0.031 af Primary=4.36 cfs 0.292 af Outflow=4.37 cfs 0.323 af

Pond 2BP: Infiltration Pipe Peak Elev=986.11' Storage=4,328 cf Inflow=5.35 cfs 0.358 af
Discarded=0.01 cfs 0.057 af Primary=3.58 cfs 0.301 af Outflow=3.60 cfs 0.358 af

Pond 3AP: Infiltration Swale Peak Elev=988.93' Storage=1,158 cf Inflow=2.31 cfs 0.124 af
Discarded=0.01 cfs 0.030 af Primary=2.28 cfs 0.094 af Outflow=2.28 cfs 0.124 af

Pond 3BP: Infiltration Swale Peak Elev=987.93' Storage=930 cf Inflow=2.28 cfs 0.094 af
Discarded=0.00 cfs 0.023 af Primary=1.89 cfs 0.071 af Outflow=1.89 cfs 0.094 af

Pond 4: STM CB 4 Peak Elev=987.14' Inflow=4.36 cfs 0.292 af
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 ' Outflow=4.36 cfs 0.292 af

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Pond 4P: Infiltration Swale

Peak Elev=995.48' Storage=834 cf Inflow=1.03 cfs 0.056 af
Discarded=0.01 cfs 0.025 af Primary=0.80 cfs 0.031 af Outflow=0.81 cfs 0.056 af

Total Runoff Area = 2.344 ac Runoff Volume = 0.971 af Average Runoff Depth = 4.97"
78.45% Pervious = 1.839 ac 21.55% Impervious = 0.505 ac

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Summary for Subcatchment P1: Entrance Runoff

Runoff = 0.16 cfs @ 12.17 hrs, Volume= 0.009 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
520	74	>75% Grass cover, Good, HSG C
323	98	Paved parking, HSG C
843	83	Weighted Average
520		61.68% Pervious Area
323		38.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P2: Driveway Runoff

Runoff = 1.32 cfs @ 12.17 hrs, Volume= 0.072 af, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
6,054	74	>75% Grass cover, Good, HSG C
1,534	98	Paved parking, HSG C
7,588	79	Weighted Average
6,054		79.78% Pervious Area
1,534		20.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3A: North Site to Infiltration Pipe

Runoff = 5.87 cfs @ 12.17 hrs, Volume= 0.323 af, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
22,801	74	>75% Grass cover, Good, HSG C
9,761	98	Paved parking, HSG C
32,562	81	Weighted Average
22,801		70.02% Pervious Area
9,761		29.98% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P3B: North Site to Infiltration Pipe

Runoff = 1.22 cfs @ 12.17 hrs, Volume= 0.066 af, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
6,289	74	>75% Grass cover, Good, HSG C
1,019	98	Paved parking, HSG C
7,308	77	Weighted Average
6,289		86.06% Pervious Area
1,019		13.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P4: Site to East Swale

Runoff = 1.03 cfs @ 12.17 hrs, Volume= 0.056 af, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
5,391	74	>75% Grass cover, Good, HSG C
786	98	Paved parking, HSG C
6,177	77	Weighted Average
5,391		87.28% Pervious Area
786		12.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P5: Site to South Basin

Runoff = 5.44 cfs @ 12.17 hrs, Volume= 0.299 af, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

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Area (sf)	CN	Description
21,652	74	>75% Grass cover, Good, HSG C
8,513	98	Paved parking, HSG C
30,165	81	Weighted Average
21,652		71.78% Pervious Area
8,513		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P6: Site to West Swale

Runoff = 2.31 cfs @ 12.18 hrs, Volume= 0.124 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
14,712	74	>75% Grass cover, Good, HSG C
67	98	Paved parking, HSG C
14,779	74	Weighted Average
14,712		99.55% Pervious Area
67		0.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment P7: Site to Sunfish Lake

Runoff = 0.42 cfs @ 12.18 hrs, Volume= 0.023 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year Event Rainfall=7.40"

Area (sf)	CN	Description
2,684	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
2,684	74	Weighted Average
2,684		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

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Summary for Reach 1R: North Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.194 ac, 22.03% Impervious, Inflow Depth = 5.00" for 100-Year Event event
 Inflow = 1.47 cfs @ 12.17 hrs, Volume= 0.081 af
 Outflow = 1.47 cfs @ 12.17 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Reach 2R: Sunfish Lake Runoff

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.150 ac, 21.51% Impervious, Inflow Depth = 3.54" for 100-Year Event event
 Inflow = 6.66 cfs @ 12.41 hrs, Volume= 0.635 af
 Outflow = 6.66 cfs @ 12.41 hrs, Volume= 0.635 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: South Infiltration Basin (Total Site)

Inflow Area = 2.089 ac, 22.14% Impervious, Inflow Depth = 4.03" for 100-Year Event event
 Inflow = 10.15 cfs @ 12.23 hrs, Volume= 0.702 af
 Outflow = 6.55 cfs @ 12.41 hrs, Volume= 0.702 af, Atten= 35%, Lag= 10.7 min
 Discarded = 0.02 cfs @ 12.41 hrs, Volume= 0.089 af
 Primary = 6.42 cfs @ 12.41 hrs, Volume= 0.612 af
 Secondary = 0.10 cfs @ 12.41 hrs, Volume= 0.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 985.21' @ 12.41 hrs Surf.Area= 4,739 sf Storage= 6,718 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 210.8 min (1,018.1 - 807.3)

