



Title: Lake Minnetonka Flats Development

Prepared by: Name: Veronica Sannes, Permitting Technician
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Recommendation:

Approval of Minnehaha Creek Watershed District (MCWD) permit application on the following conditions:

1. Payment of MCWD fees for cost of permit application, public notice mailing, and engineering and legal review.
2. Submission of Financial Assurance for Wetland Protection and Stormwater Management in the amount of:
 - a. \$5,515 for the Wetland Protection rule
 - b. \$2,452 for the Stormwater Management rule
 - c. \$7,967 total
3. Finalization of wetland buffer maintenance plan.
4. Recording of a Maintenance Declaration with Hennepin County for stormwater facilities and wetland buffer.
 - a. A draft will be provided to MCWD for review prior to recording.

Permit Conditions:

1. Incorporation and conformance of specific buffer soil amendment and planting plan.
2. Continued maintenance in accordance with the planting maintenance plan to ensure proper buffer establishment.

Summary and Background:

Location and Project Scope:

Monarch Development Partners, LLC, on behalf of Russell and Betty Falness, (Applicant) is proposing to develop two former single-family home properties totaling approximately 8.09 acres at 2400 and 2420 Commerce Boulevard in the City of Mound. The proposed development consists of three, four-unit, two-story condominium buildings, totaling 12 units (Project), as shown on page 2 of Attachment A. The development site is located in the Lake Minnetonka subwatershed and lies east of County Road 110 or Commerce Boulevard, and west of Lost Lake, a large wetland complex connected to the north side of Cooks Bay on Lake Minnetonka via approximately 2,000 feet of channel (Attachment B). The Lost Lake wetland is a Preserve wetland with predominantly cattail vegetation. Lost Lake is surrounded by predominantly developed lots that are a mix of residential, industrial, and commercial properties.

City Comprehensive Plan:

Along Commerce Boulevard, which runs north-south between Langdon Lake to the west and Lost Lake to the east, existing land use includes single-family detached, multifamily, retail-commercial, and institutional, with Our Lady of the Lake Church, immediately west of the site.

In a January 2024 amendment to its Comprehensive Plan, the City of Mound guides this area for mixed use, a designation that is, "meant to recognize that the characteristics of these areas are unique and can support a variety of uses, including commercial, public, and residential including townhomes, row houses and existing multifamily." This designation "is intended to provide flexibility so that property owners and developers have options when considering infill development in the areas." The Comprehensive Plan identifies that areas south of Shoreline Drive on Commerce Boulevard are anticipated to contain a greater percentage of residential development as part of the mixed use.

MCWD Rule Triggers:

The Applicant proposes to develop the site west of the Lost Lake wetland and triggers the Erosion Control, Wetland Protection, and Stormwater Management rules. The Erosion Control Rule is triggered due to a land disturbance area

greater than 5,000 square feet and an excavation volume greater than 50 cubic yards. While no wetland impacts are proposed, the buffer requirement of the Wetland Protection Rule is triggered by construction of impervious surface upgradient of the on-site wetland that triggers the Stormwater Management Rule. The Stormwater Management Rule is triggered as a result of the redevelopment and increase in impervious surface area. The Applicant requests an exception, pursuant to the MCWD [Variances and Exceptions Rule](#), with respect to Wetland Protection Rule section 5, which requires that a vegetated buffer 75 feet in average width be established adjacent to a wetland with a Preserve management classification. Criteria under section 5(c) requires that the buffer width may be reduced to no less than 50% of the base width of 75 feet, and in most locations this minimum width is not being met. To offset the water quality loss of buffer width, the Applicant proposes to capture and treat approximately an acre of currently untreated impervious surface runoff from Commerce Boulevard, and to improve the wetland buffer performance and habitat through soil amendments and an enhanced buffer planting plan.

Project Evolution:

Winter 2024

In February of 2024, MCWD hosted a coordination meeting to discuss the initial site plan, including the proposal to dredge Lost Lake for boat slips and navigational access from the development to Cooks Bay. This meeting included the City of Mound's Mayor, City Manager, Community Development Director, and planning consultant; Department of Natural Resources (DNR) Staff; State Representative Andrew Myers; the Lake Minnetonka Conservation District's (LMCD) Board Member, Executive Director, and regulatory staff; Monarch Development Partners; and MCWD's Board President, Administrator, and regulatory staff.

During this meeting, MCWD and the DNR reviewed the historical navigational capacity of Lost Lake, including the 1990s dredging permit to maintain the existing channel, removing fill from the wetland affiliated with the development of a post office, and the existing configuration of docks in the area. The meeting participants discussed that Monarch's proposal to expand navigational dredging for additional dock access within the Lost Lake wetland likely would not be permissible under MCWD or DNR rules. Monarch Development Partners also discussed their work with Kjolhuag Environmental Services who proposed to change the wetland management classification from Preserve to Manage 1 and therefore reduce the required buffer width from 75-feet to 45-feet.

Spring 2024

Monarch Development Partners evaluated and adjusted the site plan and dredging proposal and presented a revised concept to the Mound City Council. The revised design incorporated connected driveways and parking underneath the proposed units to increase wetland buffer widths and total wetland buffer area relative to the initial proposal. These changes to the site plan also removed hardcover from within the 25-foot shoreland impact zone, implemented by the City of Mound.

Other significant changes to the plan include a revised dock configuration extending to existing open water towards the north side of Lost Lake. This removed any need to dredge for navigational access, resulting in a smaller ecological impact.

Summer 2024

Staff and Monarch Development Partners introduced the revised site plan and obtained preliminary feedback from the MCWD Board of Managers regarding the development proposal and the associated variance or exception request. During the meeting, there were questions and discussion regarding site design of the garage and unit layout, as well as clarifying questions regarding the proprietary stormwater management facilities. It was noted that any development beyond replacing the existing single-family homes would likely require a variance or exception from the buffer width requirements, as outlined in MCWD's Wetland Protection Rule, and that the City of Mound's goal for the area is to increase density, which single-family homes would not achieve. There was also conversation surrounding previous discussions regarding the proposal to change the Lost Lake wetland's management classification from a Preserve wetland to a Manage 3 wetland which would reduce the required buffer width from 75-feet to 45-feet. MCWD staff emphasized that a detailed analysis would be required for such a reclassification, and even with the classification change, a variance or exception would still be necessary.

Fall 2024

Monarch Development Partners submitted the proposal for MCWD permitting and have worked with MCWD staff to finalize the application and Exception request.

To address the site constraints first discussed at the Winter meeting, which result in a shortfall of wetland buffer width and area, Monarch Development Partners evaluated opportunities to maximize the treatment of local stormwater runoff, expand the wetland buffer in alternate locations across the site and increase buffer quality through vegetative and soil enhancements. The revised design proposes to treat the site's approximately 0.49 acres of impervious surface to regulatory standards, and, in addition, divert and treat 0.98 acres of public roadway from Commerce Boulevard which presently drains, untreated, to Lost Lake. The wetland buffer enhancements propose to incorporate soil amendments for improved infiltration and soil structure, as well as a diverse planting plan that incorporates live plantings of native trees, shrubs, and forbs.

MCWD Rule Analysis:

Erosion Control Rule:

MCWD's [Erosion Control Rule](#) applies to projects that propose to disturb more than 5,000 square feet or move 50 cubic yards or more of material. The Project proposes to disturb 39,159 square feet and excavate approximately 5,000 cubic yards; therefore, the rule applies. The Applicant proposes perimeter control at all construction limits with two rows of erosion control on the southeastern limits towards the wetland and lake (page 19 of Attachment A). Staff have reviewed the permit and have found it to be complete and compliant with all Erosion Control Rule requirements.

Wetland Protection Rule:

Section 4(a)(2) of the MCWD [Wetland Protection rule](#) states that if an activity requires a permit under the Stormwater Management Rule (see below), a permanent vegetated buffer is required on the part of a wetland that is downgradient of the new or reconstructed impervious surface. The Lost Lake wetland is classified as a Preserve wetland and requires a 75-foot buffer. As referenced in the "Exception Request" section below, the Applicant has requested an exception to section 5 of the Wetland Protection rule, which requires the 75-foot buffer, and specifically criteria under section 5(c) which requires that the buffer width at any specific location may be no less than 50% of the base width of 75 feet.

The Applicant instead proposes a buffer that ranges from 8.0 to 37.7 feet and is, on average, 25 feet in width and is approximately 750 feet in length. The Applicant proposes for the proposed buffer to be improved by extending the buffer footprint to the northern area of the parcel, incorporating soil amendments, and implementing an enhanced planting plan. Establishing a 75-foot buffer and full rule compliance would result in 0.74 acres of buffer. The Applicant proposes a reduced buffer with an average width of 25 feet and an area of 0.51 acres.

The Applicant has included adequate site plans showing property lines, delineation of the wetland, location of the wetland buffer area, location of buffer monuments, proposed grading areas within the buffer, and the proposed buffer Planting Plan, all in compliance with section 7 of the Wetland Protection Rule. The wetland boundary was determined by a delineation performed in June 2023 and that the MCWD approved in August 2024. The proposed Planting Plan describes that the Applicant intends to seed the wetland buffer area using the MNDOT 34-262 Wet Prairie mix to achieve rule compliance and incorporate 253 live plantings of native trees, shrubs, and perennials, as described on page 18 of Attachment A, to exceed base rule requirements. The Planting Plan also describes the bed preparation used for the buffer, which consists of soil amendments prior to planting. An erosion control blanket will be used during vegetation establishment as well as consistent monitoring to ensure there is no erosion and that the buffer is established correctly.

Section 4(d) of the rule requires, as a condition of permit issuance, that the property owner file a maintenance declaration on the deed establishing the perpetual buffer and maintenance of the buffer after establishment.

Stormwater Management Rule:

MCWD's [Stormwater Management Rule](#) applies to development that meets criteria for site size, extent of site disturbance, and impervious surface as outlined in Table 1 in the rule. The Project is subject to Section 2(a) of the Stormwater Management rule and triggers the rule due to the site size, disturbance, and increase in impervious surface. Because the Project proposes to increase site impervious surface by over 50%, the applicant is required to treat the entire site's post-development impervious surface for stormwater volume and rate control. Staff and MCWD Engineer

have reviewed the permit and have found it to be complete and compliant with all Stormwater Management Rule requirements.

The Applicant proposes to use underground filtration (consisting of underground detention pipes/chambers upstream of a proprietary Jellyfish filter system) to capture and treat the entire site impervious surface to meet the Stormwater Management Rule requirements. As an additional benefit, the Applicant intends to expand treatment to also capture currently untreated runoff from the public road right-of-way, on Commerce Boulevard, to exceed the Stormwater Management Rule requirements. The off-site and on-site runoff will be directed to a rate control chamber system which will then discharge into the Jellyfish filter system and ultimately discharges to the lake. The rate control chamber is responsible for managing the flow of the runoff and controlling the rate at which the water ultimately enters the lake. The Jellyfish system is responsible for filtering trash, sediment, nutrients, and other pollutants before the runoff is routed to the lake. The max depth of the system is 3 feet above groundwater, and therefore would not conflict with the water table.

Volume Control

Section 3(a)1 of the Stormwater Management Rule requires volume control in the amount of 1 inch over the impervious surface area required in Table 1. The Project is required to treat 1 inch over the entire site's impervious surface, which is 21,368 square feet. The rule requires infiltration where feasible. However, infiltration is prohibited in areas where soils are predominantly Hydrologic Soil Group D (clay) or otherwise unreliable for infiltration. Soil borings found clay soils, and therefore infiltration is prohibited, which prompted the Applicant to pursue filtration methods. Other volume reduction practices listed in Appendix A would also not be able to feasibly provide the level of volume control required. Therefore, as indicated in section 3(c), filtration practices are required to achieve phosphorus control in an amount equivalent to that which would be achieved through the required volume reduction.

Phosphorus Control

Appendix A of the Stormwater Management Rule further explains that filtration practices are to achieve the phosphorus control credit by treating for twice the required volume reduction. Therefore, the filtration practice is sized for 2 inches over the treatment area, double the required volume for infiltration, and the adjusted required volume is 3,561 cubic feet. However, the system is oversized to 5,340 cubic feet to include off-site stormwater treatment equivalent to 0.5 inches of runoff over the adjacent 42,677 square feet of contributing impervious surface area from Commerce Boulevard. While the additional treatment is not sized for 2 inches over the treatment area due to spatial constraints, this additional 0.5-inch treatment provides additional water quality benefits as explained in the "Water Quality" section below.

Rate Control

Section 4 of the rule requires that the proposed work not increase the peak runoff rate from the site, in aggregate, for design storm events, and that any increase in peak runoff at any specific point of discharge not have a local adverse impact. The Applicant has demonstrated on page 7 of Attachment C that rates during 2-year, 10-year, and 100-year design storms would decrease and there is no increase at any specific point of site discharge.

Freeboard Requirements

Section 6 of the rule requires two feet of vertical separation between the 100-year high water elevation of a waterbody or stormwater practice and the low opening of any structure, unless the structure opening is hydraulically disconnected from the waterbody or practice. The 100-year high water elevation of the underground stormwater system is 937.05 feet. During the 100-year event, the underground stormwater system would back up to the lowest catch basin rim elevation at 937.05 feet. This elevation matches the 100-year elevation of the underground system, containing water levels underground during the 100-year event. Therefore, while there is not two feet of vertical separation between the 100-year high water level of the system and low openings, hydraulic disconnection is achieved between the stormwater system and the low openings during the 100-year event. The Applicant is constrained by street grades, building and garage height restrictions, and water table levels and is not able to gain any more vertical separation. The proposal has been evaluated by the MCWD Engineer. The Engineer has confirmed that hydraulic disconnection is provided, and rule requirements are met.

The catch basin is located adjacent to a curb cut which functions as the Emergency Overflow (EOF) of the system. The elevation of the EOF is 937.55 feet. If the system exceeds the 100-year high water level, water will be allowed to surcharge the catch basin and flow over the curb but into the lake without flooding the lowest opening, which are doors with elevations of 937.75 feet. The system has been reviewed by the MCWD Engineer and confirmed to be hydraulically disconnected from any structure openings, ensuring compliance with freeboard requirements.

Section 7(b) also provides that there may be no increase in bounce for design storm events, no increase in inundation period for 1-year, 2-year, 10-year, and 100-year design storm events, and no permitted runout control elevation changes. The proposed project conforms to all of these standards.

Section 10(c) of the rule requires, as a condition of permit issuance, that the property owner file a maintenance declaration on the deed establishing perpetual maintenance for the stormwater facilities.

Floodplain Alteration Rule

MCWD's [Floodplain Alteration Rule](#) is triggered when a project proposes to fill, excavate, or grade within the floodplain of a waterbody. While the applicant proposes to install soil amendments within the floodplain of Lost Lake to enhance the wetland buffer, section 3(a) of the Floodplain Alteration Rule states that a permit is not required for soil amendments, therefore, the rule is not triggered.

Waterbody Crossings and Structures Rule:

MCWD's Waterbody Crossings and Structures Rule is triggered when a roadway, bridge, boardwalk, utility, conveyance, or associated structure is proposed below the top of bank of a waterbody. The Applicant is currently pursuing, with the LMCD, a docking permit for a dock which would extend from the condominium units to boat slips towards the north side of Lost Lake. The current dock proposal is approximately 600 feet long and affixed to the shore in two locations, one outside of the proposed condominiums and one on the northern side of the parcel to access the off-site boat slips. While the current proposal is shown on page 3 of Attachment A, the configuration may be subject to change as the Applicant moves through the LMCD permitting process. While the Waterbody Crossings and Structures Rule regulates boardwalks, it does not apply to docks. This is consistent with considerations of resource allocation and focus on higher impact activities, and reflects that docks are regulated by the LMCD. The present dock proposal involves an extended dock length in order to avoid the need to dredge, and it would be aligned at a shallow angle in relation to the shoreline. MCWD practice has been that a dock of an extended length to reach navigable depth or avoid dredging remains a dock. MCWD staff, in consultation with legal counsel, has considered whether the alignment somewhat parallel to the shore affects the applicability of that practice in this case. Because the dock's function is for access to moored watercraft, and not for pedestrian use or associated with other shoreline facilities, staff finds that the structure remains a dock and, therefore, that the Waterbody Crossings and Structures rule doesn't apply.

Exception Request:

The Applicant seeks an exception to section 5 of the Wetland Protection rule, which requires, for a Preserve wetland, a buffer that averages 75 feet in width and is no less than half that width at all points. The Applicant instead proposes an enhanced wetland buffer and the treatment of approximately an acre of currently untreated runoff from Commerce Boulevard. As noted in the Variances and Exceptions rule, the Board of Managers may grant an exception from a particular water resources standard, specification, or management method in the MCWD rules, if it determines that an alternative approach proposed by the Applicant would achieve water resource outcomes of the type that the Board intends the standard, specification or method to achieve, and would do so to at least the same degree.

Section 5(c) states that buffer width at any point may be reduced to no less than 50% of Base Width, provided total buffer area is maintained. The Project does not meet those requirements as 50% of the 75-foot Base Width is 37.5 feet, and the majority of the proposed buffer has a width less than 37.5 feet. The minimum and maximum buffer widths are 8.0 and 37.7 feet, respectively. Section 5(d) states that the District may accept a shortfall in buffer area if the Applicant demonstrates that proposed buffer conditions will provide function and value equal to or greater than that which a buffer or required area would provide. The proposal also has a shortfall in buffer area, which the Applicant proposes to account for by the wetland buffer improvements and additional stormwater treatment.

Wetland Buffer Proposal:

The Applicant proposes to enhance the buffer in three ways: (1) Extend the wetland buffer into the northern areas of the site, where the buffer is not required, (2) Implement soil amendments to the wetland buffer area, and (3) Provide enhanced wetland buffer habitat by planting native trees and shrubs into the wetland buffer area, rather than relying solely on a standard seed mix.

Extended Buffer

The Wetland Protection Rule requires that wetland buffers be established downgradient of the proposed impervious surface. However, the Applicant proposes also to extend the wetland buffer to the northern areas of the parcel, as shown on page 6 of Attachment A, establishing wetland buffer downgradient of other, existing off-site impervious surface upgradient from the wetland. This impervious surface is on off-site private land, but the Applicant proposes the buffer on the Applicant's property.

Soil Amendments

The Applicant proposes to implement soil amendments prior to establishing wetland buffer vegetation. The subsoil will first be de-compacted to a depth of 6 inches with a grading chisel before the placement of a minimum of 6 inches of organic topsoil. Soil amendments improve wetland buffer function by improving infiltration rates which can result in improved nutrient filtering, minimized risk of erosion, and decreased runoff rates.

Enhanced Planting Plan

Section 7 of the Wetland Protection Rule requires that wetland buffer planting plans specify the seeding or planting method, but does not require a specific approach. As a result, a standard native seed mix planting plan meets rule requirements. The Applicant has proposed an enhanced planting plan which combines a base native seed mix with 253 larger plugs of native trees, shrubs, and forbs. Incorporating trees and shrubs into a planting plan not only increases biodiversity but also leverages the presence of more mature plants to have earlier habitat and water quality benefits. The Applicant is working with MCWD to develop a suitable maintenance plan for the wetland buffer vegetation, with the finalization of this plan being a condition of permit approval. The proposed plan includes watering the buffer with approximately 1 inch of water per week, when necessary, using an erosion control blanket to prevent erosion, performing bi-monthly weeding, replacing plants annually to ensure full vegetation cover, and conducting annual tree and shrub pruning.

Commerce Boulevard Treatment Proposal:

The Applicant also proposes to reroute and treat approximately 1 acre of currently untreated stormwater runoff from Commerce Boulevard to the on-site filtration system. The additional treatment of the Commerce Boulevard runoff results in a net decrease in annual particulate phosphorus, dissolved phosphorus, and total suspended solids discharging into Lost Lake when compared to both the existing condition and full rule compliance.

Exception Analysis:

MCWD staff and Engineer have evaluated both the site constraints which prompt the exception request, and how the proposal compares with strict rule compliance in regard to two key functions of wetland buffers: improving water quality and providing habitat.

Site Constraints

The site has an average depth of 83.5 feet from the east side of Commerce Boulevard to the west side of the Lost Lake public water wetland. Based on a review of aerial photographs, and information provided by Monarch Development Partners, the former single-family homes represent approximately 0.25 acres of impervious surface within approximately 13-25 feet of the wetland edge. Some of the structures affiliated with this former use were removed between 2006 and 2009, and some remain.

The current development layout has front setbacks from sidewalk along Commerce Boulevard as narrow as 12.4 feet, with other larger front setbacks constrained by adjacent property boundaries and geometry along the road. Given the site depth, even with relatively narrow front setbacks, and an evolution in the development design that has eliminated rear parking in favor of internal parking under the residential structure, the site is challenged to meet wetland buffer setbacks from Lost Lake to the east.

As described above, given the site width of 83.5 feet between Commerce Boulevard and the Lost Lake wetland, it is likely that any infill redevelopment attempting to increase density at this location in guidance with the City of Mound’s Comprehensive Plan will encounter constraints with the required 75-foot wetland buffer. Requiring development to occur wholly outside of the required 75-foot wetland buffer may render the property essentially unbuildable, beyond the potential to replace single family homes with the same setbacks.

The northern condos cannot be moved closer to Commerce Boulevard and further from Lost Lake due to northern parcel location and setback requirements. The southern condos are constrained by the placement of stormwater facilities and guest parking locations.

Water Quality:

A primary function of wetland buffers is the water quality benefits they provide by filtering pollutants, sediment, and excess nutrients from stormwater runoff before it enters the wetland. The Applicant’s proposal has been evaluated against existing conditions and full Wetland Protection Rule compliance, which would require a 75-foot wetland buffer.

In the existing condition, neither the on-site area nor the off-site area of Commerce Boulevard (collectively referred to as Total Site, for clarity) receive any stormwater treatment to reduce pollutant loads entering Lost Lake. As shown in Table 1, pollutant loads are higher under the existing conditions than under the proposed conditions, where the Applicant proposes treatment for the Total Site, reducing total loads into the system.

Full rule compliance for the Wetland Protection Rule would require the establishment of a 75-foot buffer and therefore likely render the property unbuildable or, at most, limit development to single-family home construction, which would require a 25-foot wetland buffer and would require no stormwater management treatment. Currently, stormwater runoff from Commerce Boulevard is captured by catch basins and routed directly into Lost Lake through a storm sewer pipe, and therefore would not receive any nutrient or sediment filtration by virtue of overland flow to Lost Lake through vegetated buffer. Therefore, no water quality benefits would be gained from the wetland buffer in regard to the off-site Commerce Boulevard runoff. Any removal of pollutant loads from the on-site area would only come from the wetland buffer and no additional removal. Even though the 75-foot buffer would result in some water quality benefit, the lack of treatment for Commerce Boulevard would mean that pollutant loads would still be higher than the proposed condition, which treats the Total Site.