Volume	Invert	Avail.Storage	Storage Description
#1	983.50'	8,118 cf	Infiltration Basin (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
983.50	3,130	0	0
984.00	3,580	1,678	1,678
984.50	4,050	1,908	3,585
985.00	4,530	2,145	5,730
985.50	5,020	2,388	8,118

Device	Routing	Invert	Outlet Devices
#1	Discarded	983.50'	0.200 in/hr Exfiltration over Surface area
#2	Primary	978.10'	12.0" Round Culvert L= 25.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 978.10' / 978.00' S= 0.0040 '/' Cc= 0.900

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#3 Device 2 984.30' n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
16.0" Horiz. Overflow CB Grate C= 0.600
Limited to weir flow at low heads
#4 Secondary 985.20' **20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
0.5' Crest Height

Discarded OutFlow Max=0.02 cfs @ 12.41 hrs HW=985.21' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=6.42 cfs @ 12.41 hrs HW=985.21' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Passes 6.42 cfs of 9.72 cfs potential flow)

↑**3=Overflow CB Grate** (Orifice Controls 6.42 cfs @ 4.60 fps)

Secondary OutFlow Max=0.10 cfs @ 12.41 hrs HW=985.21' TW=0.00' (Dynamic Tailwater)

↑**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.38 fps)

Summary for Pond 2AP: Infiltration Pipe

Inflow Area = 0.748 ac, 29.98% Impervious, Inflow Depth = 5.18" for 100-Year Event event
Inflow = 5.87 cfs @ 12.17 hrs, Volume= 0.323 af
Outflow = 4.37 cfs @ 12.25 hrs, Volume= 0.323 af, Atten= 26%, Lag= 4.5 min
Discarded = 0.01 cfs @ 8.82 hrs, Volume= 0.031 af
Primary = 4.36 cfs @ 12.25 hrs, Volume= 0.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 995.72' @ 12.25 hrs Surf.Area= 1,530 sf Storage= 2,699 cf

Plug-Flow detention time= 132.7 min calculated for 0.323 af (100% of inflow)

Center-of-Mass det. time= 132.9 min (923.2 - 790.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	992.00'	2,165 cf	15.00'W x 102.00'L x 4.00'H Field A 6,120 cf Overall - 707 cf Embedded = 5,413 cf x 40.0% Voids
#2A	992.50'	707 cf	CMP Round 36 x 5 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L
		2,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	992.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	993.30'	12.0" Round Culvert L= 86.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 993.30' / 992.90' S= 0.0047 ' / Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

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Discarded OutFlow Max=0.01 cfs @ 8.82 hrs HW=992.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=4.36 cfs @ 12.25 hrs HW=995.72' TW=987.13' (Dynamic Tailwater)

↑**2=Culvert** (Barrel Controls 4.36 cfs @ 5.55 fps)

Summary for Pond 2BP: Infiltration Pipe

Inflow Area = 0.915 ac, 27.04% Impervious, Inflow Depth = 4.69" for 100-Year Event event
Inflow = 5.35 cfs @ 12.22 hrs, Volume= 0.358 af
Outflow = 3.60 cfs @ 12.40 hrs, Volume= 0.358 af, Atten= 33%, Lag= 10.6 min
Discarded = 0.01 cfs @ 11.27 hrs, Volume= 0.057 af
Primary = 3.58 cfs @ 12.40 hrs, Volume= 0.301 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 986.11' @ 12.40 hrs Surf.Area= 2,880 sf Storage= 4,328 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 224.8 min (1,028.8 - 804.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	983.00'	4,071 cf	15.00'W x 192.00'L x 4.00'H Field A 11,520 cf Overall - 1,343 cf Embedded = 10,177 cf x 40.0% Voids
#2A	983.50'	1,343 cf	CMP Round 36 x 9 Inside #1 Effective Size= 36.0"W x 36.0"H => 7.07 sf x 20.00'L = 141.4 cf Overall Size= 36.0"W x 36.0"H x 20.00'L Row Length Adjustment= +10.00' x 7.07 sf x 1 rows
		5,414 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	983.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	984.30'	12.0" Round Culvert L= 37.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 984.30' / 984.00' S= 0.0081 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 11.27 hrs HW=983.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=3.58 cfs @ 12.40 hrs HW=986.11' TW=985.21' (Dynamic Tailwater)

↑**2=Culvert** (Inlet Controls 3.58 cfs @ 4.56 fps)

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Summary for Pond 3AP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 4.39" for 100-Year Event event
 Inflow = 2.31 cfs @ 12.18 hrs, Volume= 0.124 af
 Outflow = 2.28 cfs @ 12.19 hrs, Volume= 0.124 af, Atten= 1%, Lag= 0.8 min
 Discarded = 0.01 cfs @ 10.20 hrs, Volume= 0.030 af
 Primary = 2.28 cfs @ 12.19 hrs, Volume= 0.094 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 988.93' @ 12.19 hrs Surf.Area= 1,250 sf Storage= 1,158 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 406.6 min (1,208.3 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1	988.00'	1,250 cf	25.00'W x 50.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	988.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	988.80'	15.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.01 cfs @ 10.20 hrs HW=988.01' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.27 cfs @ 12.19 hrs HW=988.93' TW=987.68' (Dynamic Tailwater)
 ↳2=Sharp-Crested Rectangular Weir (Weir Controls 2.27 cfs @ 1.20 fps)

Summary for Pond 3BP: Infiltration Swale

Inflow Area = 0.339 ac, 0.45% Impervious, Inflow Depth = 3.33" for 100-Year Event event
 Inflow = 2.28 cfs @ 12.19 hrs, Volume= 0.094 af
 Outflow = 1.89 cfs @ 12.25 hrs, Volume= 0.094 af, Atten= 17%, Lag= 3.6 min
 Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.023 af
 Primary = 1.89 cfs @ 12.25 hrs, Volume= 0.071 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 987.93' @ 12.25 hrs Surf.Area= 1,000 sf Storage= 930 cf

Plug-Flow detention time= 418.9 min calculated for 0.094 af (100% of inflow)
 Center-of-Mass det. time= 419.1 min (1,232.4 - 813.2)

Volume	Invert	Avail.Storage	Storage Description
#1	987.00'	1,000 cf	25.00'W x 40.00'L x 1.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	987.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	987.80'	12.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Proposed Conditions

MSE 24-hr 3 100-Year Event Rainfall=7.40"

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Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=987.01' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=1.88 cfs @ 12.25 hrs HW=987.93' TW=984.99' (Dynamic Tailwater)↑**2=Sharp-Crested Rectangular Weir**(Weir Controls 1.88 cfs @ 1.21 fps)**Summary for Pond 4: STM CB 4**

[57] Hint: Peaked at 987.14' (Flood elevation advised)

Inflow Area = 0.748 ac, 29.98% Impervious, Inflow Depth = 4.68" for 100-Year Event event
 Inflow = 4.36 cfs @ 12.25 hrs, Volume= 0.292 af
 Outflow = 4.36 cfs @ 12.25 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.36 cfs @ 12.25 hrs, Volume= 0.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 987.14' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	985.30'	12.0" Round Culvert L= 5.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 985.30' / 985.25' S= 0.0100 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=4.36 cfs @ 12.25 hrs HW=987.13' TW=985.70' (Dynamic Tailwater)↑**1=Culvert** (Inlet Controls 4.36 cfs @ 5.55 fps)**Summary for Pond 4P: Infiltration Swale**

Inflow Area = 0.142 ac, 12.72% Impervious, Inflow Depth = 4.73" for 100-Year Event event
 Inflow = 1.03 cfs @ 12.17 hrs, Volume= 0.056 af
 Outflow = 0.81 cfs @ 12.24 hrs, Volume= 0.056 af, Atten= 22%, Lag= 4.1 min
 Discarded = 0.01 cfs @ 11.40 hrs, Volume= 0.025 af
 Primary = 0.80 cfs @ 12.24 hrs, Volume= 0.031 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 995.48' @ 12.24 hrs Surf.Area= 1,725 sf Storage= 834 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 399.4 min (1,196.4 - 797.0)

Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	6,900 cf	15.00'W x 115.00'L x 4.00'H Prismatic

Device	Routing	Invert	Outlet Devices
#1	Discarded	995.00'	0.200 in/hr Exfiltration over Surface area
#2	Primary	995.40'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 0.5' Crest Height

Proposed Conditions

MSE 24-hr 3 100-Year Event Rainfall=7.40"

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Discarded OutFlow Max=0.01 cfs @ 11.40 hrs HW=995.04' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.80 cfs @ 12.24 hrs HW=995.48' TW=984.97' (Dynamic Tailwater)

↑2=Sharp-Crested Rectangular Weir (Weir Controls 0.80 cfs @ 0.96 fps)

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Stage-Area-Storage for Pond 2AP: Infiltration Pipe

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
992.00	1,530	0	994.60	1,530	1,908
992.05	1,530	31	994.65	1,530	1,947
992.10	1,530	61	994.70	1,530	1,986
992.15	1,530	92	994.75	1,530	2,024
992.20	1,530	122	994.80	1,530	2,063
992.25	1,530	153	994.85	1,530	2,101
992.30	1,530	184	994.90	1,530	2,139
992.35	1,530	214	994.95	1,530	2,176
992.40	1,530	245	995.00	1,530	2,214
992.45	1,530	275	995.05	1,530	2,251
992.50	1,530	306	995.10	1,530	2,288
992.55	1,530	338	995.15	1,530	2,324
992.60	1,530	372	995.20	1,530	2,360
992.65	1,530	406	995.25	1,530	2,396
992.70	1,530	441	995.30	1,530	2,432
992.75	1,530	476	995.35	1,530	2,466
992.80	1,530	512	995.40	1,530	2,501
992.85	1,530	548	995.45	1,530	2,534
992.90	1,530	584	995.50	1,530	2,566
992.95	1,530	621	995.55	1,530	2,597
993.00	1,530	658	995.60	1,530	2,627
993.05	1,530	696	995.65	1,530	2,658
993.10	1,530	734	995.70	1,530	2,689
993.15	1,530	771	995.75	1,530	2,719
993.20	1,530	810	995.80	1,530	2,750
993.25	1,530	848	995.85	1,530	2,780
993.30	1,530	886	995.90	1,530	2,811
993.35	1,530	925	995.95	1,530	2,842
993.40	1,530	964	996.00	1,530	2,872
993.45	1,530	1,003			
993.50	1,530	1,042			
993.55	1,530	1,081			
993.60	1,530	1,120			
993.65	1,530	1,159			
993.70	1,530	1,199			
993.75	1,530	1,238			
993.80	1,530	1,278			
993.85	1,530	1,317			
993.90	1,530	1,357			
993.95	1,530	1,396			
994.00	1,530	1,436			
994.05	1,530	1,476			
994.10	1,530	1,515			
994.15	1,530	1,555			
994.20	1,530	1,594			
994.25	1,530	1,634			
994.30	1,530	1,673			
994.35	1,530	1,713			
994.40	1,530	1,752			
994.45	1,530	1,791			
994.50	1,530	1,830			
994.55	1,530	1,869			