In the proposed conditions, both on-site and off-site pollutant loads are reduced, resulting in lower pollutant loads overall for the Total Site. As shown in Table 1, when comparing the existing condition to the proposed condition, the existing condition has the highest nutrient loads. While the establishment of a 75-foot buffer would likely reduce nutrient loads from the site itself from the existing condition, the runoff from Commerce Boulevard would not be treated. The proposed conditions indicate a reduction in both on-site and street nutrient loads, resulting in lower annual nutrient loads compared to the existing condition. Table 1 compares pollutant loads between the existing and proposed conditions and demonstrates the removal amount that will come as a result of treatment. However, full rule compliance is not included in these tables, as to not indicate that full rule compliance would correspond with a specific amount of pollutant removal or load.

	Existing Total Site Pollutant Load (lbs/year)	Proposed Total Site Pollutant Load (lbs/year)	Pollutant Removal (lbs/year)
Annual Particulate Phosphorus	1.04	0.78	0.70
Annual Dissolved Phosphorus	0.85	0.64	0.57
Annual Total Phosphorus	1.89	1.42	1.27
Annual Total Suspended Solids	344	119	370

Table 1. Pollutant Loads in Existing and Proposed Conditions

Habitat:

Another key function of wetland buffers is to support wildlife habitat by providing shelter, food, and breeding grounds for various species. When comparing a typical planting plan to one which incorporates soil amendments and a more diverse planting plan, the latter provides more benefits for wildlife. Soil amendments improve soil structure through the addition of organic matter and the decompaction of the soil, which enhances plant growth and resilience. The use of plant plugs rather than relying solely on seeds accelerates vegetative cover establishment, and the incorporation of more mature plants leads to more rapid habitat creation. A diverse planting strategy also enhances habitat function as increased biodiversity provides a wider range of shelter and food sources for organisms with varying needs. The existing vegetation in the proposed buffer area is sparse and low quality. The Applicant's proposed planting plan will increase habitat value and function compared to the existing conditions. While a 75-foot buffer provides a larger area for wildlife habitat, relying solely on a forb seed mix leads to limited habitat complexity and little structural diversity without trees and shrubs. The 25-foot buffer offers less habitat area, but the inclusion of trees and shrubs provides greater vertical structure which supports a higher number of species by providing more varied habitat, allowing species that rely on vertical structure to create habitat in an area they wouldn't be able to if dominated only by forbs.

Summary:

The Applicant has applied for a Minnehaha Creek Watershed District permit under the Erosion Control, Wetland Protection, and Stormwater Management Rules, and an exception to the wetland buffer width requirement as outlined in section 5(c) of the Wetland Protection Rule requiring that buffer width may be reduced to no less than 50% of the base width of 75 feet. Section 5(d) also outlines that there may be a reduction in buffer area so long as the proposed buffer will provide function and value equal to or greater than that which a buffer of required area would provide. The Applicant has proposed additional stormwater treatment, expanding the buffer beyond the required area, incorporating soil amendments, and enhanced buffer plantings to offset the shortfall in buffer width and area.

MCWD staff and District Engineer have evaluated the exception request of the 75-foot wetland buffer width in regard to water quality and habitat and find that the Applicant has provided sufficient evidence that the proposed project will achieve water resource outcomes equivalent or greater than full rule compliance in regard to section 5 of the Wetland Protection rule.

Therefore, staff recommends approval of the requested exception, and the permit application, with the conditions listed at the beginning of this report.

Attachments:

- A. Site Plans
- B. Site Maps
- C. Stormwater Management Report

Attachment A: Site Plans

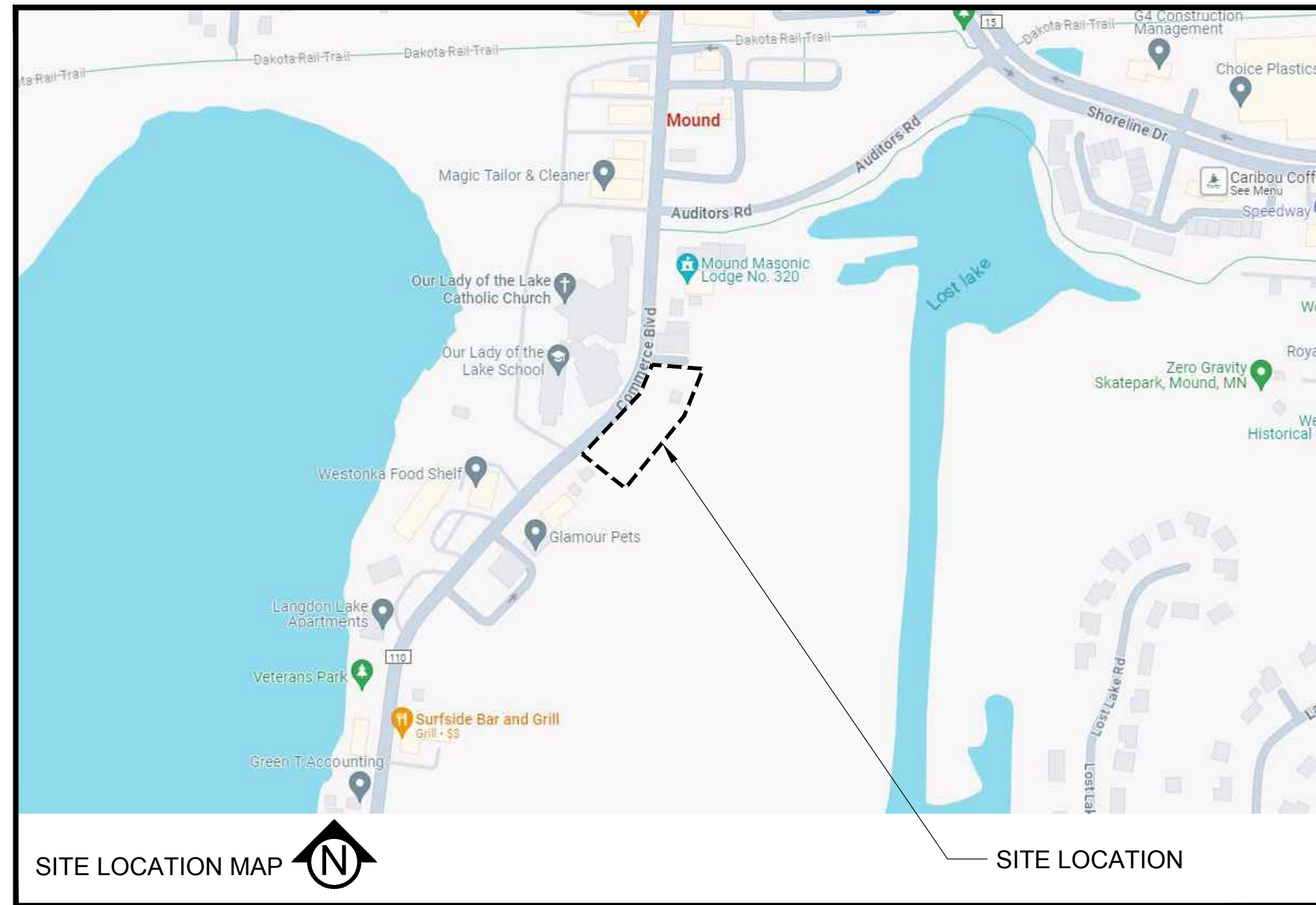
LAKE MINNETONKA FLATS

MOUND, MINNESOTA

ISSUED FOR: WATERSHED RESUBMITTAL

**PRELIMINARY:
 NOT FOR
 CONSTRUCTION**

PROJECT
LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD, MOUND, MN 55364
 OWNER
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331



SITE LOCATION MAP

SITE LOCATION

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.

Matthew R. Pavek
 Matthew R. Pavek
 DATE 09/25/24 LICENSE NO. 44263

ISSUE/SUBMITTAL SUMMARY	
DATE	DESCRIPTION
07/31/24	CITY SUBMITTAL
08/01/24	WATERSHED SUBMITTAL
08/27/24	CITY RESUBMITTAL
09/06/24	CITY WATERSHED RESUBMITTAL
09/18/24	CITY RESUBMITTAL
09/25/24	WATERSHED RESUBMITTAL

PROJECT MANAGER	MATT PAVEK
CONTACT NUMBER	612-615-0060 X701
DRAWN BY	MD, MP, RB
REVIEWED BY	MP, RB
PROJECT NUMBER	23360

REVISION SUMMARY	
DATE	DESCRIPTION

SHEET INDEX	
SHEET NUMBER	SHEET TITLE
C0.0	TITLE SHEET
C1.0	REMOVALS PLAN
C2.0	SITE PLAN - OVERALL
C2.1	SITE PLAN
C2.2	OPENSOURCE EXHIBIT
W1.0	75' BUFFER EXHIBIT
W1.1	SHORELAND IMPACT EXHIBIT
W1.2	FLOODPLAIN EXHIBIT
C3.0	GRADING PLAN
C4.0	UTILITY PLAN - SAN & WATER
C4.1	UTILITY PLAN - STORM
C5.0	CIVIL DETAILS
C5.1	CIVIL DETAILS
C5.2	CIVIL DETAILS
C5.3	CIVIL DETAILS
L1.0	LANDSCAPE PLAN
L1.1	VEGETATED BUFFER PLAN
L1.2	LANDSCAPE PLAN NOTES & DETAILS
SW1.0	SWPPP - EXISTING CONDITIONS
SW1.1	SWPPP - PROPOSED CONDITIONS
SW1.2	SWPPP - DETAILS
SW1.3	SWPPP - NARRATIVE
SW1.4	SWPPP - ATTACHMENTS
SW1.5	SWPPP - ATTACHMENTS

TITLE SHEET

C0.0

PROJECT CONTACTS		
	NAME & ADDRESS	CONTACT
CIVIL ENGINEER	CIVIL SITE GROUP 5000 GLENWOOD AVE GOLDEN VALLEY, MN 55422	MATT PAVEK 612-615-0060 MPAVEK@CIVILSITEGROUP.COM
LANDSCAPE ARCHITECT	CIVIL SITE GROUP 5000 GLENWOOD AVE GOLDEN VALLEY, MN 55422	ROB BINDER 612-615-0060 RBINDER@CIVILSITEGROUP.COM
PROPERTY OWNER	MONARCH DEVELOPMENT PARTNERS, LLC 441 SECOND STREET EXCELSIOR, MN 55331	CARL RUNCK 612-209-8688 CARL@MONARCHDEVELOPMENTSPARTNERS.COM
ARCHITECT	WHITTEN ASSOCIATES 4159 HEATHERTON PLACE MINNETONKA, MN 55345	TIM WHITTEN 612-747-0771 TIM@WHITTENASSOCIATES.COM
SURVEYOR	CIVIL SITE GROUP 5000 GLENWOOD AVE GOLDEN VALLEY, MN 55422	RORY SYNSTELIEN 612-615-0060 RORY@CIVILSITEGROUP.COM
GEOTECHNICAL ENGINEER	HAUGO GEOTECHNICAL SERVICES 2825 CEDAR AVENUE S MINNEAPOLIS, MN 55407	PAUL GIONFRIDDO 612-729-2959 PGIONFRIDDO@HAUGOGTS.COM

ALL EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. CONTACT "GOPHER STATE ONE CALL" (651-454-0002 OR 800-252-1166) FOR UTILITY LOCATIONS, 48 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY UTILITIES THAT ARE DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.



Know what's below.
 Call before you dig.

**PRELIMINARY:
 NOT FOR
 CONSTRUCTION**

LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD, MOUND, MN 55364
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331

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.
 Matthew R. Pavlek
 DATE 09/25/24 LICENSE NO. 44263

ISSUE/SUBMITTAL SUMMARY	
DATE	DESCRIPTION
07/31/24	CITY SUBMITTAL
08/01/24	WATERSHED SUBMITTAL
08/27/24	CITY RESUBMITTAL
09/06/24	CITY/WATERSHED RESUBMITTAL
09/18/24	CITY RESUBMITTAL
09/25/24	WATERSHED RESUBMITTAL

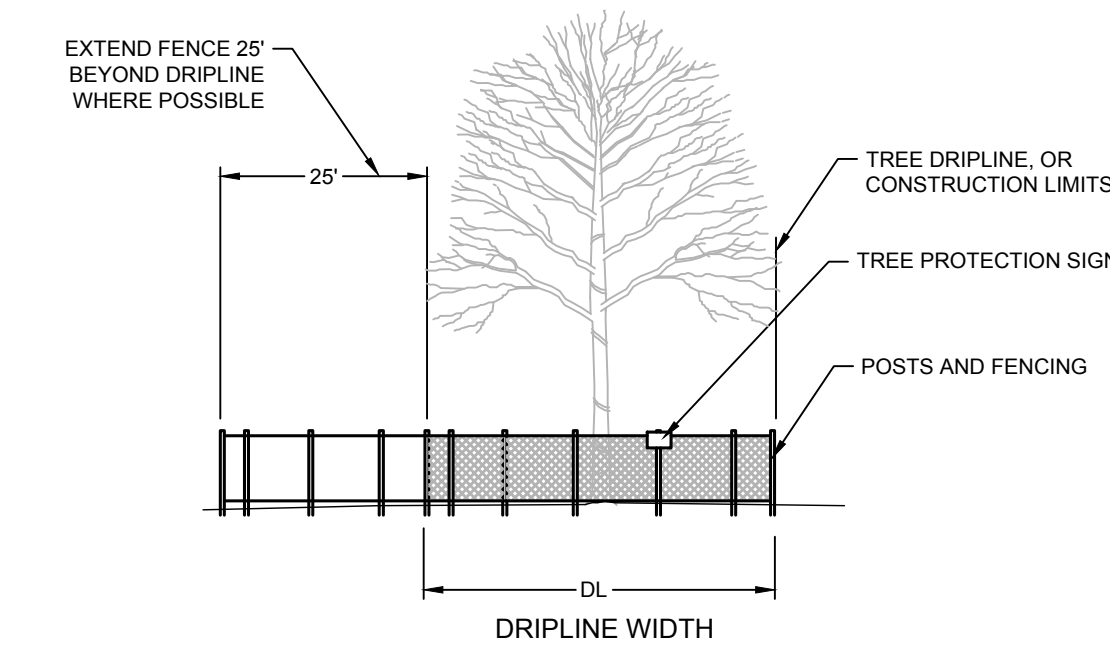
REVISION SUMMARY	
DATE	DESCRIPTION

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REMOVALS PLAN
C1.0
 © COPYRIGHT 2023 CIVIL SITE GROUP INC.

REMOVAL NOTES:

- ALL EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. CONTACT "GOPHER STATE ONE CALL" (651-454-0002 OR 800-252-1166) FOR UTILITY LOCATIONS, 48 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY UTILITIES THAT ARE DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.
- SEE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) PLAN FOR CONSTRUCTION STORM WATER MANAGEMENT PLAN.
- REMOVAL OF MATERIALS NOTED ON THE DRAWINGS SHALL BE IN ACCORDANCE WITH MNDOT, STATE AND LOCAL REGULATIONS.
- REMOVAL OF PRIVATE UTILITIES SHALL BE COORDINATED WITH UTILITY OWNER PRIOR TO CONSTRUCTION ACTIVITIES.
- EXISTING PAVEMENTS SHALL BE SAWCUT IN LOCATIONS AS SHOWN ON THE DRAWINGS OR THE NEAREST JOINT FOR PROPOSED PAVEMENT CONNECTIONS.
- REMOVED MATERIALS SHALL BE DISPOSED OF TO A LEGAL OFF-SITE LOCATION AND IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS.
- ABANDON, REMOVAL, CONNECTION, AND PROTECTION NOTES SHOWN ON THE DRAWINGS ARE APPROXIMATE. COORDINATE WITH PROPOSED PLANS.
- EXISTING ON-SITE FEATURES NOT NOTED FOR REMOVAL SHALL BE PROTECTED THROUGHOUT THE DURATION OF THE CONTRACT.
- PROPERTY LINES SHALL BE CONSIDERED GENERAL CONSTRUCTION LIMITS UNLESS OTHERWISE NOTED ON THE DRAWINGS. WORK WITHIN THE GENERAL CONSTRUCTION LIMITS SHALL INCLUDE STAGING, DEMOLITION AND CLEAN-UP OPERATIONS AS WELL AS CONSTRUCTION SHOWN ON THE DRAWINGS.
- MINOR WORK OUTSIDE OF THE GENERAL CONSTRUCTION LIMITS SHALL BE ALLOWED AS SHOWN ON THE PLAN AND PER CITY REQUIREMENTS. FOR ANY WORK ON ADJACENT PRIVATE PROPERTY, THE CONTRACTOR SHALL OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER PRIOR TO ANY WORK.
- DAMAGE BEYOND THE PROPERTY LIMITS CAUSED BY CONSTRUCTION ACTIVITY SHALL BE REPAIRED IN A MANNER APPROVED BY THE ENGINEER/LANDSCAPE ARCHITECT OR IN ACCORDANCE WITH THE CITY.
- PROPOSED WORK (BUILDING AND CIVIL) SHALL NOT DISTURB EXISTING UTILITIES UNLESS OTHERWISE SHOWN ON THE DRAWINGS AND APPROVED BY THE CITY PRIOR TO CONSTRUCTION.
- SITE SECURITY MAY BE NECESSARY AND PROVIDED IN A MANNER TO PROHIBIT VANDALISM, AND THEFT, DURING AND AFTER NORMAL WORK HOURS, THROUGHOUT THE DURATION OF THE CONTRACT. SECURITY MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY.
- VEHICULAR ACCESS TO THE SITE SHALL BE MAINTAINED FOR DELIVERY AND INSPECTION ACCESS DURING NORMAL OPERATING HOURS. AT NO POINT THROUGHOUT THE DURATION OF THE CONTRACT SHALL CIRCULATION OF ADJACENT STREETS BE BLOCKED WITHOUT APPROVAL BY THE CITY PRIOR TO CONSTRUCTION ACTIVITIES.
- ALL TRAFFIC CONTROLS SHALL BE PROVIDED AND ESTABLISHED PER THE REQUIREMENTS OF THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD) AND THE CITY. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, SIGNAGE, BARRICADES, FLASHERS, AND FLAGGERS AS NEEDED. ALL PUBLIC STREETS SHALL REMAIN OPEN TO TRAFFIC AT ALL TIMES. NO ROAD CLOSURES SHALL BE PERMITTED WITHOUT APPROVAL BY THE CITY.
- SHORING FOR BUILDING EXCAVATION MAY BE USED AT THE DISCRETION OF THE CONTRACTOR AND AS APPROVED BY THE OWNERS REPRESENTATIVE AND THE CITY PRIOR TO CONSTRUCTION ACTIVITIES.
- STAGING, DEMOLITION, AND CLEAN-UP AREAS SHALL BE WITHIN THE PROPERTY LIMITS AS SHOWN ON THE DRAWINGS AND MAINTAINED IN A MANNER AS REQUIRED BY THE CITY.
- ALL EXISTING SITE TRAFFIC/REGULATORY SIGNAGE TO BE INVENTORIED AND IF REMOVED FOR CONSTRUCTION SHALL BE RETURNED TO LGU.
- ALL EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. CONTACT "GOPHER STATE ONE CALL" (651-454-0002 OR 800-252-1166) FOR UTILITY LOCATIONS, 48 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY UTILITIES THAT ARE DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.



FURNISH A AND INSTALL TEMPORARY FENCE AT THE TREE'S DRIP LINE OR CONSTRUCTION LIMITS AS SHOWN ON PLAN, PRIOR TO ANY CONSTRUCTION. WHERE POSSIBLE PLACE FENCE 25' BEYOND DRIP LINE. PLACE TREE PROTECTION SIGN ON POSTS, ONE PER INDIVIDUAL TREE (FACING CONSTRUCTION ACTIVITY), OR ONE EVERY 100' LF ALONG A GROVE OR MULTI-TREE PROTECTION AREA.

1 TREE PROTECTION
 NTS

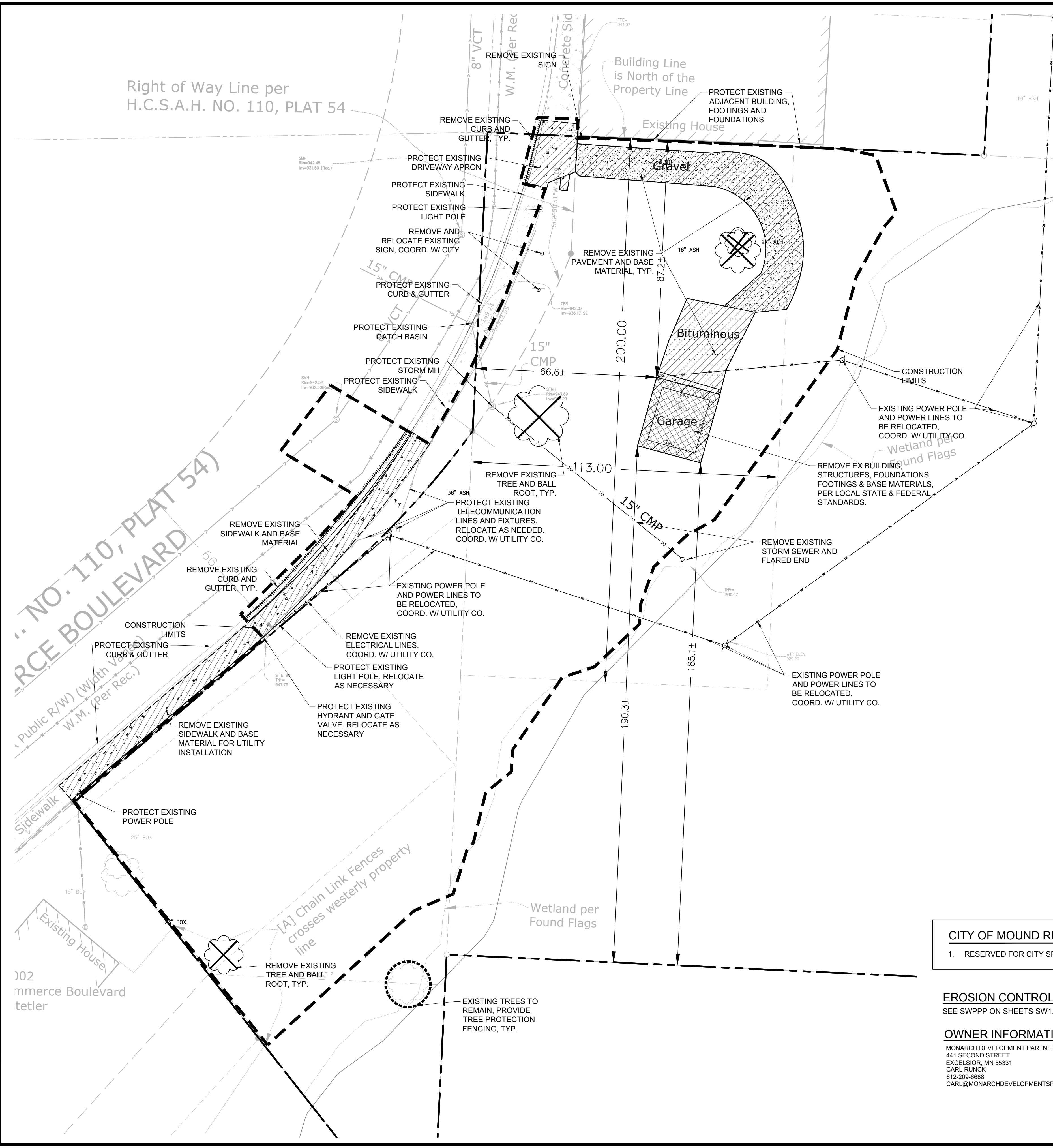
REMOVALS LEGEND:

- REMOVAL OF PAVEMENT AND ALL BASE MATERIAL, INCLUDING BIT., CONC., AND GRAVEL PAVTS.
- REMOVAL OF STRUCTURE INCLUDING ALL FOOTINGS AND FOUNDATIONS.
- REMOVAL OF TREES AND VEGETATION INCLUDING STUMPS AND ROOT SYSTEMS
- CONSTRUCTION LIMITS
- PROPERTY LINE
- REMOVE CURB AND GUTTER. IF IN RIGHT-OF-WAY, COORDINATE WITH LOCAL GOVERNING UNIT.
- TREE PROTECTION
- TREE REMOVAL - INCLUDING ROOTS AND STUMPS

CITY OF MOUND REMOVAL NOTES:
 1. RESERVED FOR CITY SPECIFIC REMOVAL NOTES.

EROSION CONTROL NOTES:
 SEE SWPPP ON SHEETS SW1.0 - SW1.5

OWNER INFORMATION
 MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET
 EXCELSIOR, MN 55331
 CARL RUNCK
 612-209-8688
 CARL@MONARCHDEVELOPMENTSPARTNERS.COM



**PRELIMINARY:
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PROJECT
LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD, MOUND, MN 55364
OWNER
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331

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Matthew R. Pavak
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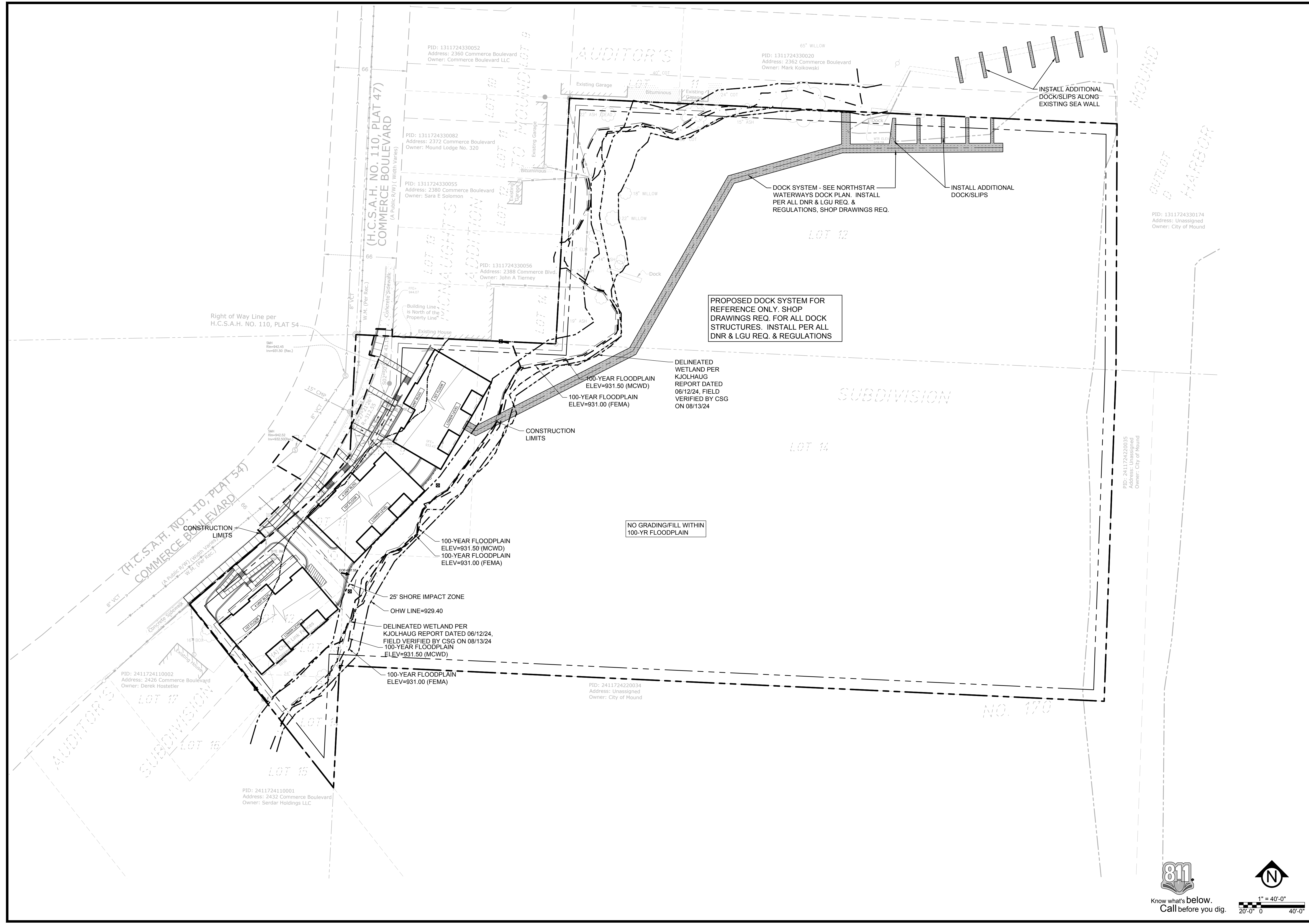
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SITE PLAN - OVERALL

C2.0



811
 Know what's below.
 Call before you dig.

1" = 40'-0"
 20'-0" 0 40'-0"

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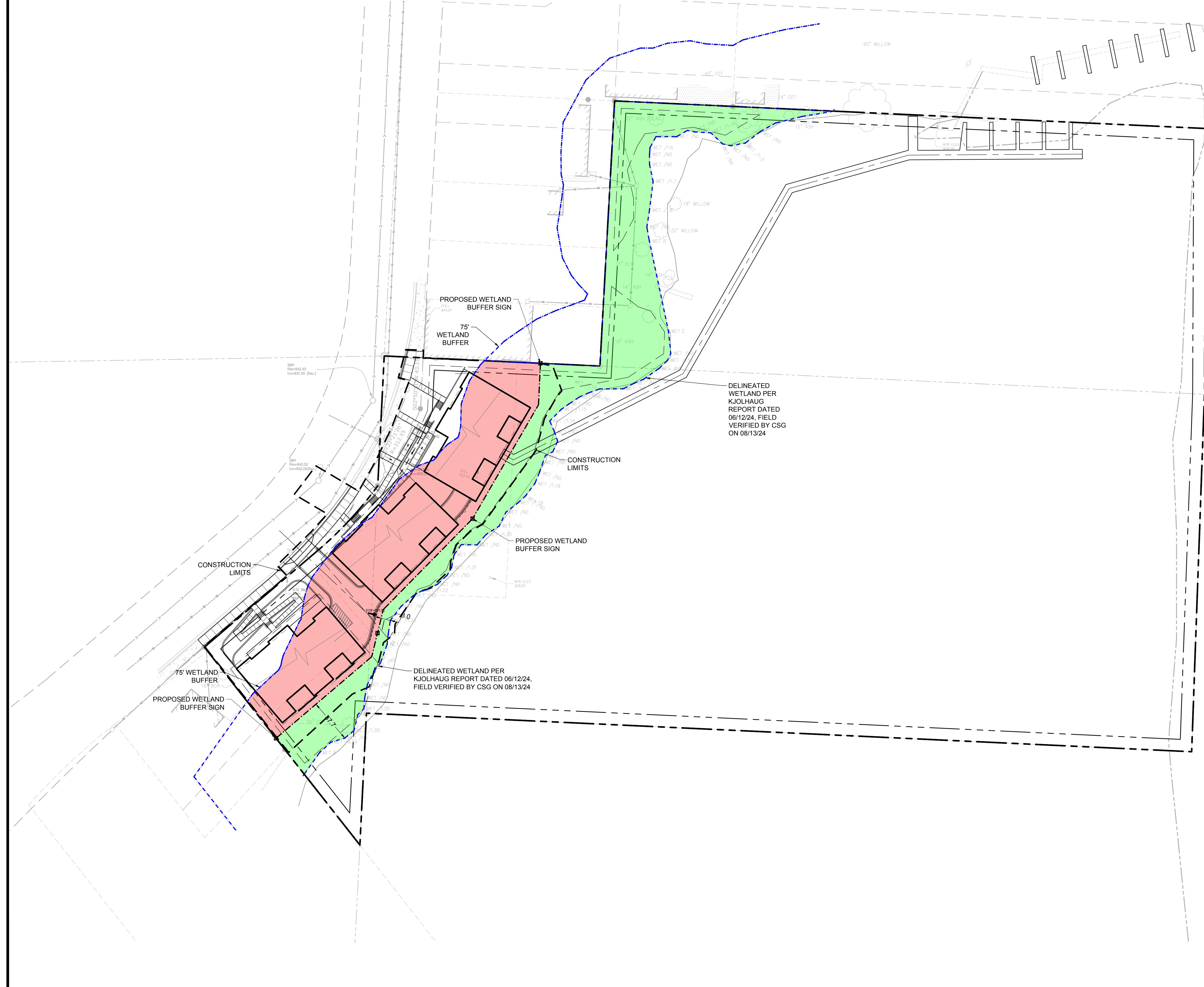
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75' BUFFER EXHIBIT

W1.0



WETLAND BUFFER AREA TABLE		
	REQUIRED	PROVIDED
AVERAGE BUFFER	75 FEET (PRESERVE)	25.9 FEET*
MINIMUM BUFFER	67 FEET (PRESERVE)	8.0 FEET
MAXIMUM BUFFER	N/A	37.7 FEET
75' BUFFER AREA ON SITE		44,243 SF
REDUCED BUFFER AREA (RED)		21,820 SF
PROPOSED BUFFER AREA ON SITE (GREEN)		22,423 SF
*Length of buffer=864 22,423 sf/864 ft=25.9 ft		

SEE LANDSCAPE PLAN FOR SOIL AMENDMENT AND SEEDING INFORMATION

811
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 20'-0" 0 40'-0"

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SHORELAND IMPACT EXHIBIT

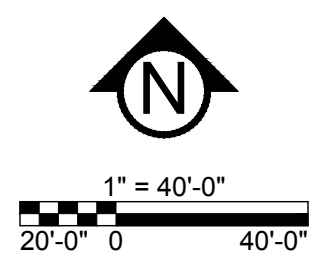
W1.1

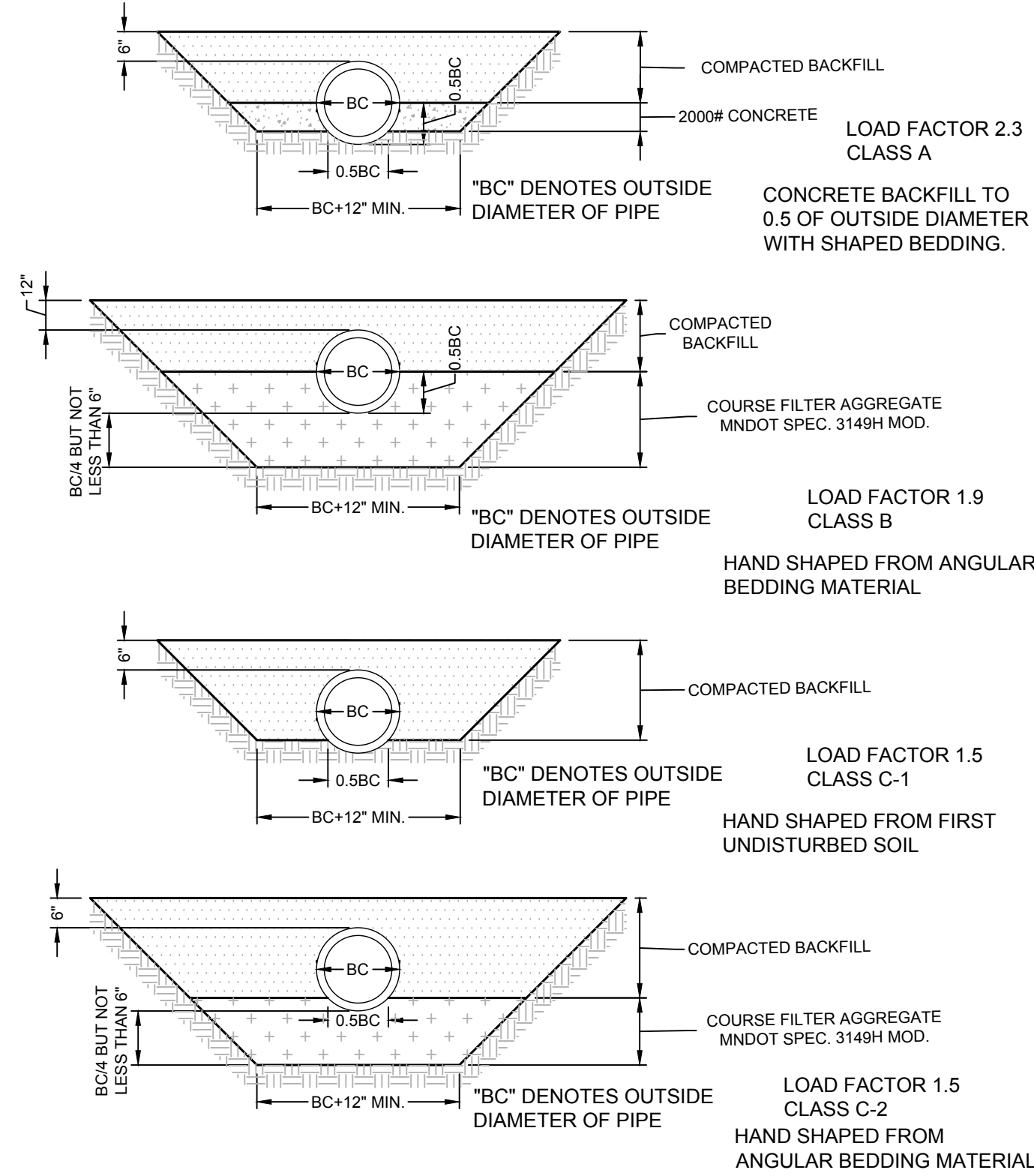


SITE PLAN LEGEND:

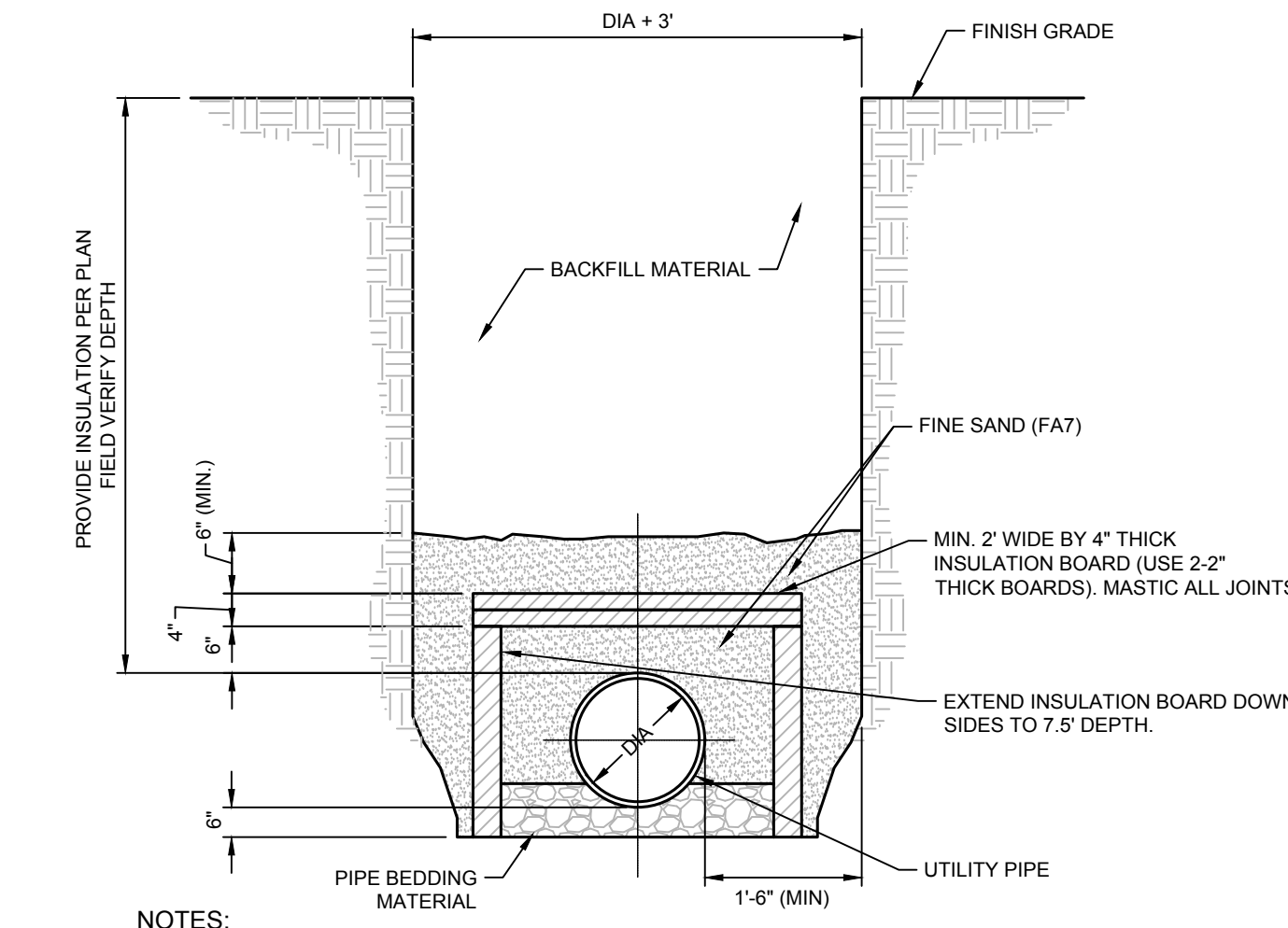
- DISTURBED SHORE IMPACT ZONE
- PRESERVED SHORE IMPACT ZONE

SHORELAND IMPACT ZONE			
		REQUIRED	PROPOSED
SHORE IMPACT ZONE (25' FROM OHW)	19,593 SF		
PRESERVED SHORE IMPACT ZONE AREA	15,423 SF	70%	78.7%