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Hydrograph for Pond 2AP: Infiltration Pipe

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	992.00	0.00	0.00	0.00
2.00	0.00	0	992.00	0.00	0.00	0.00
4.00	0.00	0	992.00	0.00	0.00	0.00
6.00	0.00	0	992.00	0.00	0.00	0.00
8.00	0.01	2	992.00	0.01	0.01	0.00
10.00	0.06	177	992.29	0.01	0.01	0.00
12.00	2.22	1,505	994.09	1.60	0.01	1.59
14.00	0.19	1,082	993.55	0.20	0.01	0.20
16.00	0.10	1,020	993.47	0.10	0.01	0.09
18.00	0.08	1,004	993.45	0.08	0.01	0.07
20.00	0.06	987	993.43	0.06	0.01	0.05
22.00	0.04	966	993.40	0.04	0.01	0.03
24.00	0.02	938	993.37	0.02	0.01	0.01
26.00	0.00	875	993.29	0.01	0.01	0.00
28.00	0.00	824	993.22	0.01	0.01	0.00
30.00	0.00	773	993.15	0.01	0.01	0.00
32.00	0.00	722	993.08	0.01	0.01	0.00
34.00	0.00	671	993.02	0.01	0.01	0.00
36.00	0.00	620	992.95	0.01	0.01	0.00
38.00	0.00	569	992.88	0.01	0.01	0.00
40.00	0.00	518	992.81	0.01	0.01	0.00
42.00	0.00	467	992.74	0.01	0.01	0.00
44.00	0.00	416	992.66	0.01	0.01	0.00
46.00	0.00	365	992.59	0.01	0.01	0.00
48.00	0.00	314	992.51	0.01	0.01	0.00
50.00	0.00	263	992.43	0.01	0.01	0.00
52.00	0.00	212	992.35	0.01	0.01	0.00
54.00	0.00	161	992.26	0.01	0.01	0.00
56.00	0.00	110	992.18	0.01	0.01	0.00
58.00	0.00	59	992.10	0.01	0.01	0.00
60.00	0.00	8	992.01	0.01	0.01	0.00
62.00	0.00	0	992.00	0.00	0.00	0.00
64.00	0.00	0	992.00	0.00	0.00	0.00
66.00	0.00	0	992.00	0.00	0.00	0.00
68.00	0.00	0	992.00	0.00	0.00	0.00
70.00	0.00	0	992.00	0.00	0.00	0.00
72.00	0.00	0	992.00	0.00	0.00	0.00
74.00	0.00	0	992.00	0.00	0.00	0.00
76.00	0.00	0	992.00	0.00	0.00	0.00
78.00	0.00	0	992.00	0.00	0.00	0.00
80.00	0.00	0	992.00	0.00	0.00	0.00
82.00	0.00	0	992.00	0.00	0.00	0.00
84.00	0.00	0	992.00	0.00	0.00	0.00
86.00	0.00	0	992.00	0.00	0.00	0.00
88.00	0.00	0	992.00	0.00	0.00	0.00
90.00	0.00	0	992.00	0.00	0.00	0.00
92.00	0.00	0	992.00	0.00	0.00	0.00
94.00	0.00	0	992.00	0.00	0.00	0.00
96.00	0.00	0	992.00	0.00	0.00	0.00

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Stage-Area-Storage for Pond 2BP: Infiltration Pipe