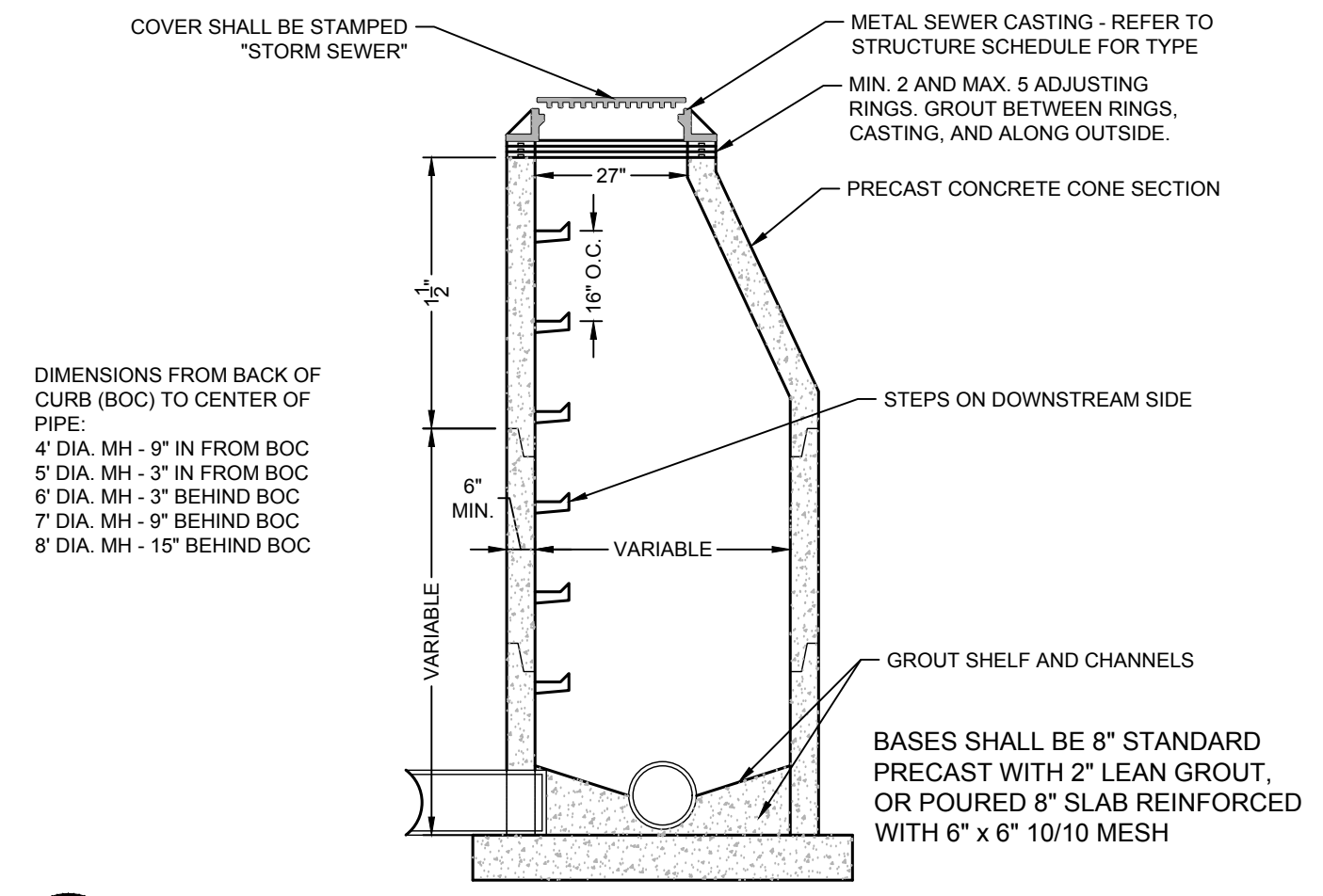


1 PIPE BEDDING - RCP & DIP
NTS

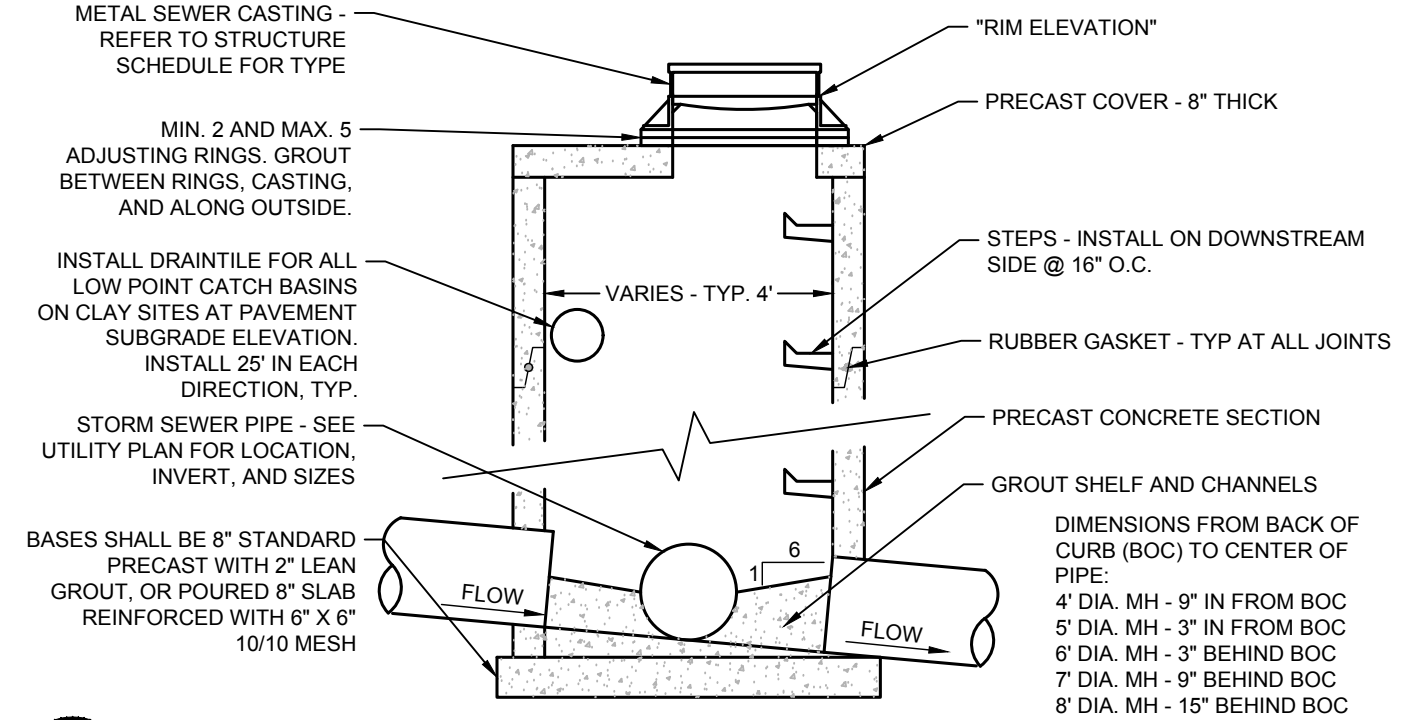


2 UTILITY PIPE INSULATION DETAIL
NTS

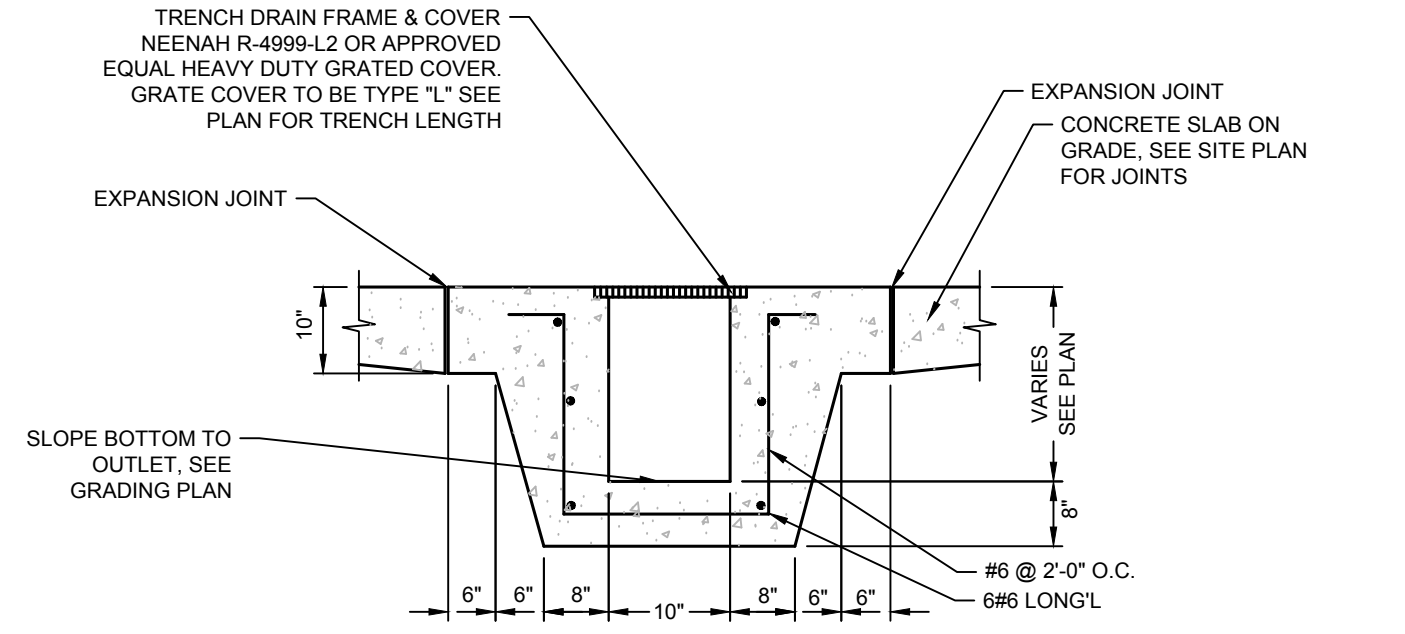
NOTES:
1. INSULATION BOARD TO BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM MEETING ASTM 578, TYPE VI, 40PSI COMPRESSING STRENGTH (ASTM D1621) 0.1% MAX. WATER ABSORPTION (ASTM C272).
2. BACKFILL MATERIAL AROUND INSULATION MUST BE FINE SAND FREE FROM ROOT, ORGANIC MATERIAL, OR OTHER INJURIOUS MATERIALS.
3. OVERLAP ALL INSULATION BOARD JOINTS.



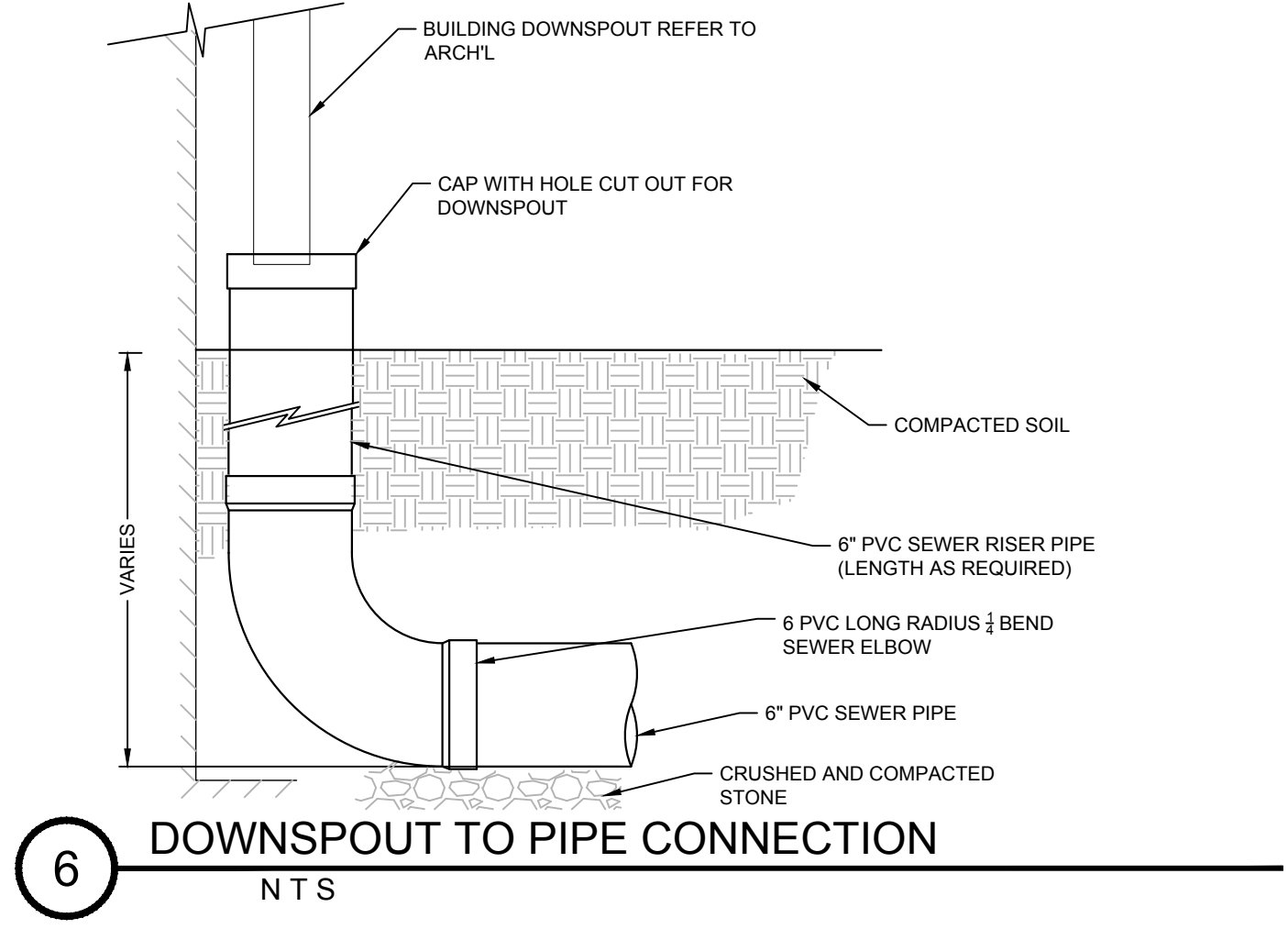
3 STORM MANHOLE
NTS



4 CATCH BASIN
NTS



5 TRENCH DRAIN
NTS



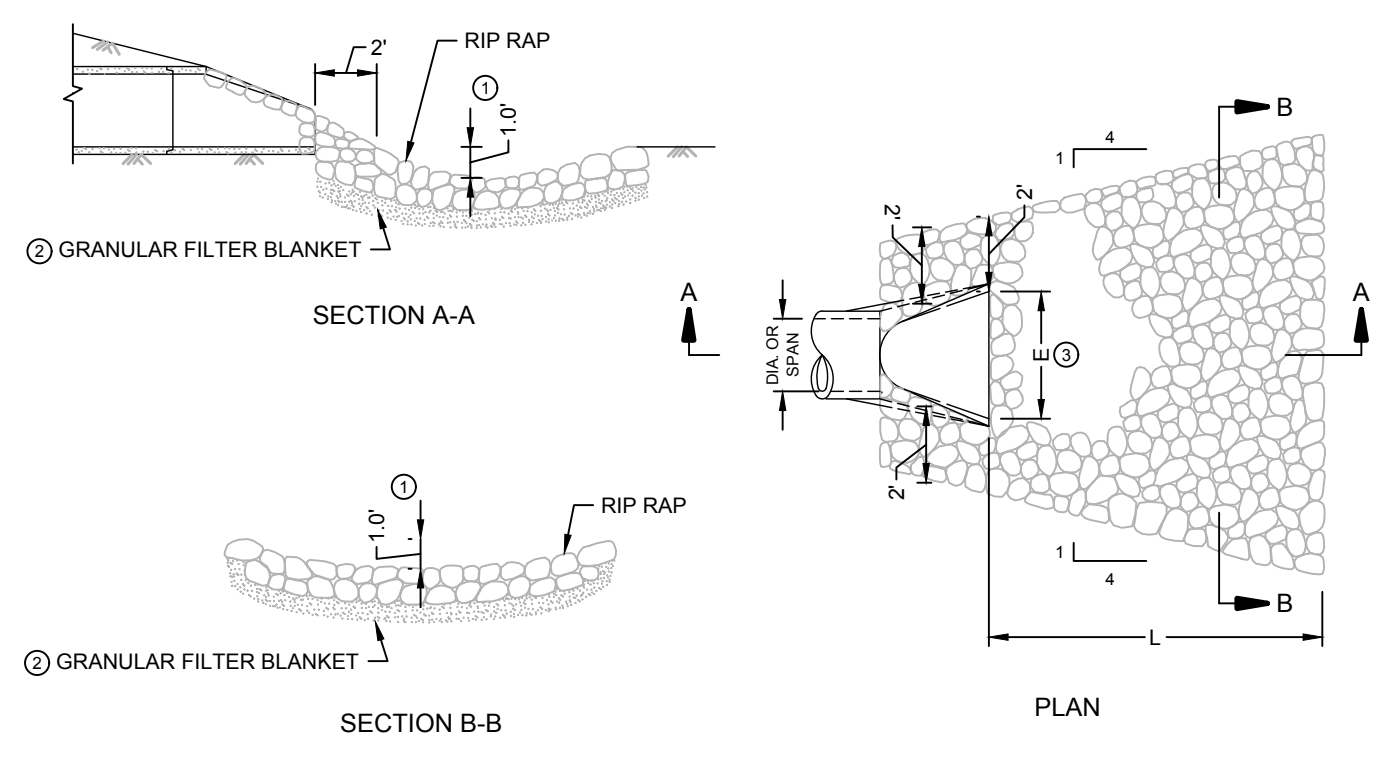
6 DOWNSPOUT TO PIPE CONNECTION
NTS

TABLE OF QUANTITIES
RIPRAP AT RCP OUTLETS

DIA. OF ROUND PIPE (IN)	L (FT)	CLASS II $d_{50} = 6"$		CLASS III $d_{50} = 9"$		CLASS IV $d_{50} = 12"$	
		12" DEPTH RIP RAP (CY)	6" DEPTH GRANULAR FILTER (CY)	18" DEPTH RIP RAP (CY)	9" DEPTH GRANULAR FILTER (CY)	24" DEPTH RIP RAP (CY)	12" DEPTH GRANULAR FILTER (CY)
12	8	2.8	1.4	4.1	2.1	5.5	2.8
15	8	3.9	1.9	5.4	2.8	7.8	3.9
18	10	3.9	2.0	5.9	3.0	7.8	3.9
21	10	4.2	2.1	6.3	3.2	8.4	4.2
24	12	5.5	2.9	8.3	4.2	11.0	5.5
27	12	5.8	2.9	8.7	4.4	11.6	5.8
30	14	7.3	3.7	10.9	5.5	14.5	7.2
36	16	9.2	4.6	13.8	6.9	18.3	9.2
42	18	10.9	5.5	16.3	8.2	21.7	10.9
48	20	12.8	6.5	19.4	9.7	25.8	12.8

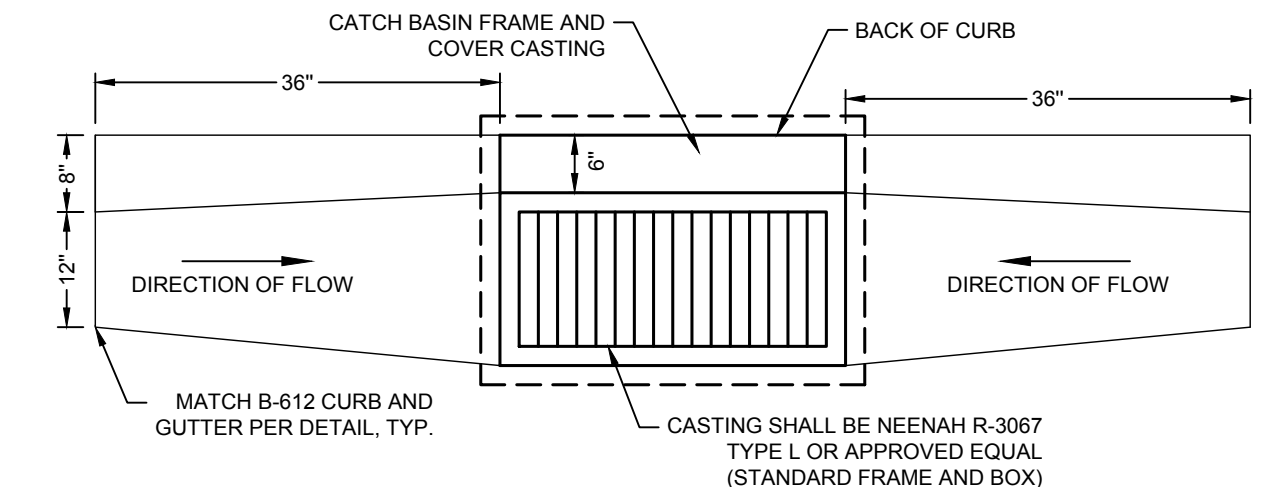
TABLE OF QUANTITIES
RIPRAP AT RCP - A OUTLETS OR BOXES OF EQUIVALENT SPAN WIDTH

SPAN OF PIPE, ARCH (IN)	L (FT)	CLASS II $d_{50} = 6"$		CLASS III $d_{50} = 9"$		CLASS IV $d_{50} = 12"$	
		12" DEPTH RIP RAP (CY)	6" DEPTH GRANULAR FILTER (CY)	18" DEPTH RIP RAP (CY)	9" DEPTH GRANULAR FILTER (CY)	24" DEPTH RIP RAP (CY)	12" DEPTH GRANULAR FILTER (CY)
22	10	3.8	2.0	5.9	3.0	7.8	3.9
28	12	5.5	2.9	8.2	4.1	10.9	5.5
36	14	7.2	3.9	10.9	5.4	14.5	7.2
43	16	9.2	4.6	13.7	6.9	18.3	9.2
51	18	10.9	5.5	16.3	8.2	21.7	10.9
58	20	12.7	6.4	19.0	9.5	25.4	12.7



7 RIPRAP @ FLARED END SECTION
NTS

NOTES:
• PIPE SIZES LARGER THAN THOSE SHOWN REQUIRE A SPECIAL DESIGN.
• REQUIREMENTS FOR RIPRAP SIZE AND THICKNESS AND FILTER BLANKET WILL BE DESIGNATED IN THE PLANS.
• FOR PIPES GREATER THAN OR EQUAL TO 30", USE 1.5'.
• THE CONTRACTOR, AT HIS OPTION, MAY SUBSTITUTE A GEOTEXTILE FABRIC, SPEC. 3733, FOR THE GRANULAR FILTER BLANKET UNLESS OTHERWISE SPECIFIED IN THE PLANS. THE FABRIC SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CURVE APRON 3 FT.
• DIMENSION E IS GIVEN ON STANDARD PLATES 3100 AND 3110.



8 B-612 CURB AND GUTTER AT CATCH BASIN
NTS

NOTE: CATCH BASIN TO BE DEPRESSED BELOW DESIGN GUTTER GRADE PER DETAIL 110 ON SHEET C5.2

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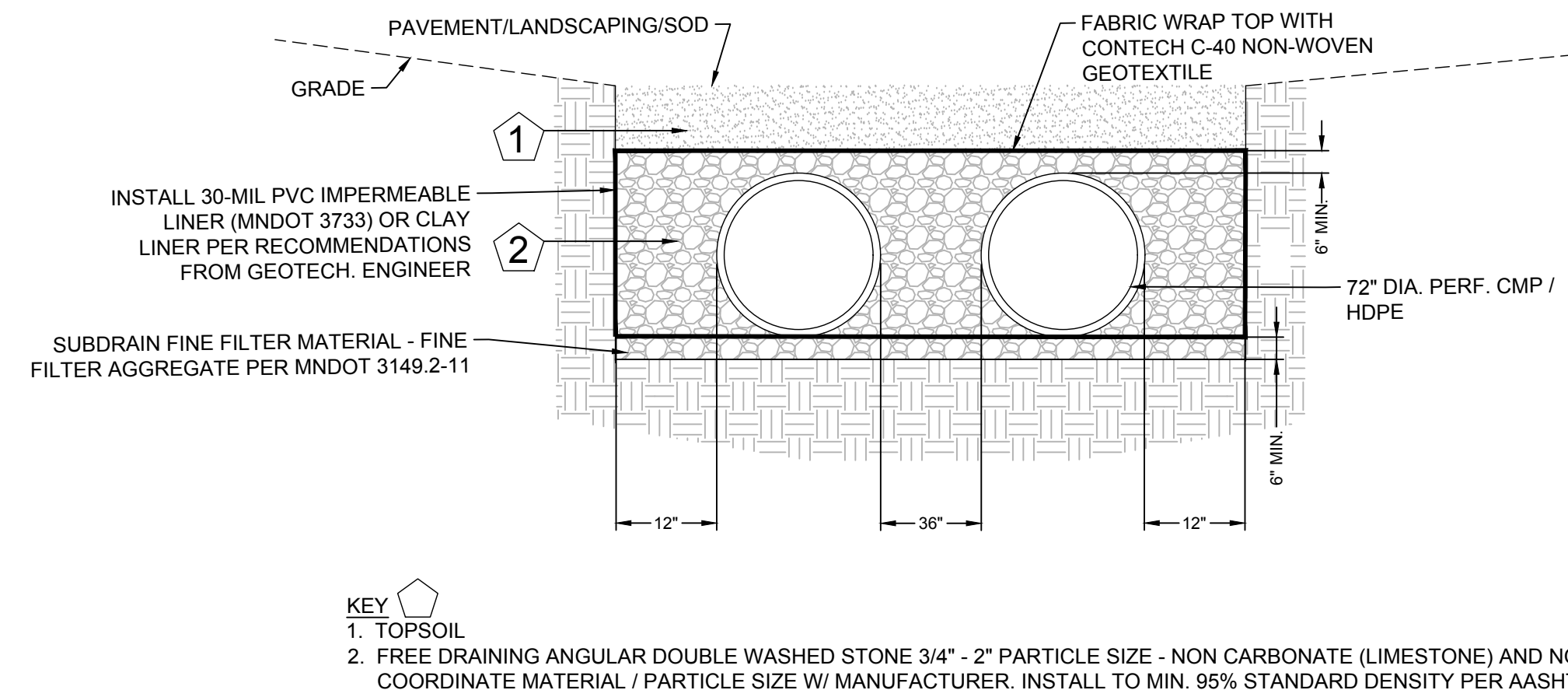
PROJECT MANAGER: MATT PAVLEK
CONTACT NUMBER: 612-615-0060 X701
DRAWN BY: M.D. MP, RB
REVIEWED BY: MP, RB
PROJECT NUMBER: 23360

REVISION SUMMARY

DATE	DESCRIPTION

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LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD., MOUND, MN 55364
 OWNER
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331



CONSTRUCTION SEQUENCING

1. INSTALL SILT FENCE AND/OR OTHER APPROPRIATE TEMPORARY EROSION CONTROL DEVICES TO PREVENT SEDIMENT FROM LEAVING OR ENTERING THE PRACTICE DURING CONSTRUCTION.
2. ALL DOWN-GRADIENT PERIMETER SEDIMENT CONTROL BMP'S MUST BE IN PLACE BEFORE ANY UP-GRADIENT LAND DISTURBING ACTIVITY BEGINS.
3. PERFORM CONTINUOUS INSPECTIONS OF EROSION CONTROL PRACTICES.
4. INSTALL UTILITIES (WATER, SANITARY SEWER, ELECTRIC, PHONE, FIBER OPTIC, ETC) PRIOR TO THE STORMWATER SYSTEM.
5. PERFORM ALL OTHER SITE IMPROVEMENTS.
6. SEED AND MULCH ALL AREAS AFTER DISTURBANCE.
7. CONSTRUCT RETENTION DEVICE UPON STABILIZATION OF CONTRIBUTING DRAINAGE AREA.
8. IMPLEMENT TEMPORARY AND PERMANENT EROSION CONTROL PRACTICES.
9. PLANT AND MULCH SITE.
10. REMOVE TEMPORARY EROSION CONTROL DEVICES AFTER THE CONTRIBUTING DRAINAGE AREA IS ADEQUATELY VEGETATED.

GENERAL NOTES

1. IN THE EVENT THAT SEDIMENT IS INTRODUCED INTO THE BMP DURING OR IMMEDIATELY FOLLOWING EXCAVATION, THIS MATERIAL SHALL BE REMOVED FROM THE PRACTICE PRIOR TO CONTINUING CONSTRUCTION.
2. GRADING OF RETENTION DEVICES SHALL BE ACCOMPLISHED USING LOW-COMPACTION EARTH-MOVING EQUIPMENT TO PREVENT COMPACTION OF UNDERLYING SOILS.
3. ALL SUB MATERIALS BELOW THE SPECIFIED RETENTION DEPTH (ELEVATION) SHALL BE UNDISTURBED, UNLESS OTHERWISE NOTED.
4. SEE UTILITY PLAN / SHOP DRAWINGS FOR SYSTEM LAYOUT.
5. TYPICAL DETAILS ARE FOR REFERENCE ONLY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH REVIEWED SHOP DRAWINGS.

1 UNDERGROUND RATE CONTROL BASIN WITH LINER
 N.T.S.

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD PEAK DIVERSION STYLE WITH PRECAST TOP SLAB IS SHOWN. ALTERNATE OFFLINE VAULT, CURB INLET OR SHALLOW PIPE INLET OPTIONS ARE AVAILABLE. PEAK CAPACITY CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.

CARTRIDGE SELECTION	54"	40"	27"	15"
CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-0"	5'-4"	4'-3"	3'-3"
FLOW RATE (HIGH FLOW) DRAINDOWN (GFS) (PER CART)	0.178 / 0.089	0.132 / 0.067	0.086 / 0.045	0.049 / 0.025
MAX. TREATMENT (GFS)	0.95	0.67	0.45	0.25
DECK TO INSIDE TOP (MIN) (B)	5'-0"	4'-0"	4'-0"	4'-0"

FRAME AND COVER
 (DIAMETER VARIES)
 N.T.S.

24" TRENCH COVER
 N.T.S.

GENERAL NOTES:

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.contechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION AND SITE SPECIFIC EARTH COVER REQUIREMENT. TYPICAL CASTINGS SHALL MEET AASHTO M306 LOAD RATINGS AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-867, ASTM C-918, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDED TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE (WHERE APPLICABLE) AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES:

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
- C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT.
- D. CARTRIDGE INSTALLATION BY CONTECH SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
 2025 Centre Pointe Dr., Suite 400, West Chester, OH 45399
 800-338-1122 513-445-7000 513-445-7993 FAX

JELLYFISH JFPD0406
 STANDARD DETAIL
 PEAK DIVERSION CONFIGURATION

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DATE	DESCRIPTION
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PROJECT MANAGER: MATT PAVEK
 CONTACT NUMBER: 612-615-0060 / 701
 DRAWN BY: MD, MP, RB
 REVIEWED BY: MP, RB
 PROJECT NUMBER: 23280

REVISION SUMMARY

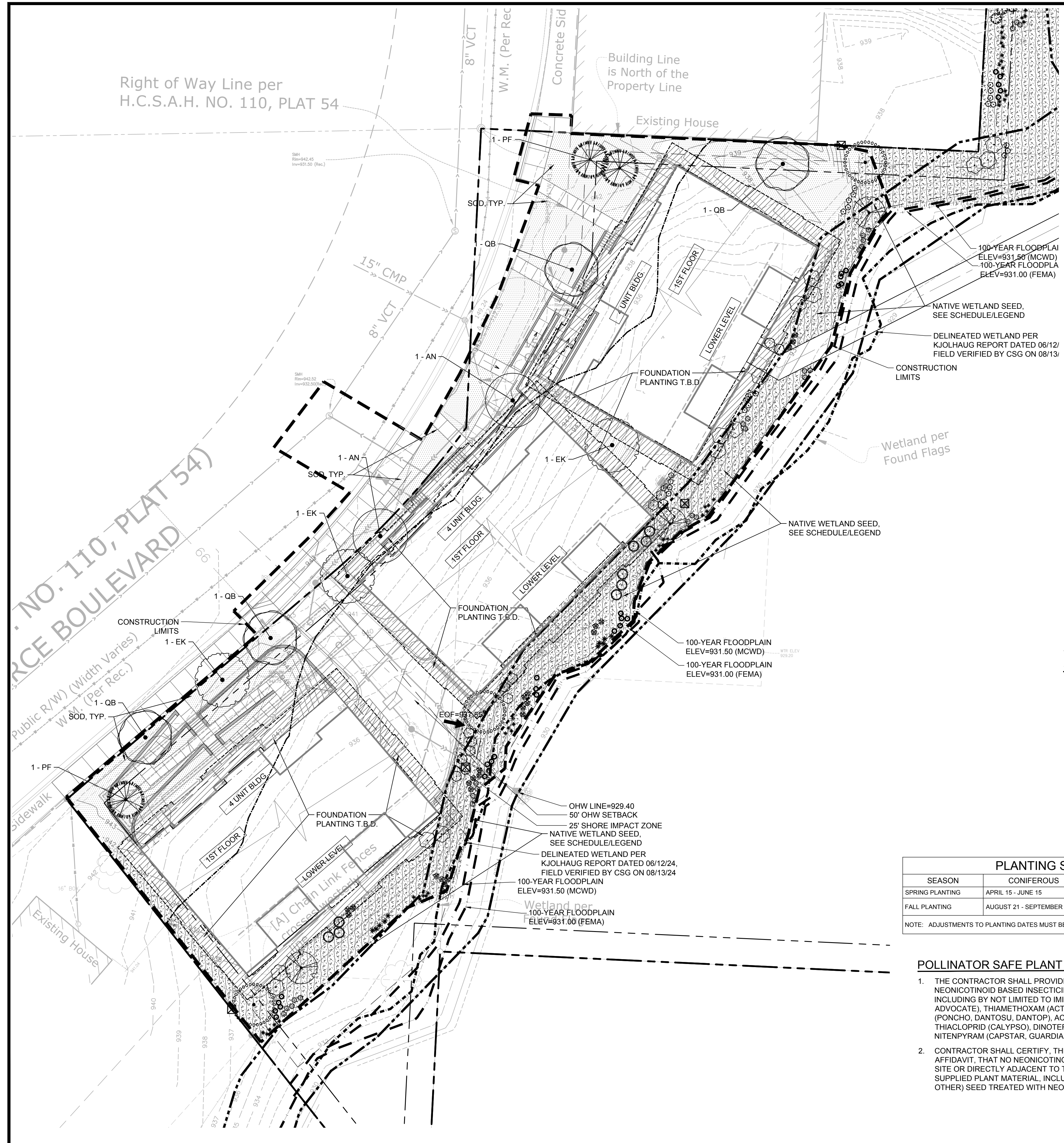
DATE	DESCRIPTION
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CIVIL DETAILS
C5.2
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**PRELIMINARY:
 NOT FOR
 CONSTRUCTION**

LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD, MOUND, MN 55364
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331

Right of Way Line per
 H.C.S.A.H. NO. 110, PLAT 54



LANDSCAPE NOTES:

- ALL EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. CONTACT "GOPHER STATE ONE CALL" (651-454-0002 OR 800-252-1166) FOR UTILITY LOCATIONS, 48 HOURS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL REPAIR OR REPLACE ANY UTILITIES THAT ARE DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.
- REFERENCE MULCH SCHEDULE FOR MULCH MATERIALS AND LOCATIONS.
- ALL TREES SHALL BE MULCHED WITH SHREDDED CEDAR MULCH TO OUTER EDGE OF SAUCER OR TO EDGE OF PLANTING BED, IF APPLICABLE. ALL MULCH SHALL BE KEPT WITHIN A MINIMUM OF 2" FROM TREE TRUNK.
- IF SHOWN ON PLAN, RANDOM SIZED LIMESTONE BOULDERS COLOR AND SIZE TO COMPLIMENT NEW LANDSCAPING. OWNER TO APPROVE BOULDER SAMPLES PRIOR TO INSTALLATION.
- PLANT MATERIALS SHALL CONFORM WITH THE AMERICAN ASSOCIATION OF NURSERYMEN STANDARDS AND SHALL BE OF HARDY STOCK, FREE FROM DISEASE, DAMAGE AND DISFIGURATION. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING PLUMPNESS OF PLANT MATERIAL FOR DURATION OF ACCEPTANCE PERIOD.
- UPON DISCOVERY OF A DISCREPANCY BETWEEN THE QUANTITY OF PLANTS SHOWN ON THE SCHEDULE AND THE QUANTITY SHOWN ON THE PLAN, THE PLAN SHALL GOVERN.
- CONDITION OF VEGETATION SHALL BE MONITORED BY THE LANDSCAPE ARCHITECT THROUGHOUT THE DURATION OF THE CONTRACT. LANDSCAPE MATERIALS PART OF THE CONTRACT SHALL BE WARRANTED FOR TWO (2) FULL GROWING SEASONS FROM SUBSTANTIAL COMPLETION DATE.
- ALL AREAS DISTURBED BY CONSTRUCTION ACTIVITIES SHALL RECEIVE 6" LAYER TOPSOIL AND SOD AS SPECIFIED UNLESS OTHERWISE NOTED ON THE DRAWINGS.
- COORDINATE LOCATION OF VEGETATION WITH UNDERGROUND AND OVERHEAD UTILITIES, LIGHTING FIXTURES, DOORS AND WINDOWS. CONTRACTOR SHALL STAKE IN THE FIELD FINAL LOCATION OF TREES AND SHRUBS FOR REVIEW AND APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
- ALL PLANT MATERIALS SHALL BE WATERED AND MAINTAINED UNTIL ACCEPTANCE.
- REPAIR AT NO COST TO OWNER ALL DAMAGE RESULTING FROM LANDSCAPE CONTRACTOR'S ACTIVITIES.
- SWEEP AND MAINTAIN ALL PAVED SURFACES FREE OF DEBRIS GENERATED FROM LANDSCAPE CONTRACTOR'S ACTIVITIES.
- PROVIDE SITE WIDE IRRIGATION SYSTEM DESIGN AND INSTALLATION. SYSTEM SHALL BE FULLY PROGRAMMABLE AND CAPABLE OF ALTERNATE DATE WATERING. THE SYSTEM SHALL PROVIDE HEAD TO HEAD OR DRIP COVERAGE AND BE CAPABLE OF DELIVERING ONE INCH OF PRECIPITATION PER WEEK. SYSTEM SHALL EXTEND INTO THE PUBLIC RIGHT-OF-WAY TO THE EDGE OF PAVEMENT/BACK OF CURB.
- CONTRACTOR SHALL SECURE APPROVAL OF PROPOSED IRRIGATION SYSTEM INCLUDING PRICING FROM OWNER, PRIOR TO INSTALLATION.

AREA	MULCH TYPE	EDGING	FABRIC	REMARKS
TREE RINGS	4" DEPTH, SHREDDED CEDAR	YES	NO	SEE DETAIL SHT. L1.1
PLANTING BEDS	4" DEPTH, SHREDDED CEDAR	YES	NO	
MAINT. STRIP AT BUILDING FOUNDATION	NA	NA	NA	
NATIVE SEED AREAS	PUNCHED STRAW	NA	NA	INSTALL PER MNDOT SEEDING MANUAL, INCLUDING COVER CROP

NOTE: COORDINATE ALL MULCH AND PLANTING BED MATERIAL PRIOR TO INSTALLATION, PROVIDE SAMPLES AND SHOP DRAWINGS/PHOTOS/DATA SHEETS OF ALL MATERIALS

PLANT SCHEDULE

CODE	QTY	COMMON / BOTANICAL NAME	CONT	NATIVE PLANTS	POLLINATOR FRIENDLY
TREES					
AN	2	Northwood Red Maple / <i>Acer rubrum</i> 'Northwood'	2.5" Cal. B&B	NATIVE CULTIVAR	Y
EK	3	Espresso Kentucky Coffeetree / <i>Gymnocladus dioica</i> 'Espresso'	2.5" Cal. B&B	NATIVE CULTIVAR	N
QB	4	Swamp White Oak / <i>Quercus bicolor</i>	2.5" Cal. B&B	NATIVE	Y
9		SUBTOTAL:			
EVERGREEN TREES					
PF	3	Pyramidal White Pine / <i>Pinus strobus</i> 'Fastigiata'	6' HT. B&B	NATIVE CULTIVAR	N
3		SUBTOTAL:			

LEGEND

SYMBOL	COMMON / BOTANICAL NAME	QTY	SIZE
GROUND COVERS			
	Lower Basin Native Seed Mix MNDOT 34-262 WET PRAIRIE, PER MNDOT SEEDING MANUAL SPECIFICATIONS (2014)	6,384 sf	Seed Mix
	Blue Grass Based Sod Commercial grade, locally grown, "Big Roll" preferred	6,135 sf	Sod

SOIL AMENDMENT (WETLAND BUFFER AREAS):

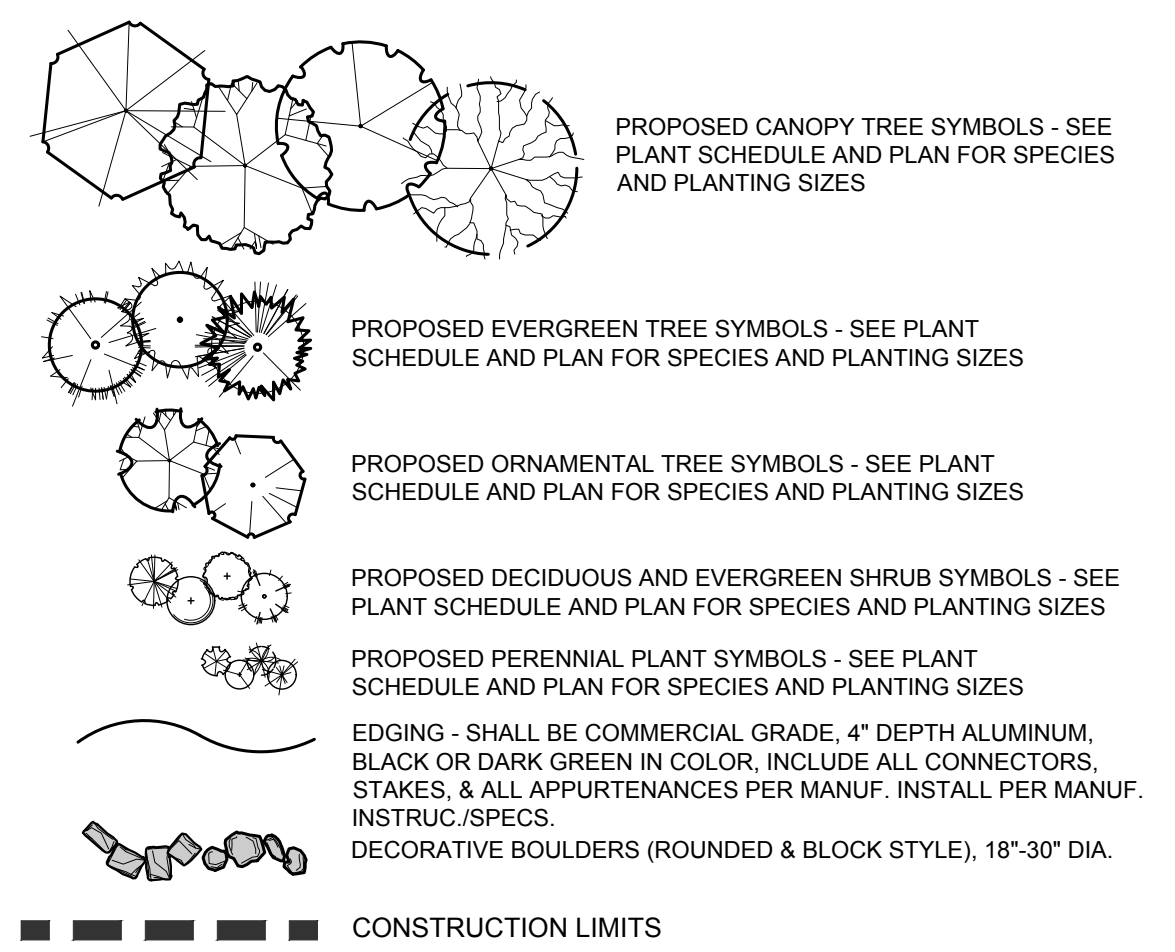
- WETLAND BUFFER AREAS SHALL BE SEEDED PER PLAN AND SEED SCHEDULE.
- SUBSOIL MUST BE DE-COMPACTED TO A DEPTH OF 6 INCHES PRIOR TO PLACEMENT OF 6" (MINIMUM) TOPSOIL. DE-COMPACTATION METHOD SHALL BE SCARIFY/LOOSEN TOP 6" OF SOIL WITH GRADING CHISEL, PRIOR TO PLACEMENT OF 6" TOPSOIL.

SEASON	CONIFEROUS	DECIDUOUS	REMARKS
SPRING PLANTING	APRIL 15 - JUNE 15	APRIL 15 - JUNE 15	
FALL PLANTING	AUGUST 21 - SEPTEMBER 30	AUGUST 15 - NOVEMBER 15	

NOTE: ADJUSTMENTS TO PLANTING DATES MUST BE APPROVED IN WRITING BY THE LANDSCAPE ARCHITECT.

POLLINATOR SAFE PLANT MATERIAL:

- THE CONTRACTOR SHALL PROVIDE ONLY PLANT MATERIAL FREE OF NEONICOTINOID BASED INSECTICIDES AND/OR TREATMENTS OF ANY KIND, INCLUDING BY NOT LIMITED TO IMIDACLOPRID (CONFIDOR, ADMIRE, GAUCHO, ADVOCATE), THIAMETHOXAM (ACTARA, PLATINUM, CRUISER), CLOTHIANIDIN (PONCHO, DANTOSU, DANTOP), ACETAMIPRID (MOSPIAN, ASSAIL, CHIPCOTRISTAR), THIACTOPRID (CALYPSO), DINOTEFURAN (STARKLE, SAFARI, VENOM), AND NITENPYRAM (CAPSTAR, GUARDIAN).
- CONTRACTOR SHALL CERTIFY, THROUGH SUPPLIERS POLICY STATEMENT OR AFFIDAVIT, THAT NO NEONICOTINOID BASED INSECTICIDES HAVE BEEN USED ON SITE OR DIRECTLY ADJACENT TO THE GROWING OR STORAGE PLOTS OF THE SUPPLIED PLANT MATERIAL, INCLUDING THE PLANTING OF AGRICULTURAL (OR OTHER) SEED TREATED WITH NEONICS.



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 LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA.