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
983.00	2,880	0	985.60	2,880	3,598
983.05	2,880	58	985.65	2,880	3,671
983.10	2,880	115	985.70	2,880	3,744
983.15	2,880	173	985.75	2,880	3,816
983.20	2,880	230	985.80	2,880	3,889
983.25	2,880	288	985.85	2,880	3,960
983.30	2,880	346	985.90	2,880	4,032
983.35	2,880	403	985.95	2,880	4,103
983.40	2,880	461	986.00	2,880	4,174
983.45	2,880	518	986.05	2,880	4,244
983.50	2,880	576	986.10	2,880	4,313
983.55	2,880	637	986.15	2,880	4,382
983.60	2,880	699	986.20	2,880	4,450
983.65	2,880	764	986.25	2,880	4,518
983.70	2,880	829	986.30	2,880	4,584
983.75	2,880	896	986.35	2,880	4,650
983.80	2,880	964	986.40	2,880	4,714
983.85	2,880	1,032	986.45	2,880	4,777
983.90	2,880	1,101	986.50	2,880	4,838
983.95	2,880	1,170	986.55	2,880	4,895
984.00	2,880	1,240	986.60	2,880	4,953
984.05	2,880	1,311	986.65	2,880	5,011
984.10	2,880	1,382	986.70	2,880	5,068
984.15	2,880	1,453	986.75	2,880	5,126
984.20	2,880	1,525	986.80	2,880	5,183
984.25	2,880	1,598	986.85	2,880	5,241
984.30	2,880	1,670	986.90	2,880	5,299
984.35	2,880	1,743	986.95	2,880	5,356
984.40	2,880	1,816	987.00	2,880	5,414
984.45	2,880	1,890			
984.50	2,880	1,963			
984.55	2,880	2,037			
984.60	2,880	2,111			
984.65	2,880	2,185			
984.70	2,880	2,259			
984.75	2,880	2,334			
984.80	2,880	2,408			
984.85	2,880	2,483			
984.90	2,880	2,558			
984.95	2,880	2,632			
985.00	2,880	2,707			
985.05	2,880	2,782			
985.10	2,880	2,856			
985.15	2,880	2,931			
985.20	2,880	3,006			
985.25	2,880	3,080			
985.30	2,880	3,154			
985.35	2,880	3,229			
985.40	2,880	3,303			
985.45	2,880	3,377			
985.50	2,880	3,451			
985.55	2,880	3,524			

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Hydrograph for Pond 2BP: Infiltration Pipe

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	983.00	0.00	0.00	0.00
2.00	0.00	0	983.00	0.00	0.00	0.00
4.00	0.00	0	983.00	0.00	0.00	0.00
6.00	0.00	0	983.00	0.00	0.00	0.00
8.00	0.00	0	983.00	0.00	0.00	0.00
10.00	0.01	0	983.00	0.01	0.01	0.00
12.00	2.04	1,508	984.19	0.01	0.01	0.00
14.00	0.24	2,153	984.63	0.30	0.01	0.29
16.00	0.11	1,984	984.51	0.13	0.01	0.11
18.00	0.09	1,939	984.48	0.09	0.01	0.08
20.00	0.06	1,901	984.46	0.07	0.01	0.06
22.00	0.04	1,854	984.43	0.05	0.01	0.03
24.00	0.02	1,793	984.38	0.03	0.01	0.01
26.00	0.00	1,688	984.31	0.01	0.01	0.00
28.00	0.00	1,591	984.25	0.01	0.01	0.00
30.00	0.00	1,495	984.18	0.01	0.01	0.00
32.00	0.00	1,399	984.11	0.01	0.01	0.00
34.00	0.00	1,303	984.04	0.01	0.01	0.00
36.00	0.00	1,207	983.98	0.01	0.01	0.00
38.00	0.00	1,111	983.91	0.01	0.01	0.00
40.00	0.00	1,015	983.84	0.01	0.01	0.00
42.00	0.00	919	983.77	0.01	0.01	0.00
44.00	0.00	823	983.70	0.01	0.01	0.00
46.00	0.00	727	983.62	0.01	0.01	0.00
48.00	0.00	631	983.55	0.01	0.01	0.00
50.00	0.00	535	983.46	0.01	0.01	0.00
52.00	0.00	439	983.38	0.01	0.01	0.00
54.00	0.00	343	983.30	0.01	0.01	0.00
56.00	0.00	247	983.21	0.01	0.01	0.00
58.00	0.00	151	983.13	0.01	0.01	0.00
60.00	0.00	55	983.05	0.01	0.01	0.00
62.00	0.00	0	983.00	0.00	0.00	0.00
64.00	0.00	0	983.00	0.00	0.00	0.00
66.00	0.00	0	983.00	0.00	0.00	0.00
68.00	0.00	0	983.00	0.00	0.00	0.00
70.00	0.00	0	983.00	0.00	0.00	0.00
72.00	0.00	0	983.00	0.00	0.00	0.00
74.00	0.00	0	983.00	0.00	0.00	0.00
76.00	0.00	0	983.00	0.00	0.00	0.00
78.00	0.00	0	983.00	0.00	0.00	0.00
80.00	0.00	0	983.00	0.00	0.00	0.00
82.00	0.00	0	983.00	0.00	0.00	0.00
84.00	0.00	0	983.00	0.00	0.00	0.00
86.00	0.00	0	983.00	0.00	0.00	0.00
88.00	0.00	0	983.00	0.00	0.00	0.00
90.00	0.00	0	983.00	0.00	0.00	0.00
92.00	0.00	0	983.00	0.00	0.00	0.00
94.00	0.00	0	983.00	0.00	0.00	0.00
96.00	0.00	0	983.00	0.00	0.00	0.00