Robert L. Binder
 Robert L. Binder
 DATE 09/25/24 LICENSE NO. 25821

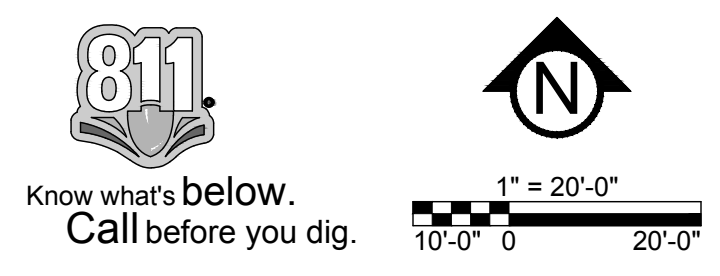
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07/31/24	CITY SUBMITTAL
08/01/24	WATERSHED SUBMITTAL
08/27/24	CITY RESUBMITTAL
09/06/24	CITY WATERSHED RESUBMITTAL
09/18/24	CITY RESUBMITTAL
09/25/24	WATERSHED RESUBMITTAL

DATE	DESCRIPTION

PROJECT MANAGER	MATT PAVAK
CONTACT NUMBER	612-615-0060 x701
DRAWN BY	MD, MP, RB
REVIEWED BY	MP, RB
PROJECT NUMBER	23360

LANDSCAPE PLAN

L1.0



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LAKE MINNETONKA FLATS
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MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331

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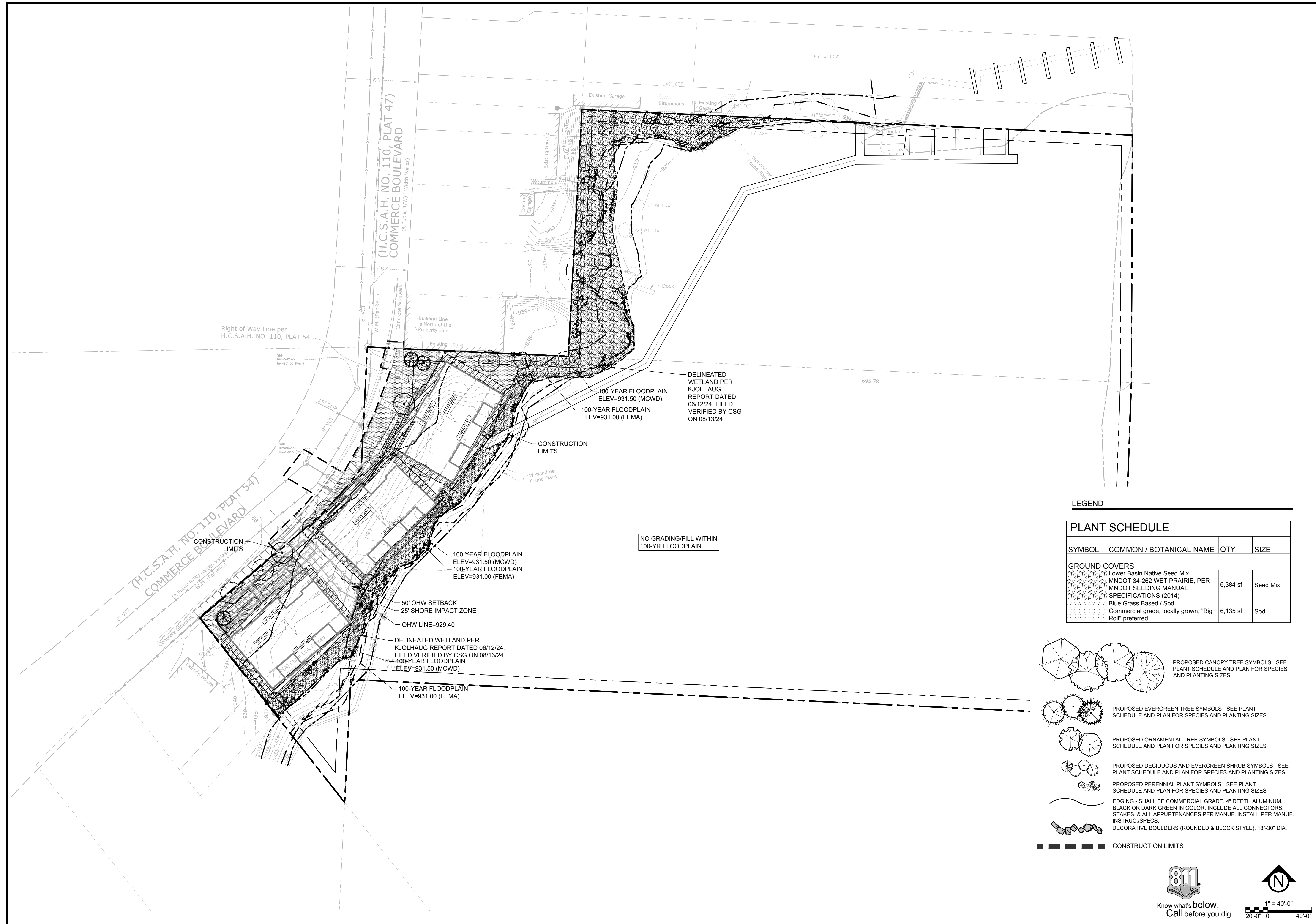
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PROJECT MANAGER	MATT PAVAK
CONTACT NUMBER	612-615-0060 x701
DRAWN BY	MD, MP, RB
REVIEWED BY	MP, RB
PROJECT NUMBER	23360

REVISION SUMMARY	
DATE	DESCRIPTION

VEGETATED BUFFER PLAN

L1.1



LEGEND

PLANT SCHEDULE

SYMBOL	COMMON / BOTANICAL NAME	QTY	SIZE
GROUND COVERS			
	Lower Basin Native Seed Mix MNDOT 34-262 WET PRAIRIE, PER MNDOT SEEDING MANUAL SPECIFICATIONS (2014)	6,384 sf	Seed Mix
	Blue Grass Based / Sod Commercial grade, locally grown, "Big Roll" preferred	6,135 sf	Sod

PROPOSED CANOPY TREE SYMBOLS - SEE PLANT SCHEDULE AND PLAN FOR SPECIES AND PLANTING SIZES

PROPOSED EVERGREEN TREE SYMBOLS - SEE PLANT SCHEDULE AND PLAN FOR SPECIES AND PLANTING SIZES

PROPOSED ORNAMENTAL TREE SYMBOLS - SEE PLANT SCHEDULE AND PLAN FOR SPECIES AND PLANTING SIZES

PROPOSED DECIDUOUS AND EVERGREEN SHRUB SYMBOLS - SEE PLANT SCHEDULE AND PLAN FOR SPECIES AND PLANTING SIZES

PROPOSED PERENNIAL PLANT SYMBOLS - SEE PLANT SCHEDULE AND PLAN FOR SPECIES AND PLANTING SIZES

EDGING - SHALL BE COMMERCIAL GRADE, 4" DEPTH ALUMINUM, BLACK OR DARK GREEN IN COLOR, INCLUDE ALL CONNECTORS, STAKES, & ALL APPURTENANCES PER MANUF. INSTALL PER MANUF. INSTRUC./SPECS.

DECORATIVE BOULDERS (ROUNDED & BLOCK STYLE), 18"-30" DIA.

CONSTRUCTION LIMITS

NO GRADING/FILL WITHIN
 100-YR FLOODPLAIN



Know what's below.
 Call before you dig.



1" = 40'-0"
 20'-0" 0 40'-0"

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Matthew R. Pavek
 Matthew R. Pavek
 DATE 09/25/24 LICENSE NO. 44263

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REVISION SUMMARY	
DATE	DESCRIPTION

REVISION SUMMARY	
DATE	DESCRIPTION

SWPPP - EXISTING CONDITIONS
SW1.0
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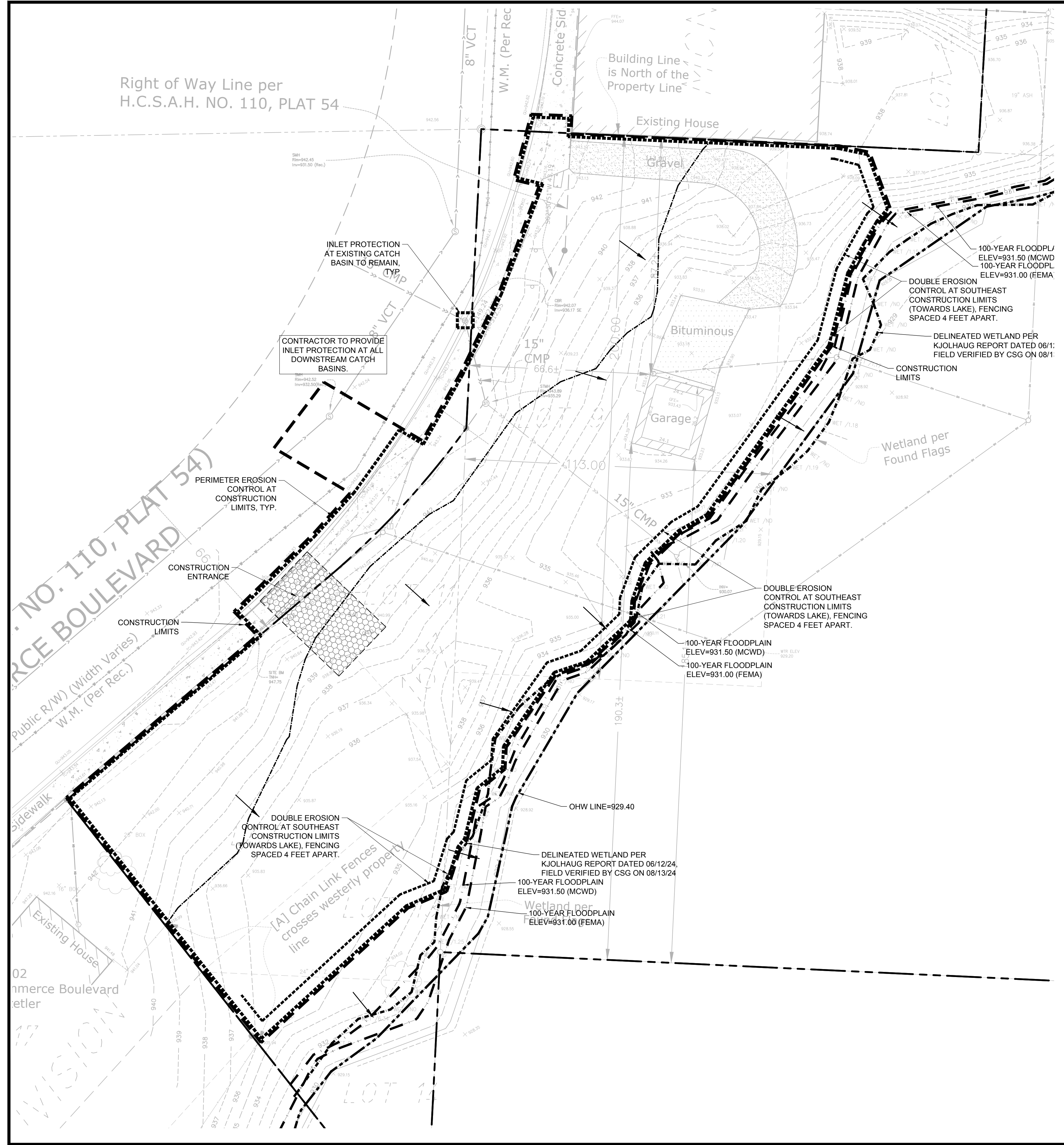
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- THIS PROJECT IS GREATER THAN ONE ACRE AND WILL REQUIRE AN MPCA NPDES PERMIT. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY EROSION CONTROL PERMITS REQUIRED BY THE CITY.
- SEE SHEETS SW1.0 - SW1.5 FOR ALL EROSION CONTROL NOTES, DESCRIPTIONS, AND PRACTICES.
- SEE GRADING PLAN FOR ADDITIONAL GRADING AND EROSION CONTROL NOTES.
- CONTRACTOR IS RESPONSIBLE FOR SWPPP IMPLEMENTATION, INSPECTIONS, AND COMPLIANCE WITH NPDES PERMIT.

CITY OF MOUND EROSION CONTROL NOTES:

- RESERVED FOR CITY SPECIFIC EROSION CONTROL NOTES.

ALL SPECIFIED EROSION AND SEDIMENT CONTROL PRACTICES, AND MEASURES CONTAINED IN THIS SWPPP ARE THE MINIMUM REQUIREMENTS. ADDITIONAL PRACTICES MAY BE REQUIRED DURING THE COURSE OF CONSTRUCTION.



LEGEND:

- 1125 --- EX. 1' CONTOUR ELEVATION INTERVAL
- DRAINAGE ARROW
- SILT FENCE / BIOROLL - GRADING LIMIT
- INLET PROTECTION
- ▨ STABILIZED CONSTRUCTION ENTRANCE

811
 Know what's below.
 Call before you dig.

1" = 20'-0"
 10'-0" 0 20'-0"

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REVISION SUMMARY	
DATE	DESCRIPTION

SWPPP - PROPOSED CONDITIONS
SW1.1
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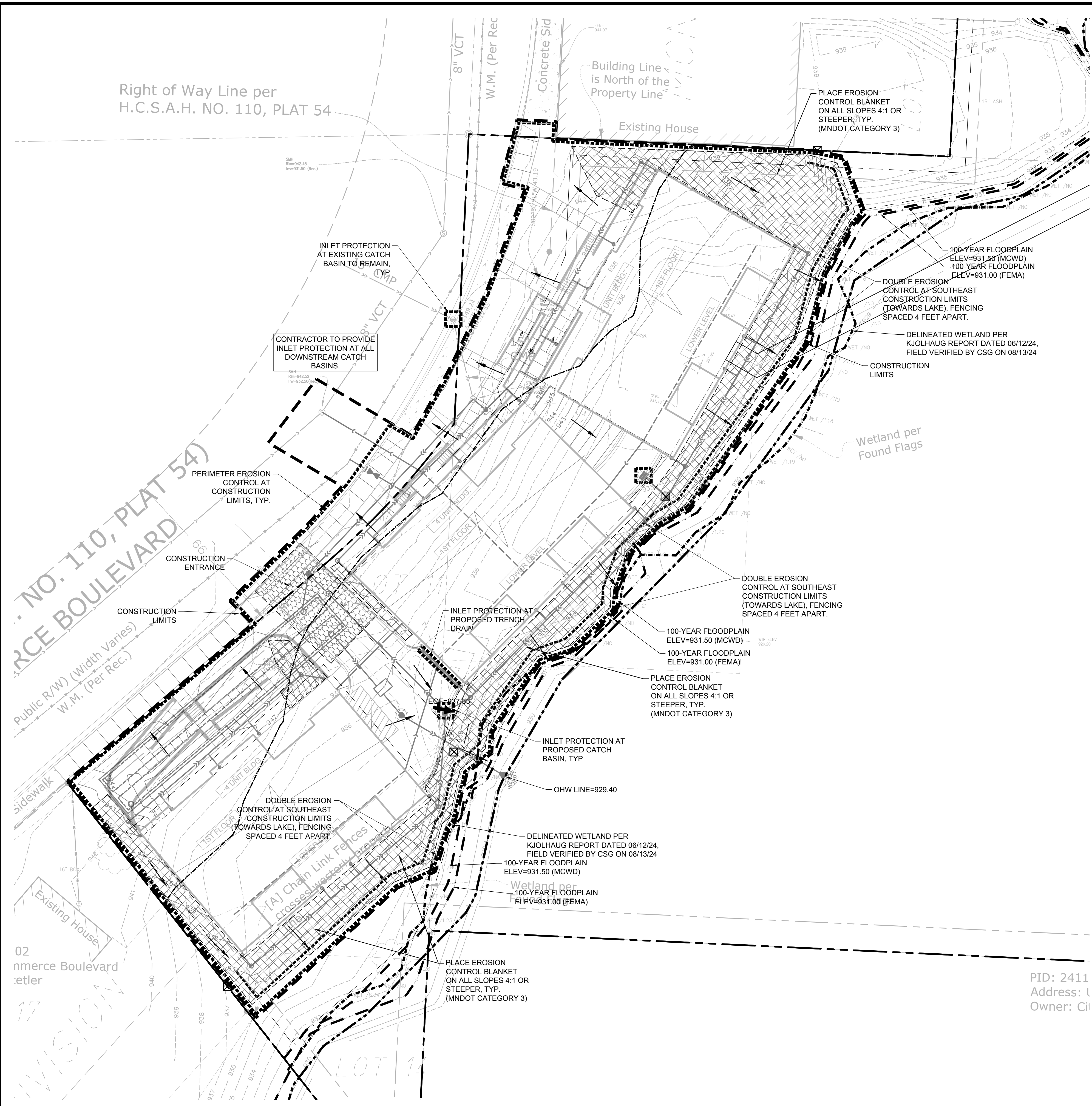
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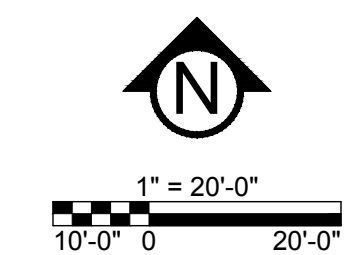
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PID: 2411
 Address: l
 Owner: Ci

LEGEND:

- 1125 --- EX. 1' CONTOUR ELEVATION INTERVAL
- 1137 --- 1.0' CONTOUR ELEVATION INTERVAL
- DRAINAGE ARROW
- SILT FENCE / BIOROLL - GRADING LIMIT
- INLET PROTECTION
- ▨ STABILIZED CONSTRUCTION ENTRANCE
- ▩ EROSION CONTROL BLANKET



Right of Way Line per
 H.C.S.A.H. NO. 110, PLAT 54

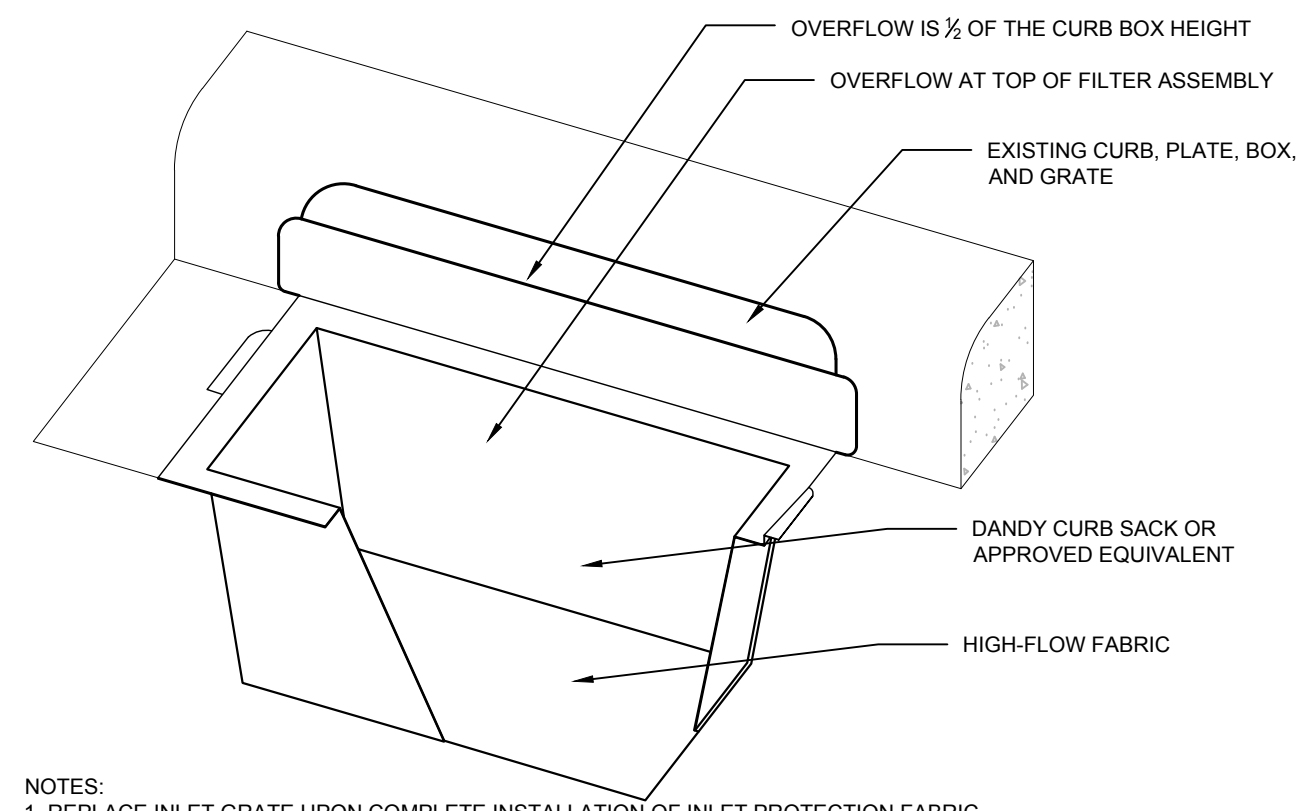
NO. 110, PLAT 54
 COMMERCE BOULEVARD
 Public R/W (Width Varies)
 W.M. (Per Rec.)

02 Commerce Boulevard
 Metler

LOT 1

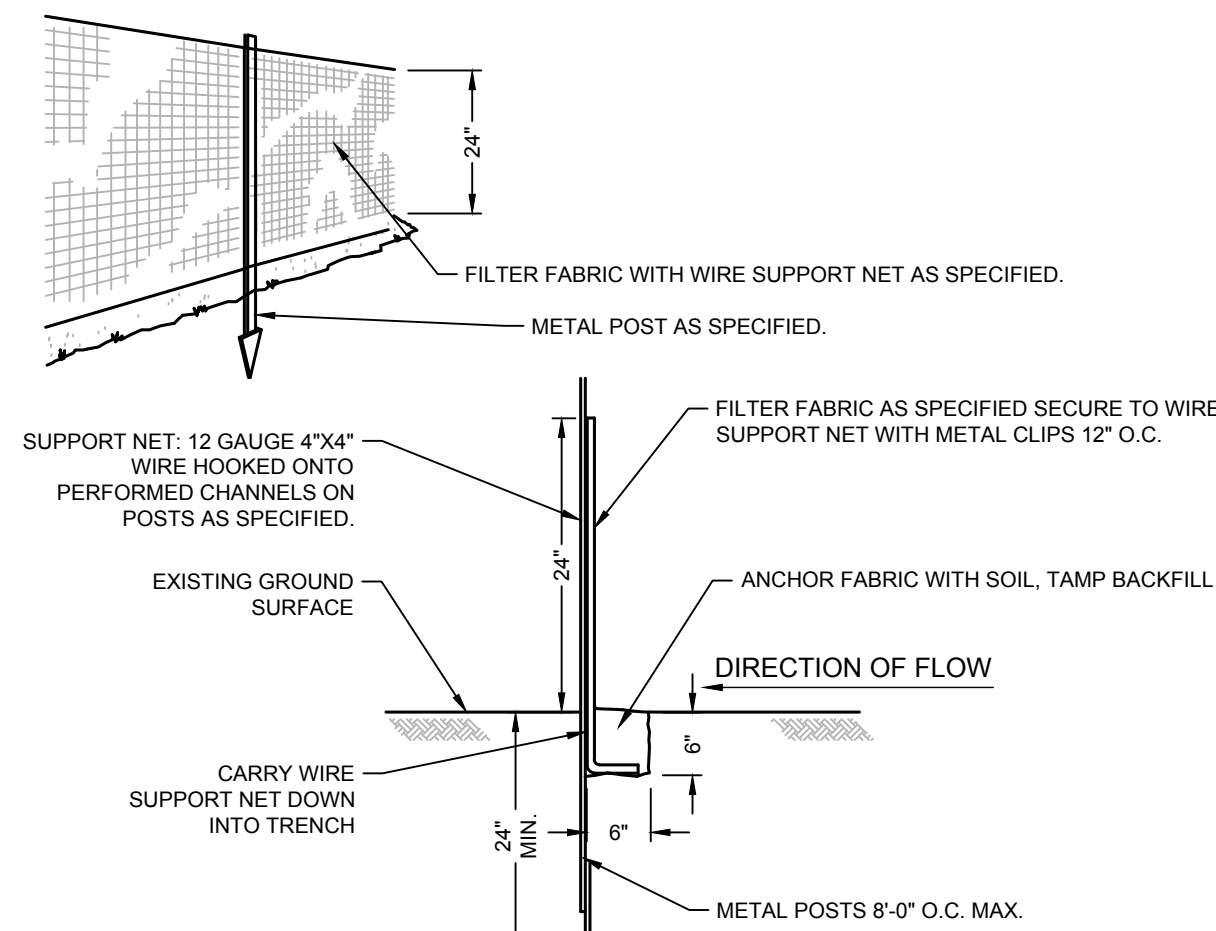
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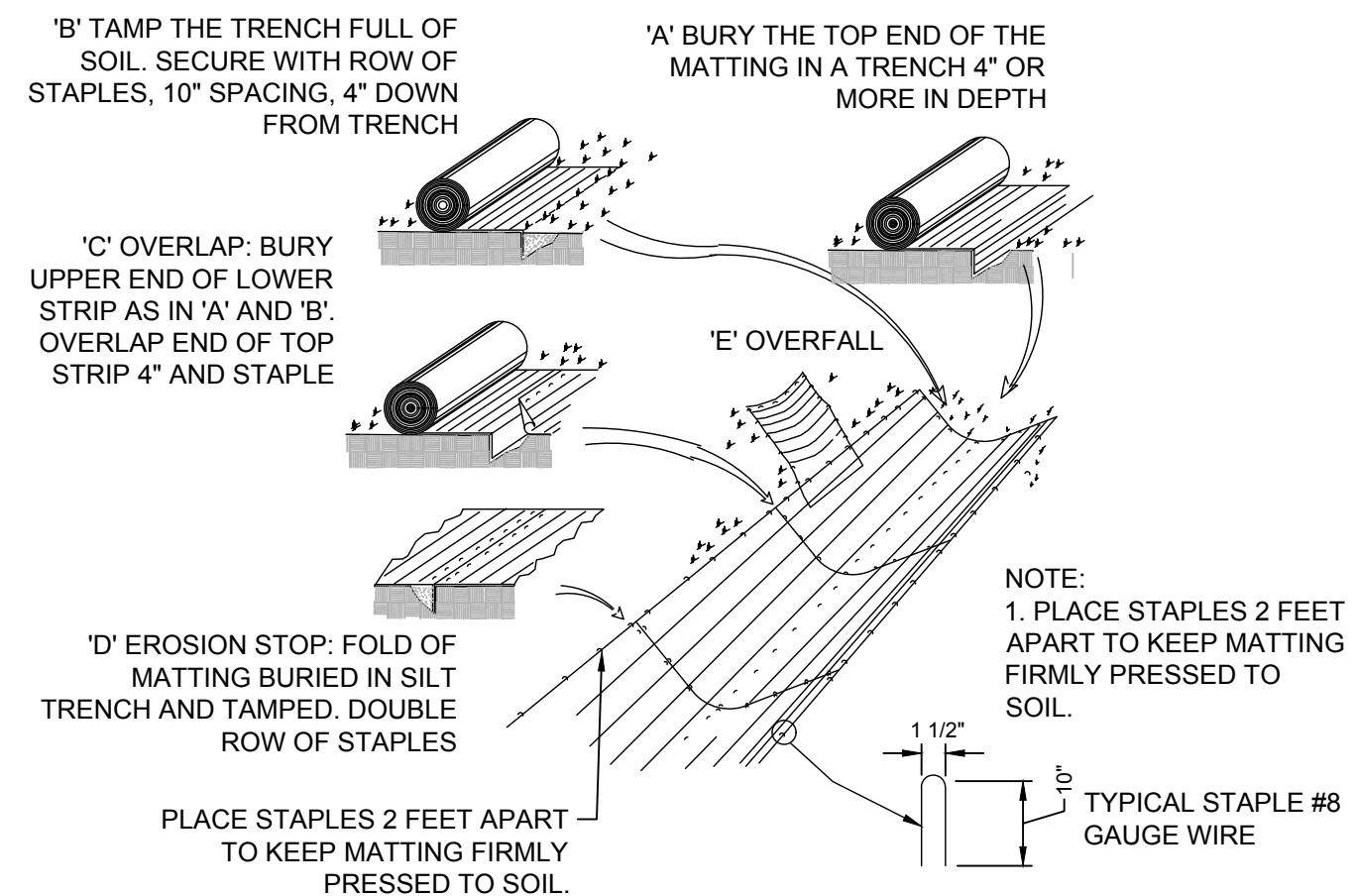


NOTES:
 1. REPLACE INLET GRATE UPON COMPLETE INSTALLATION OF INLET PROTECTION FABRIC.
 2. CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT AND DEBRIS FROM THE SURFACE OF THE SYSTEM AFTER EACH STORM EVENT AND AT THE COMPLETION OF THE CONTRACT.
 3. CONTRACTOR SHALL USE DANDY SACK OR APPROVED EQUIVALENT FOR STRUCTURES WITHOUT CURBING.

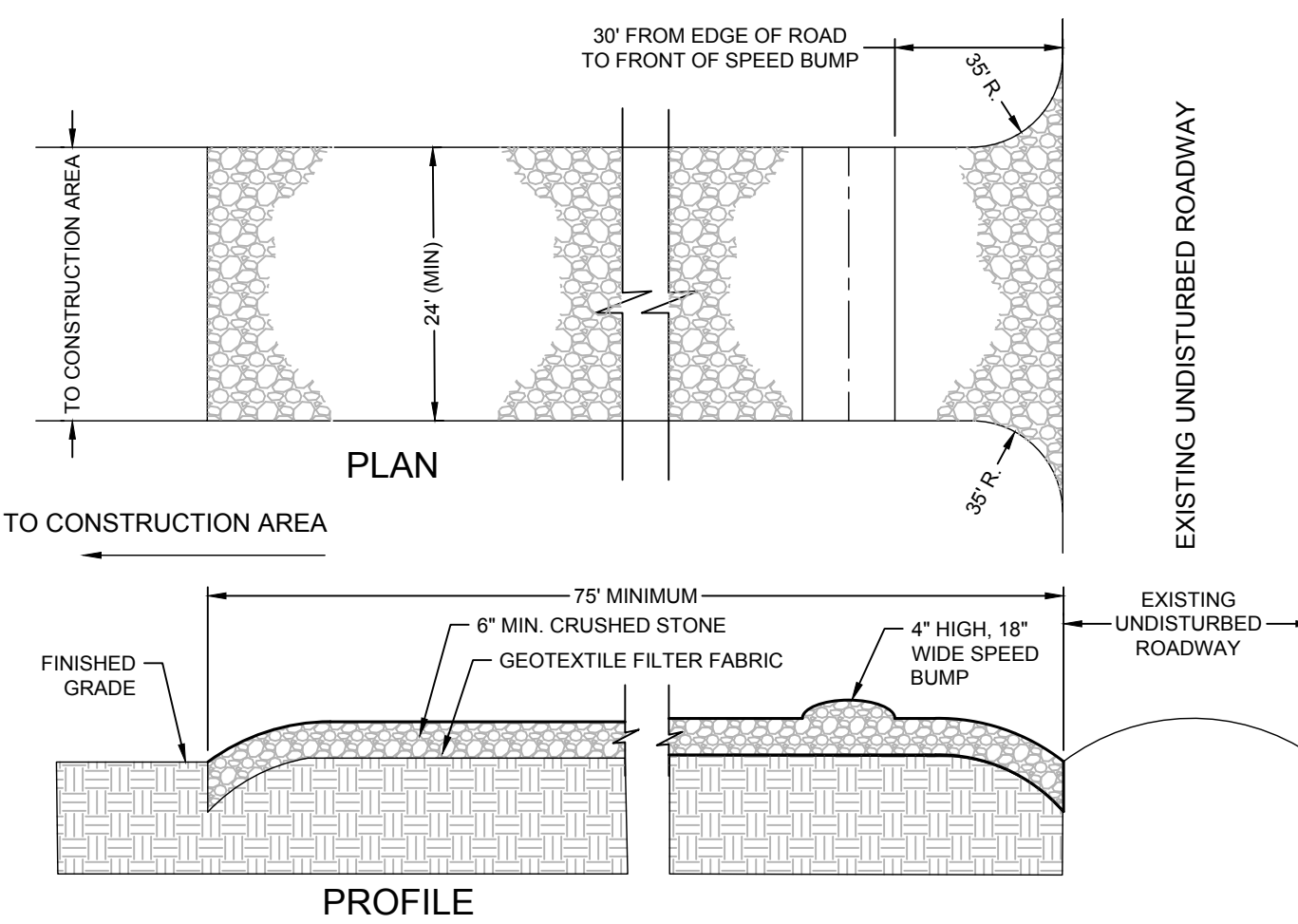
1 CURB INLET SACK
 N T S



2 SEDIMENT FENCE
 N T S

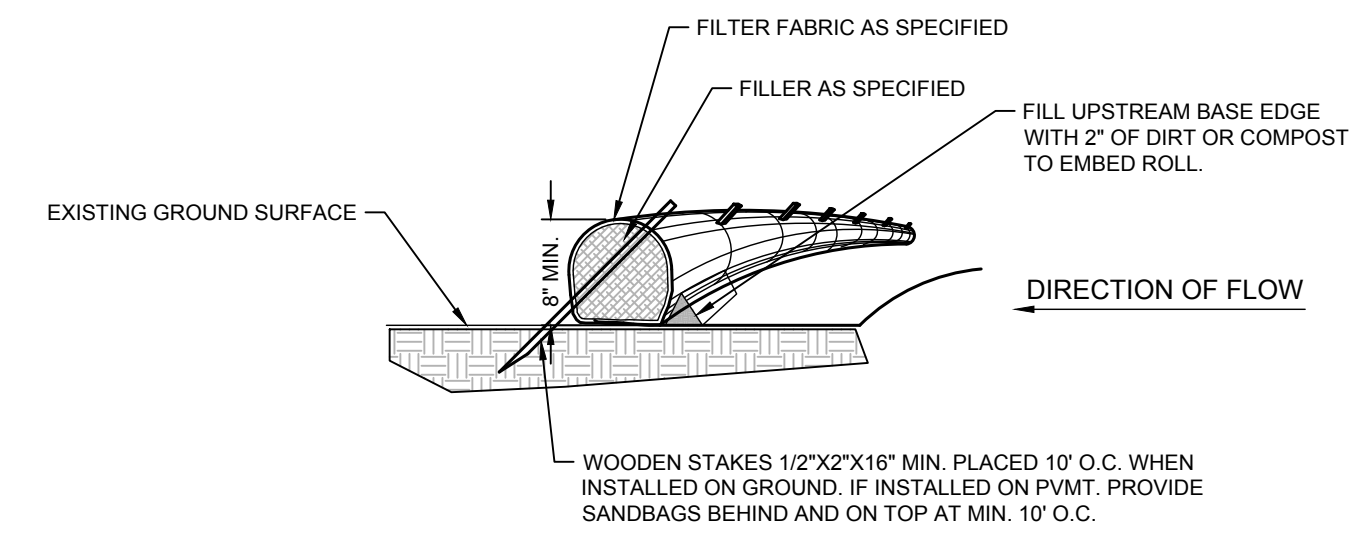


3 EROSION BLANKET
 N T S



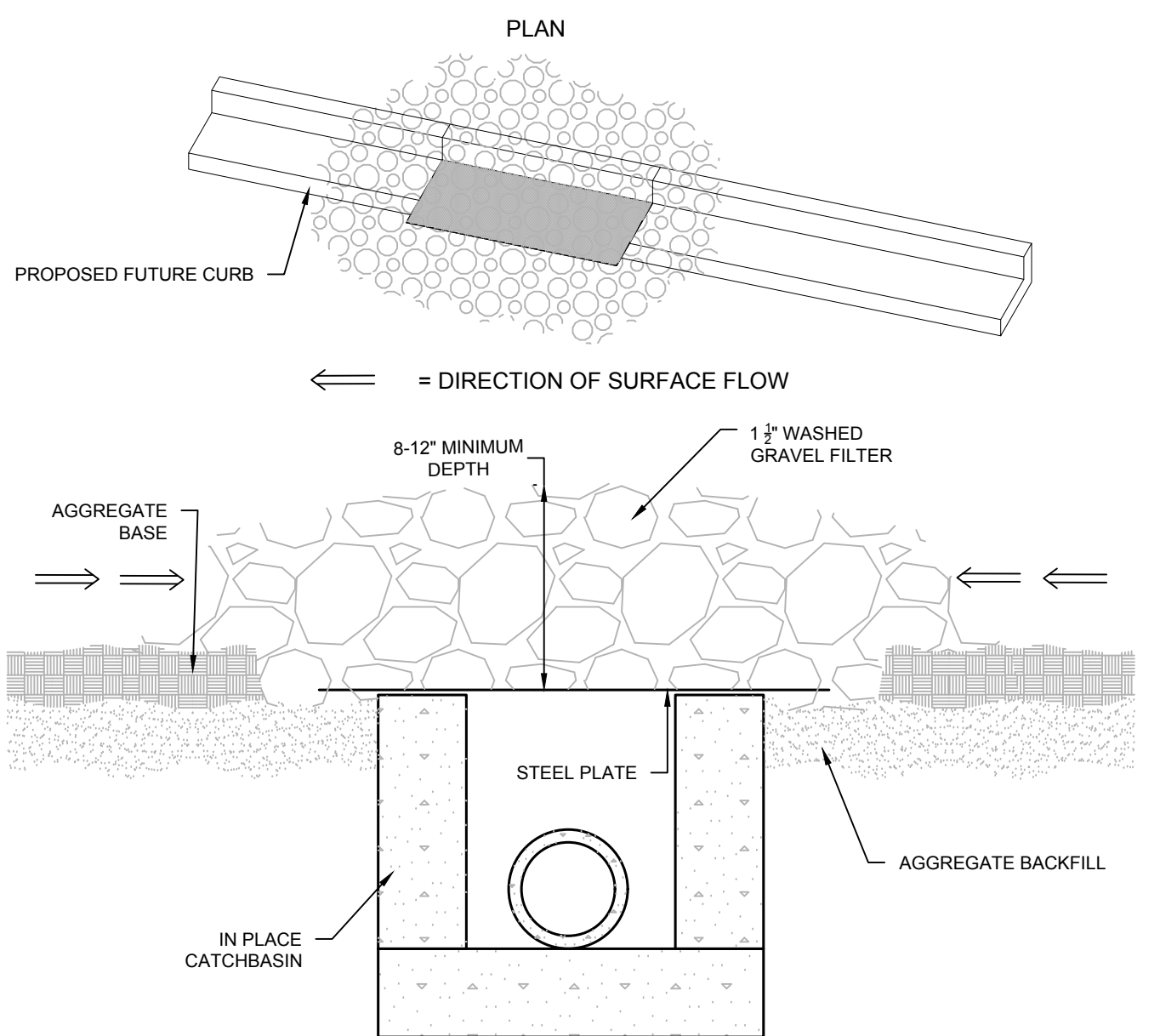
NOTES:
 1. PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND UNDISTURBED ROADWAY.
 2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO UNDISTURBED ROADWAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDING STONE TO THE LENGTH OF THE ENTRANCE.
 3. REPAIR AND CLEANOUT MEASURES USED TO TRAP SEDIMENT.
 4. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO UNDISTURBED ROADWAY SHALL BE REMOVED AS DIRECTED BY THE ENGINEER.
 5. FINAL LOCATION AND INSTALLATION SHALL BE COORDINATED WITH THE CITY PRIOR TO CONSTRUCTION ACTIVITIES.
 6. CRUSHED STONE SHALL BE 1-1/2" DIA. CLOSE GRADED, AND IN ACCORDANCE TO MNDOT SECTION 2118.

4 STABILIZED CONSTRUCTION ACCESS
 N T S



NOTE:
 1. COMPOST FILTER LOGS (BIO ROLLS) SHALL BE FILTREXX EROSION CONTROL SOXX OR APPROVED EQUAL.
 2. COMPOST FILLER TO BE MADE FROM A COMPOST BLEND 30%-40% GRADE 2 (SPEC 3890) AND 60%-70% PARTIALLY DECOMPOSED WOOD CHIPS, PER MNDOT SPEC 3897.
 3. FILTER FABRIC SHALL BE GEOTEXTILE KNITTED MATERIAL WITH MAX. OPENINGS OF 3/8".
 4. IF MULTIPLE ROLLS NEEDED, OVERLAP BY MIN. 12" AT ENDS AND STAKE.
 5. SILT SHALL BE REMOVED ONCE IT REACHES 80% OF THE HEIGHT OF THE ROLL OR AS DEEMED NECESSARY BY SITE CONTRACTOR TO MAINTAIN PROPER FUNCTION.

5 SEDIMENT BIO-ROLL / COMPOST FILTER LOG
 N T S



6 INLET PROTECTION ROCK FILTER
 N T S

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DATE	DESCRIPTION

REVISION SUMMARY	
DATE	DESCRIPTION

SWPPP - DETAILS

SW1.2

THE CONTRACTOR AND ALL SUBCONTRACTORS INVOLVED WITH A CONSTRUCTION ACTIVITY THAT DISTURBS SITE SOIL OR WHO IMPLEMENT A POLLUTANT CONTROL MEASURE IDENTIFIED IN THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) MUST COMPLY WITH THE REQUIREMENTS OF THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT (DATED AUGUST 1, 2018 # MNR100001) AND ANY LOCAL GOVERNING AGENCY HAVING JURISDICTION CONCERNING EROSION AND SEDIMENTATION CONTROL.

STORMWATER DISCHARGE DESIGN REQUIREMENTS

SWPPP

THE NATURE OF THIS PROJECT WILL BE CONSISTENT WITH WHAT IS REPRESENTED IN THIS SET OF CONSTRUCTION PLANS AND SPECIFICATIONS. SEE THE SWPPP PLAN SHEETS AND SWPPP NARRATIVE (ATTACHMENT A) FOR ADDITIONAL SITE SPECIFIC SWPPP INFORMATION. THE PLANS SHOW LOCATIONS AND TYPES OF ALL TEMPORARY AND PERMANENT EROSION PREVENTION AND SEDIMENT CONTROL BMP'S. STANDARD DETAILS ARE ATTACHED TO THIS SWPPP DOCUMENT.

THE INTENDED SEQUENCING OF MAJOR CONSTRUCTION ACTIVITIES IS AS FOLLOWS:

1. INSTALL STABILIZED ROCK CONSTRUCTION ENTRANCE
2. INSTALLATION OF SILT FENCE AROUND SITE
3. INSTALL AROUND CONSTRUCTION FENCING AROUND INFILTRATION AREAS
4. INSTALL INLET PROTECTION AT ALL ADJACENT AND DOWNSTREAM CATCH BASINS
5. CLEAR AND GRUB FOR TEMPORARY SEDIMENT BASIN / POND INSTALL
6. CONSTRUCT TEMPORARY SEDIMENT BASIN / POND (SECTION 14)
7. CLEAR AND GRUB REMAINDER OF SITE
8. STRIP AND STOCKPILE TOPSOIL
9. ROUGH GRADING OF SITE
10. STABILIZE DENUDED AREAS AND STOCKPILES
11. INSTALL SANITARY SEWER, WATER MAIN STORM SEWER AND SERVICES
12. INSTALL SILT FENCE / INLET PROTECTION AROUND CBS
13. INSTALL STRIP AND GUTTER
14. INSTALL CURB AND GUTTER
15. BITUMINOUS ON STREETS
16. FINAL GRADE BOULEVARD, INSTALL SEED AND MULCH
17. REMOVE ACCUMULATED SEDIMENT FROM BASIN / POND
18. FINAL GRAD POND / INFILTRATION BASINS (DO NOT COMPACT SOILS IN INFILTRATION AREAS.)
19. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITES IS STABILIZED BY EITHER SEED OR SOILLANDSCAPING, REMOVE SILT FENCE AND RESEED ANY AREAS DISTURBED BY THE REMOVAL.

RECORDS RETENTION:

THE SWPPP (ORIGINAL OR COPIES) INCLUDING, ALL CHANGES TO IT, AND INSPECTIONS AND MAINTENANCE RECORDS MUST BE KEPT AT THE SITE DURING CONSTRUCTION BY THE PERMITEE WHO HAS OPERATIONAL CONTROL OF THAT PORTION OF THE SITE. THE SWPPP CAN BE KEPT IN EITHER THE FIELD OFFICE OR IN AN ON SITE VEHICLE DURING NORMAL WORKING HOURS.

ALL OWNER(S) MUST KEEP THE SWPPP, ALONG WITH THE FOLLOWING ADDITIONAL RECORDS, ON FILE FOR THREE (3) YEARS AFTER SUBMITTAL OF THE NOT AS OUTLINED IN SECTION 4. THIS DOES NOT INCLUDE ANY RECORDS AFTER SUBMITTAL OF THE NOT.

1. THE FINAL SWPPP;
2. ANY OTHER STORMWATER RELATED PERMITS REQUIRED FOR THE PROJECT;
3. RECORDS OF ALL INSPECTION AND MAINTENANCE CONDUCTED DURING CONSTRUCTION (SEE SECTION 11, INSPECTIONS AND MAINTENANCE);
4. ALL PERMANENT OPERATION AND MAINTENANCE AGREEMENTS THAT HAVE BEEN IMPLEMENTED, INCLUDING ALL RIGHT OF WAY, CONTRACTS, COVENANTS AND OTHER BINDING REQUIREMENTS REGARDING PERPETUAL MAINTENANCE; AND
5. ALL REQUIRED CALCULATIONS FOR DESIGN OF THE TEMPORARY AND PERMANENT STORMWATER MANAGEMENT SYSTEMS.

SWPPP IMPLEMENTATION RESPONSIBILITIES:

1. THE OWNER AND CONTRACTOR ARE PERMITEE(S) AS IDENTIFIED BY THE NPDES PERMIT.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE IMPLEMENTATION OF THE SWPPP, INCLUDING THE ACTIVITIES OF ALL OF THE CONTRACTOR'S SUBCONTRACTORS.
3. CONTRACTOR SHALL PROVIDE A PERSON(S) KNOWLEDGEABLE AND EXPERIENCED IN THE APPLICATION OF EROSION PREVENTION AND SEDIMENT CONTROL BMP'S TO OVERSEE ALL INSTALLATION AND MAINTENANCE OF BMP'S AND IMPLEMENTATION OF THE SWPPP.
4. CONTRACTOR SHALL PROVIDE PERSON(S) MEETING THE TRAINING REQUIREMENTS OF THE NPDES PERMIT TO CONDUCT INSPECTION AND MAINTENANCE OF ALL EROSION PREVENTION AND SEDIMENT CONTROL BMP'S IN ACCORDANCE WITH THE REQUIREMENTS OF THE PERMIT. ONE OF THESE INDIVIDUAL(S) MUST BE AVAILABLE FOR AN ONSITE INSPECTION WITHIN 72 HOURS UPON REQUEST BY MPCA. CONTRACTOR SHALL PROVIDE TRAINING DOCUMENTATION FOR THESE INDIVIDUAL(S) AS REQUIRED BY THE NPDES PERMIT. THIS TRAINING DOCUMENTATION SHALL BE RECORDED IN OR WITH THE SWPPP BEFORE THE START OF CONSTRUCTION OR AS SOON AS THE PERSONNEL FOR THE PROJECT HAVE BEEN DETERMINED. DOCUMENTATION SHALL INCLUDE:
 - 4.1. NAMES OF THE PERSONNEL ASSOCIATED WITH THE PROJECT THAT ARE REQUIRED TO BE TRAINED PER SECTION 21 OF THE PERMIT.
 - 4.2. DATE OF TRAINING AND NAME OF INSTRUCTOR AND ENTITY PROVIDING TRAINING.
 - 4.3. CONTENT OF TRAINING COURSE OR WORKSHOP INCLUDING THE NUMBER OF HOURS OF TRAINING.
5. FOLLOWING FINAL STABILIZATION AND THE TERMINATION OF COVERAGE FOR THE NPDES PERMIT, THE OWNER IS EXPECTED TO FURNISH LONG TERM OPERATION AND MAINTENANCE (O & M) OF THE PERMANENT STORM WATER MANAGEMENT SYSTEM.