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

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Stage-Area-Storage for Pond 1P: South Infiltration Basin (Total Site)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
983.50	3,130	0	984.54	4,088	3,748
983.52	3,148	63	984.56	4,108	3,830
983.54	3,166	126	984.58	4,127	3,912
983.56	3,184	189	984.60	4,146	3,995
983.58	3,202	253	984.62	4,165	4,078
983.60	3,220	318	984.64	4,184	4,161
983.62	3,238	382	984.66	4,204	4,245
983.64	3,256	447	984.68	4,223	4,330
983.66	3,274	512	984.70	4,242	4,414
983.68	3,292	578	984.72	4,261	4,499
983.70	3,310	644	984.74	4,280	4,585
983.72	3,328	710	984.76	4,300	4,670
983.74	3,346	777	984.78	4,319	4,757
983.76	3,364	844	984.80	4,338	4,843
983.78	3,382	912	984.82	4,357	4,930
983.80	3,400	979	984.84	4,376	5,017
983.82	3,418	1,048	984.86	4,396	5,105
983.84	3,436	1,116	984.88	4,415	5,193
983.86	3,454	1,185	984.90	4,434	5,282
983.88	3,472	1,254	984.92	4,453	5,371
983.90	3,490	1,324	984.94	4,472	5,460
983.92	3,508	1,394	984.96	4,492	5,550
983.94	3,526	1,464	984.98	4,511	5,640
983.96	3,544	1,535	985.00	4,530	5,730
983.98	3,562	1,606	985.02	4,550	5,821
984.00	3,580	1,678	985.04	4,569	5,912
984.02	3,599	1,749	985.06	4,589	6,004
984.04	3,618	1,821	985.08	4,608	6,096
984.06	3,636	1,894	985.10	4,628	6,188
984.08	3,655	1,967	985.12	4,648	6,281
984.10	3,674	2,040	985.14	4,667	6,374
984.12	3,693	2,114	985.16	4,687	6,467
984.14	3,712	2,188	985.18	4,706	6,561
984.16	3,730	2,262	985.20	4,726	6,656
984.18	3,749	2,337	985.22	4,746	6,750
984.20	3,768	2,412	985.24	4,765	6,845
984.22	3,787	2,488	985.26	4,785	6,941
984.24	3,806	2,564	985.28	4,804	7,037
984.26	3,824	2,640	985.30	4,824	7,133
984.28	3,843	2,717	985.32	4,844	7,230
984.30	3,862	2,794	985.34	4,863	7,327
984.32	3,881	2,871	985.36	4,883	7,424
984.34	3,900	2,949	985.38	4,902	7,522
984.36	3,918	3,027	985.40	4,922	7,620
984.38	3,937	3,106	985.42	4,942	7,719
984.40	3,956	3,185	985.44	4,961	7,818
984.42	3,975	3,264	985.46	4,981	7,917
984.44	3,994	3,344	985.48	5,000	8,017
984.46	4,012	3,424	985.50	5,020	8,118
984.48	4,031	3,504			
984.50	4,050	3,585			
984.52	4,069	3,666			

Proposed Conditions*MSE 24-hr 3 100-Year Event Rainfall=7.40"*

Prepared by {enter your company name here}

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Hydrograph for Pond 1P: South Infiltration Basin (Total Site)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	983.50	0.00	0.00	0.00	0.00
2.00	0.00	0	983.50	0.00	0.00	0.00	0.00
4.00	0.00	0	983.50	0.00	0.00	0.00	0.00
6.00	0.00	0	983.50	0.00	0.00	0.00	0.00
8.00	0.01	0	983.50	0.01	0.01	0.00	0.00
10.00	0.06	109	983.53	0.01	0.01	0.00	0.00
12.00	2.05	2,329	984.18	0.02	0.02	0.00	0.00
14.00	0.56	3,298	984.43	0.65	0.02	0.63	0.00
16.00	0.24	3,058	984.37	0.26	0.02	0.24	0.00
18.00	0.18	3,000	984.35	0.19	0.02	0.17	0.00
20.00	0.12	2,953	984.34	0.13	0.02	0.11	0.00
22.00	0.07	2,899	984.33	0.08	0.02	0.06	0.00
24.00	0.03	2,839	984.31	0.04	0.02	0.02	0.00
26.00	0.00	2,727	984.28	0.02	0.02	0.00	0.00
28.00	0.00	2,600	984.25	0.02	0.02	0.00	0.00
30.00	0.00	2,473	984.22	0.02	0.02	0.00	0.00
32.00	0.00	2,348	984.18	0.02	0.02	0.00	0.00
34.00	0.00	2,223	984.15	0.02	0.02	0.00	0.00
36.00	0.00	2,099	984.12	0.02	0.02	0.00	0.00
38.00	0.00	1,977	984.08	0.02	0.02	0.00	0.00
40.00	0.00	1,856	984.05	0.02	0.02	0.00	0.00
42.00	0.00	1,735	984.02	0.02	0.02	0.00	0.00
44.00	0.00	1,616	983.98	0.02	0.02	0.00	0.00
46.00	0.00	1,498	983.95	0.02	0.02	0.00	0.00
48.00	0.00	1,380	983.92	0.02	0.02	0.00	0.00
50.00	0.00	1,264	983.88	0.02	0.02	0.00	0.00
52.00	0.00	1,149	983.85	0.02	0.02	0.00	0.00
54.00	0.00	1,034	983.82	0.02	0.02	0.00	0.00
56.00	0.00	921	983.78	0.02	0.02	0.00	0.00
58.00	0.00	809	983.75	0.02	0.02	0.00	0.00
60.00	0.00	697	983.72	0.02	0.02	0.00	0.00
62.00	0.00	587	983.68	0.02	0.02	0.00	0.00
64.00	0.00	478	983.65	0.02	0.02	0.00	0.00
66.00	0.00	369	983.62	0.01	0.01	0.00	0.00
68.00	0.00	262	983.58	0.01	0.01	0.00	0.00
70.00	0.00	156	983.55	0.01	0.01	0.00	0.00
72.00	0.00	51	983.52	0.01	0.01	0.00	0.00
74.00	0.00	0	983.50	0.00	0.00	0.00	0.00
76.00	0.00	0	983.50	0.00	0.00	0.00	0.00
78.00	0.00	0	983.50	0.00	0.00	0.00	0.00
80.00	0.00	0	983.50	0.00	0.00	0.00	0.00
82.00	0.00	0	983.50	0.00	0.00	0.00	0.00
84.00	0.00	0	983.50	0.00	0.00	0.00	0.00
86.00	0.00	0	983.50	0.00	0.00	0.00	0.00
88.00	0.00	0	983.50	0.00	0.00	0.00	0.00
90.00	0.00	0	983.50	0.00	0.00	0.00	0.00
92.00	0.00	0	983.50	0.00	0.00	0.00	0.00
94.00	0.00	0	983.50	0.00	0.00	0.00	0.00
96.00	0.00	0	983.50	0.00	0.00	0.00	0.00

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STORMWATER OPERATION AND MAINTENANCE PLAN

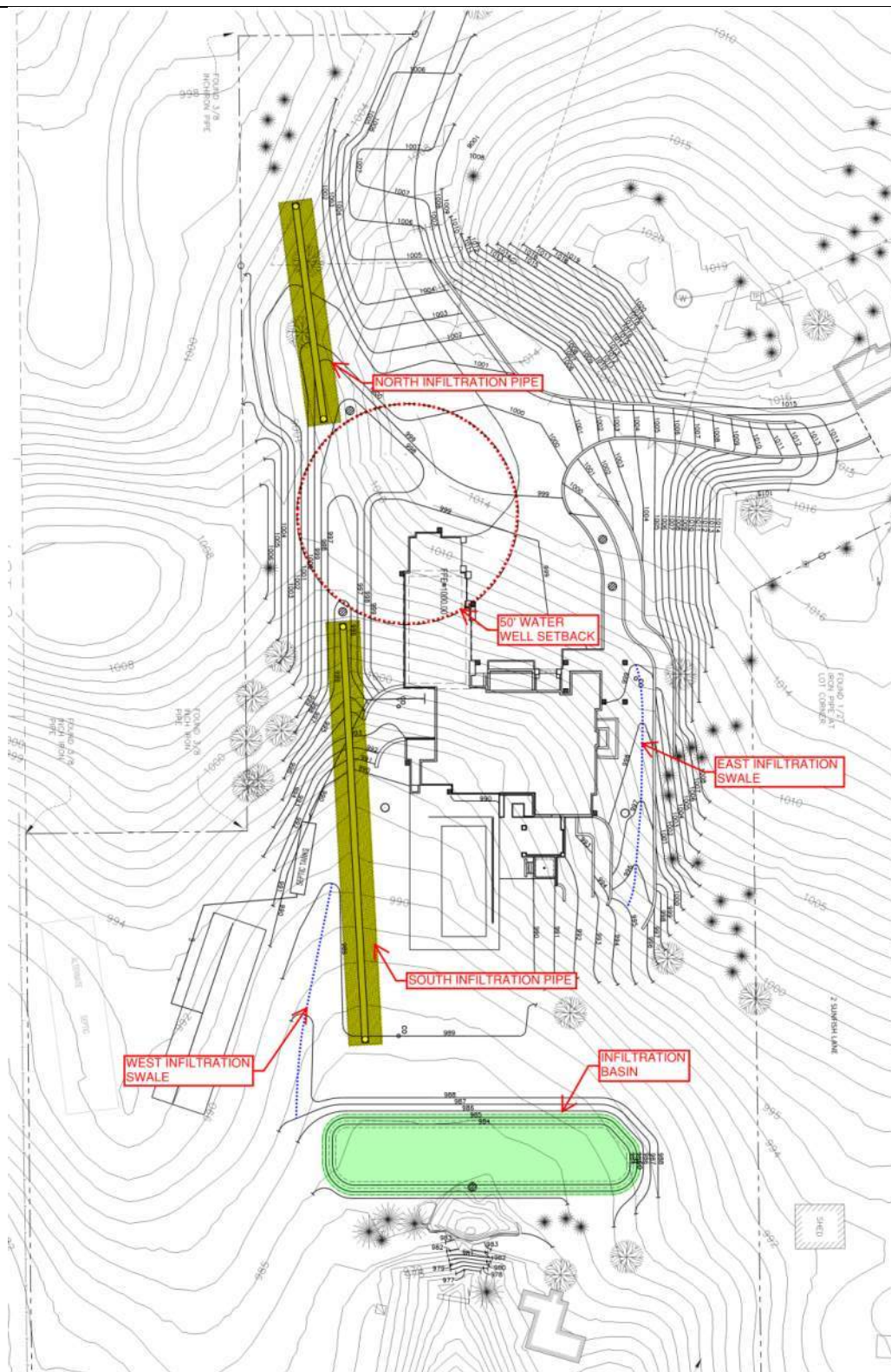
JOHANNSON RESIDENCE

1 Sunfish Lane
Sunfish Lake, MN

June 22, 2020

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OVERVIEW – INFILTRATION BASIN

A infiltration basin is a planted depression or a hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to filtrate through a blended sand and compost medium that is collected by perforated drain tile at the bottom of the system. The purpose of a infiltration basin is to improve water quality in nearby bodies of water and to ensure that rainwater becomes available for plants as groundwater rather than being sent through stormwater drains and discharging to the nearest river or lake.

Below the surface of the basin, soils are engineered and appropriate plants or turf selected for the feature. The basin acts as a small bioretention cell in which stormwater is cleaned and reduced in volume once it enters the area. Nitrogen and phosphorus levels and overall sediment loads in the stormwater are reduced by the action of the plants and growing media on the water.

OVERVIEW – INFILTRATION PIPE

A infiltration basin is a planted depression or a hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to filtrate through a blended sand and compost medium that is collected by perforated drain tile at the bottom of the system. The purpose of a infiltration basin is to improve water quality in nearby bodies of water and to ensure that rainwater becomes available for plants as groundwater rather than being sent through stormwater drains and discharging to the nearest river or lake.

Below the surface of the basin, soils are engineered and appropriate plants or turf selected for the feature. The basin acts as a small bioretention cell in which stormwater is cleaned and reduced in volume once it enters the area. Nitrogen and phosphorus levels and overall sediment loads in the stormwater are reduced by the action of the plants and growing media on the water.

OVERVIEW – MAINTENANCE OF INFILTRATION SYSTEM

Regular inspection and maintenance aids in the effective operation of the infiltration basin system. It is the responsibility of the property owner to maintain all stormwater BMP's in accordance with the minimum design standards and other guidance provided in this manual.

Inspection Schedule:

One inspection form shall be completed for the proposed system on a regular basis as specified on the attached checklist.

Erosion Control:

The soil and mulch on the property shall be inspected for eroded areas. Eroded areas shall be filled with soil or mulch and vegetated. In the event that erosion persists in a particular area, compacted aggregate shall be used to further stabilize the slope and to mitigate future erosion.

Sediment Accumulation & Clogging:

Sediment accumulation within the basin may reduce the filtration capacity and impair proper performance of the facility. The facility shall be inspected for accumulation of sediment as part of the inspection. Excessive sediment accumulation shall be removed as noted in the attached form.

Standing Water:

The recurring presence of standing water more than 48 hours after a rain event indicates that the soil media within the basin has been overcompacted or has accumulated sediment that is impeding filtration. This could also indicate that the perforated drain tile is clogged and needs to be cleaned out. If this condition occurs, the vegetation within the basin should be removed and the confining layer of soil removed and replaced with new, free-draining soil. The new soil media should be tested for proper filtration and then the vegetation replaced.

INSPECTION AND MAINTENANCE FORM

BMP/Location: Infiltration Pipe		
Date:	Inspector:	
Inspection Activity	Comments	Recommended Actions
<i>Monthly (& following large storm events)</i>		
Trash and Debris		*Remove trash and debris as soon as possible *Remove sediment in pipes when depth exceeds 6" or when infiltration is compromised
Catch Basins and Roof Drains		*Record depth of sediment at each inspection to gauge sediment accumulation rate *A vacuum truck shall be utilized to remove sediment within infiltration systems when infiltration is compromised
BMP: UG 36" CMP		
Dewatering		*If standing water is located, notify the city of the system's failure to drain within 72 hours of a storm event for further direction
<i>Annually</i>		
Structural Components		*Notify maintenance staff of any observed structural or screen damage, loose or missing bolts, inlet or outlet blockages, etc.
Surfaces above structure		*Sinkholes shall be filled and monitored for further depression. Continued depressions likely indicate a device failure and internal inspection is warranted.
Vegetation		*Remove and replace dead or diseased plants *Remove invasive weeds and make sure bare areas are covered
Additional Comments:		
Maintenance Required?	YES / NO	Maintenance Date:
Maintenance Comments:		

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BMP/Location: Infiltration Basin		
Date:	Inspector:	
Inspection Activity	Comments	Recommended Actions
<i>Monthly (& following large storm events)</i>		
Trash and Debris		*Remove trash from garden area and clear inflow points
Ponding		*Clear inflow points of built-up sediment, check for erosion
<i>Annually</i>		
Mulch		*Check mulch surface for sediment build-up. Remove and replace mulch material as required
Underdrain System		*If clogged, try back-washing/vacuuming under the drain from the outlet
Infiltration Basin Soil Mix		*Make sure soil level is below overflow grate and has a hard surface level.
Vegetation		*Remove and replace dead or diseased plants *Remove invasive weeds and make sure bare areas are covered
Additional Comments:		
Maintenance Required?	YES / NO	Maintenance Date:
Maintenance Comments:		