CONSTRUCTION ACTIVITY REQUIREMENTS

SWPPP AMENDMENTS (SECTION 6):

1. ONE OF THE INDIVIDUALS DESCRIBED IN ITEM 21.2 A OR ITEM 21.2 B OR ANOTHER QUALIFIED INDIVIDUAL MUST COMPLETE ALL SWPPP CHANGES. CHANGES INVOLVING THE USE OF A LESS STRINGENT BMP MUST INCLUDE A JUSTIFICATION DESCRIBING HOW THE REPLACEMENT BMP IS EFFECTIVE FOR THE SITE CHARACTERISTICS.
2. PERMITEES MUST AMEND THE SWPPP TO INCLUDE ADDITIONAL OR MODIFIED BMP'S AS NECESSARY TO CORRECT PROBLEMS IDENTIFIED OR ADDRESS SITUATIONS WHENEVER THERE IS A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, MAINTENANCE, WEATHER OR SEASONAL CONDITIONS HAVING A SIGNIFICANT EFFECT ON THE DISCHARGE OF POLLUTANTS TO SURFACE WATERS OR GROUNDWATER.
3. PERMITEES MUST AMEND THE SWPPP TO INCLUDE ADDITIONAL OR MODIFIED BMP'S AS NECESSARY TO CORRECT PROBLEMS IDENTIFIED OR ADDRESS SITUATIONS WHENEVER INSPECTIONS OR INVESTIGATIONS BY THE SITE OWNER OR OPERATOR, USEPA OR MPCA OFFICIALS INDICATE THE SWPPP IS NOT EFFECTIVE IN ELIMINATING OR SIGNIFICANTLY MINIMIZING THE DISCHARGE OF POLLUTANTS TO SURFACE WATERS OR GROUNDWATER OR THE DISCHARGES ARE CAUSING WATER QUALITY STANDARD EXCEEDANCES (E.G., NUISANCE CONDITIONS AS DEFINED IN MINN. R. 7050.0210, SUBP. 2) OR THE SWPPP IS NOT CONSISTENT WITH THE OBJECTIVES OF A USEPA APPROVED TMDL.

BMP SELECTION AND INSTALLATION (SECTION 7):

1. PERMITEES MUST SELECT, INSTALL, AND MAINTAIN THE BMP'S IDENTIFIED IN THE SWPPP AND IN THIS PERMIT IN AN APPROPRIATE AND FUNCTIONAL MANNER AND IN ACCORDANCE WITH RELEVANT MANUFACTURER SPECIFICATIONS AND ACCEPTED ENGINEERING PRACTICES.

EROSION PREVENTION (SECTION 8):

1. BEFORE WORK BEGINS, PERMITEES MUST DELINEATE THE LOCATION OF AREAS NOT TO BE DISTURBED.
2. PERMITEES MUST MINIMIZE THE NEED FOR DISTURBANCE OF PORTIONS OF THE PROJECT WITH STEEP SLOPES. WHEN STEEP SLOPES MUST BE DISTURBED, PERMITEES MUST USE TECHNIQUES SUCH AS PHASING AND STABILIZATION PRACTICES DESIGNED FOR STEEP SLOPES (E.G., SLOPE DRAINING AND TERRACING).
3. PERMITEES MUST STABILIZE ALL EXPOSED SOIL AREAS, INCLUDING STOCKPILES. STABILIZATION MUST BE INITIATED IMMEDIATELY TO LIMIT SOIL EROSION WHEN CONSTRUCTION ACTIVITY HAS PERMANENTLY OR TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS. STABILIZATION MUST BE COMPLETED NO LATER THAN 14 CALENDAR DAYS AFTER THE CONSTRUCTION ACTIVITY HAS CEASED. STABILIZATION IS NOT REQUIRED ON CONSTRUCTED BASE COMPONENTS OF ROADS, PARKING LOTS AND SIMILAR SURFACES. STABILIZATION IS NOT REQUIRED ON TEMPORARY STOCKPILES WITHOUT SIGNIFICANT SILT, CLAY OR ORGANIC COMPONENTS (E.G., CLEAN AGGREGATE STOCKPILES, DEMOLITION CONCRETE STOCKPILES, SAND STOCKPILES) BUT PERMITEES MUST PROVIDE SEDIMENT CONTROLS AT THE BASE OF THE STOCKPILE.
4. FOR PUBLIC WATERS THAT THE MINNESOTA DNR HAS PROMULGATED "WORK IN WATER RESTRICTIONS" DURING SPECIFIED FISH SPAWNING TIME FRAMES, PERMITEES MUST COMPLETE STABILIZATION OF ALL EXPOSED SOIL AREAS WITHIN 200 FEET OF THE WATER'S EDGE, AND THAT DRAIN TO THESE WATERS, WITHIN 24 HOURS DURING THE RESTRICTION PERIOD.
5. PERMITEES MUST STABILIZE THE NORMAL WETTED PERIMETER OF THE LAST 200 LINEAR FEET OF TEMPORARY OR PERMANENT DRAINAGE DITCHES OR SWALES THAT DRAIN WATER FROM THE SITE WITHIN 24 HOURS AFTER CONNECTING TO A SURFACE WATER OR PROPERTY EDGE. PERMITEES MUST COMPLETE STABILIZATION OF REMAINING PORTIONS OF TEMPORARY OR PERMANENT DITCHES OR SWALES WITHIN 14 CALENDAR DAYS AFTER CONNECTING TO A SURFACE WATER OR PROPERTY EDGE AND CONSTRUCTION IN THAT PORTION OF THE DITCH TEMPORARILY OR PERMANENTLY CEASES.
6. TEMPORARY OR PERMANENT DITCHES OR SWALES BEING USED AS A SEDIMENT CONTAINMENT SYSTEM DURING CONSTRUCTION (WITH PROPERLY DESIGNED ROCK-DITCH CHECKS, BIO ROLLS, SILT DIKES, ETC.) DO NOT NEED TO BE STABILIZED. PERMITEES MUST STABILIZE THESE AREAS WITHIN 24 HOURS AFTER THEIR USE AS A SEDIMENT CONTAINMENT SYSTEM CEASES
7. PERMITEES MUST NOT USE MULCH, HYDROMULCH, TACKIFIER, POLYACRYLAMIDE OR SIMILAR EROSION

- PREVENTION PRACTICES WITHIN ANY PORTION OF THE NORMAL WETTED PERIMETER OF A TEMPORARY OR PERMANENT DRAINAGE DITCH OR SWALE SECTION WITH A CONTINUOUS SLOPE OF GREATER THAN 2 PERCENT.
8. PERMITEES MUST PROVIDE TEMPORARY OR PERMANENT ENERGY DISSIPATION AT ALL PIPE OUTLETS WITHIN 24 HOURS AFTER CONNECTION TO A SURFACE WATER OR PERMANENT STORMWATER TREATMENT SYSTEM.
 9. PERMITEES MUST NOT DISTURB MORE LAND (I.E., PHASING) THAN CAN BE EFFECTIVELY INSPECTED AND MAINTAINED IN ACCORDANCE WITH SECTION 11.

SEDIMENT CONTROL (SECTION 9):

1. PERMITEES MUST ESTABLISH SEDIMENT CONTROL BMP'S ON ALL DOWNGRADIENT PERIMETERS OF THE SITE AND DOWNGRADIENT AREAS OF THE SITE THAT DRAIN TO ANY SURFACE WATER, INCLUDING CURB AND GUTTER SYSTEMS. PERMITEES MUST LOCATE SEDIMENT CONTROL PRACTICES UPGRADIENT OF ANY BUFFER ZONES. PERMITEES MUST INSTALL SEDIMENT CONTROL PRACTICES BEFORE ANY UPGRADIENT LAND-DISTURBING ACTIVITIES BEGIN AND MUST KEEP THE SEDIMENT CONTROL PRACTICES IN PLACE UNTIL THEY ESTABLISH PERMANENT COVER.
2. IF DOWNGRADIENT SEDIMENT CONTROLS ARE OVERLOADED, BASED ON FREQUENT FAILURE OR EXCESSIVE MAINTENANCE REQUIREMENTS, PERMITEES MUST INSTALL ADDITIONAL UPGRADIENT SEDIMENT CONTROL PRACTICES OR REDUNDANT BMP'S TO ELIMINATE THE OVERLOADING AND AMEND THE SWPPP TO IDENTIFY THESE ADDITIONAL PRACTICES AS REQUIRED IN ITEM 6.3.
3. TEMPORARY OR PERMANENT DRAINAGE DITCHES AND SEDIMENT BASINS DESIGNED AS PART OF A SEDIMENT CONTAINMENT SYSTEM (E.G., DITCHES WITH ROCK CHECK DAMS) REQUIRE SEDIMENT CONTROL PRACTICES ONLY AS APPROPRIATE FOR SITE CONDITIONS.
4. A FLOATING SILT CURTAIN PLACED IN THE WATER IS NOT A SEDIMENT CONTROL BMP TO SATISFY ITEM 9.2 EXCEPT WHEN WORKING ON A SHORELINE OR BELOW THE WATERLINE. IMMEDIATELY AFTER THE SHORT TERM CONSTRUCTION ACTIVITY (E.G., INSTALLATION OF RIP RAP ALONG THE SHORELINE) IN THAT AREA IS COMPLETE, PERMITEES MUST INSTALL AN UPWARD PERIMETER CONTROL PRACTICE IF EXPOSED SOILS STILL DRAIN TO A SURFACE WATER.
5. PERMITEES MUST RE-INSTALL ALL SEDIMENT CONTROL PRACTICES ADJUSTED OR REMOVED TO ACCOMMODATE SHORT-TERM ACTIVITIES SUCH AS CLEARING OR GRUBBING, OR PASSAGE OF VEHICLES, IMMEDIATELY AFTER THE SHORT-TERM ACTIVITY IS COMPLETED. PERMITEES MUST RE-INSTALL SEDIMENT CONTROL PRACTICES BEFORE THE NEXT PRECIPITATION EVENT EVEN IF THE SHORT-TERM ACTIVITY IS NOT COMPLETE.
6. PERMITEES MUST PROTECT ALL STORM DRAIN INLETS USING APPROPRIATE BMP'S DURING CONSTRUCTION UNTIL THEY ESTABLISH PERMANENT COVER ON ALL AREAS WITH POTENTIAL FOR DISCHARGING TO THE INLET.
7. PERMITEES MAY REMOVE INLET PROTECTION FOR A PARTICULAR INLET IF A SPECIFIC SAFETY CONCERN (E.G. STREET FLOODING/FREEZING) IS IDENTIFIED BY THE PERMITEES OR THE JURISDICTIONAL AUTHORITY (E.G. COUNTY/TOWNSHIP/MINNESOTA DEPARTMENT OF TRANSPORTATION/ENGINEER). PERMITEES MUST DOCUMENT THE NEED FOR REMOVAL IN THE SWPPP.
8. PERMITEES MUST PROVIDE SILT FENCE OR OTHER EFFECTIVE SEDIMENT CONTROLS AT THE BASE OF STOCKPILES ON THE DOWNGRADIENT PERIMETER.
9. PERMITEES MUST LOCATE STOCKPILES OUTSIDE OF NATURAL BUFFERS OR SURFACE WATERS, INCLUDING STORMWATER CONVEYANCES SUCH AS CURB AND GUTTER SYSTEMS UNLESS THERE IS A BYPASS IN PLACE FOR THE STORMWATER.
10. PERMITEES MUST INSTALL A VEHICLE TRACKING BMP TO MINIMIZE THE TRACK OUT OF SEDIMENT FROM THE CONSTRUCTION SITE OR ONTO PAVED ROADS WITHIN THE SITE.
11. PERMITEES MUST USE STREET SWEEPING IF VEHICLE TRACKING BMP'S ARE NOT ADEQUATE TO PREVENT SEDIMENT TRACKING OUT OF THE STREET.
12. PERMITEES MUST INSTALL TEMPORARY SEDIMENT BASINS AS REQUIRED IN SECTION 14.
13. IN ANY AREAS OF THE SITE WHERE FINAL VEGETATIVE STABILIZATION WILL OCCUR, PERMITEES MUST RESTRICT VEHICLE AND EQUIPMENT USE TO MINIMIZE SOIL COMPACTION.
14. PERMITEES MUST PRESERVE TOPSOIL ON THE SITE, UNLESS INFEASIBLE.
15. PERMITEES MUST DIRECT DISCHARGES FROM BMP'S TO VEGETATED AREAS UNLESS INFEASIBLE.
16. PERMITEES MUST PRESERVE A 50 FOOT NATURAL BUFFER OR, IF A BUFFER IS INFEASIBLE ON THE SITE, PROVIDE REDUNDANT (DOUBLE) PERIMETER SEDIMENT CONTROLS WITHIN A SURFACE WATER IS LOCATED WITHIN 50 FEET OF THE PROJECT'S EARTH DISTURBANCES AND STORMWATER FLOWS TO THE SURFACE WATER. PERMITEES MUST INSTALL PERIMETER SEDIMENT CONTROLS AT LEAST 5 FEET APART UNLESS LIMITED BY LACK OF AVAILABLE SPACE. NATURAL BUFFERS ARE NOT REQUIRED ADJACENT TO ROAD DITCHES, JUDICIAL DITCHES, COUNTY DITCHES, STORMWATER CONVEYANCE CHANNELS, STORM DRAIN INLETS, AND SEDIMENT BASINS. IF PRESERVING THE BUFFER IS INFEASIBLE, PERMITEES MUST DOCUMENT THE REASONS IN THE SWPPP. SHEET PILE OR REDUNDANT PERIMETER CONTROL IF INSTALLED IN A MANNER THAT RETAINS ALL STORMWATER.
17. PERMITEES MUST USE POLYMERS, FLOCCULANTS, OR OTHER SEDIMENTATION TREATMENT CHEMICALS IN ACCORDANCE WITH ACCEPTED ENGINEERING PRACTICES, DOSING SPECIFICATIONS AND SEDIMENT REMOVAL DESIGN SPECIFICATIONS PROVIDED BY THE MANUFACTURER OR SUPPLIER. THE PERMITEES MUST USE CONVENTIONAL EROSION AND SEDIMENT CONTROLS PRIOR TO CHEMICAL ADDITION AND MUST DIRECT TREATED STORMWATER TO A SEDIMENT CONTROL SYSTEM FOR FILTRATION OR SETTLEMENT OF THE FLOC PRIOR TO DISCHARGE.

DEWATERING AND BASIN DRAINING (SECTION 10):

1. PERMITEES MUST DISCHARGE TURBID OR SEDIMENT-LADEN WATERS RELATED TO DEWATERING OR BASIN DRAINING (E.G., PUMPED DISCHARGES, TRENCHDITCH CUTS FOR DRAINAGE) TO A TEMPORARY OR PERMANENT SEDIMENT BASIN. PERMITEES MUST INSPECT THE BASIN PRIOR TO DISCHARGE TO SURFACE WATERS IF THEY VISUALLY CHECK TO ENSURE ADEQUATE TREATMENT HAS BEEN OBTAINED AND NUISANCE CONDITIONS (SEE MINN. R. 7050.0210, SUBP. 2) WILL NOT RESULT FROM THE DISCHARGE. IF PERMITEES CANNOT DISCHARGE THE WATER TO A SEDIMENTATION BASIN PRIOR TO ENTERING A SURFACE WATER, PERMITEES MUST TREAT IT WITH APPROPRIATE BMP'S SUCH THAT THE DISCHARGE DOES NOT ADVERSELY AFFECT WATER OR DOWNSTREAM PROPERTIES.
2. IF PERMITEES MUST DISCHARGE WATER CONTAINING OIL OR GREASE, THEY MUST USE AN OIL-WATER SEPARATOR OR SUITABLE FILTRATION DEVICE (E.G., CARTRIDGE FILTERS, ABSORBENTS PADS) PRIOR TO DISCHARGE.
3. PERMITEES MUST DISCHARGE ALL WATER FROM DEWATERING OR BASIN-DRAINING ACTIVITIES IN A MANNER THAT DOES NOT CAUSE EROSION OR SCOUR IN THE IMMEDIATE VICINITY OF DISCHARGE POINTS OR INUNDATION OF WETLANDS IN THE IMMEDIATE VICINITY OF DISCHARGE POINTS THAT CAUSES SIGNIFICANT ADVERSE IMPACT TO THE WETLAND.
4. IF PERMITEES USE FILTERS WITH BACKWASH WATER, THEY MUST HAUL THE BACKWASH WATER AWAY FOR DISPOSAL, RETURN THE BACKWASH WATER TO THE BEGINNING OF THE TREATMENT PROCESS, OR INCORPORATE THE BACKWASH WATER INTO THE SITE IN A MANNER THAT DOES NOT CAUSE EROSION.

INSPECTIONS AND MAINTENANCE (SECTION 11):

1. PERMITEES MUST ENSURE A TRAINED PERSON, AS IDENTIFIED IN ITEM 21.2.B, WILL INSPECT THE ENTIRE CONSTRUCTION SITE AT LEAST ONCE EVERY SEVEN (7) DAYS DURING ACTIVE CONSTRUCTION AND WITHIN 24 HOURS AFTER A RAINFALL EVENT GREATER THAN 1/2 INCH IN 24 HOURS.
2. PERMITEES MUST INSPECT AND MAINTAIN ALL PERMANENT STORMWATER TREATMENT BMP'S.
3. PERMITEES MUST INSPECT AND MAINTAIN ALL POLLUTION PREVENTION AND SEDIMENT CONTROL BMP'S AND POLLUTION PREVENTION MEASURES TO ENSURE INTEGRITY AND EFFECTIVENESS. PERMITEES MUST REPAIR, REPLACE OR SUPPLEMENT ALL NONFUNCTIONAL BMP'S WITH FUNCTIONAL BMP'S BY THE END OF THE NEXT BUSINESS DAY AFTER DISCOVERY UNLESS ANOTHER TIME FRAME IS SPECIFIED IN ITEM 11.5 OR 11.6. PERMITEES MAY TAKE ADDITIONAL TIME IF FIELD CONDITIONS PREVENT ACCESS TO THE AREA.
4. DURING EACH INSPECTION, PERMITEES MUST INSPECT SURFACE WATERS, INCLUDING DRAINAGE DITCHES AND CONVEYANCE SYSTEMS BUT NOT CURB AND GUTTER SYSTEMS, FOR EVIDENCE OF EROSION AND SEDIMENT DEPOSITION. PERMITEES MUST REMOVE ALL DELTAS AND SEDIMENT DEPOSITED IN SURFACE WATERS, INCLUDING DRAINAGE WAYS, CATCH BASINS, AND OTHER DRAINAGE SYSTEMS AND RESTABILIZE THE AREAS WHERE SEDIMENT REMOVAL RESULTS IN EXPOSED SOIL. PERMITEES MUST COMPLETE REMOVAL AND STABILIZATION WITHIN SEVEN (7) CALENDAR DAYS OF DISCOVERY UNLESS PRECLUDED BY LEGAL, REGULATORY, OR PHYSICAL ACCESS CONSTRAINTS. PERMITEES MUST USE ALL REASONABLE EFFORTS TO OBTAIN ACCESS. IF PRECLUDED, REMOVAL AND STABILIZATION MUST TAKE PLACE WITHIN SEVEN (7) DAYS OF OBTAINING ACCESS. PERMITEES ARE RESPONSIBLE FOR CONTACTING ALL LOCAL, REGIONAL, STATE AND FEDERAL AUTHORITIES AND RECEIVING ANY APPLICABLE PERMITS, PRIOR TO CONDUCTING ANY WORK IN SURFACE WATERS.
5. PERMITEES MUST INSPECT CONSTRUCTION SITE VEHICLE EXIT LOCATIONS, STREETS AND CURB AND GUTTER SYSTEMS WITHIN AND ADJACENT TO THE PROJECT FOR SEDIMENTATION FROM EROSION OR TRACKED SEDIMENT FROM VEHICLES. PERMITEES MUST REMOVE SEDIMENT FROM ALL EXISTING SURFACES WITHIN ONE (1) CALENDAR DAY OF DISCOVERY OR, IF APPLICABLE, WITHIN A SHORTER TIME TO AVOID A SAFETY HAZARD TO USERS OF PUBLIC STREETS.
6. PERMITEES MUST REPAIR, REPLACE OR SUPPLEMENT ALL PERIMETER CONTROL DEVICES WHEN THEY BECOME NONFUNCTIONAL OR THE SEDIMENT REACHES 1/2 OF THE HEIGHT OF THE DEVICE.
7. PERMITEES MUST DRAIN TEMPORARY AND PERMANENT SEDIMENTATION BASINS AND REMOVE THE SEDIMENT WHEN THE DEPTH OF SEDIMENT COLLECTED IN THE BASIN REACHES 1/2 THE STORAGE VOLUME.
8. PERMITEES MUST ENSURE THAT AT LEAST ONE INDIVIDUAL PRESENT ON THE SITE (OR AVAILABLE TO THE PROJECT SITE IN THREE (3) CALENDAR DAYS) IS TRAINED IN THE JOB DUTIES DESCRIBED IN ITEM 21.2.B.
9. PERMITEES MAY ADJUST THE INSPECTION SCHEDULE DESCRIBED IN ITEM 11.2 AS FOLLOWS:
 - a. INSPECTIONS OF AREAS WITH PERMANENT COVER CAN BE REDUCED TO ONCE PER MONTH, EVEN IF CONSTRUCTION ACTIVITY CONTINUES ON OTHER PORTIONS OF THE SITE.
 - b. WHERE SITES HAVE PERMANENT COVER ON ALL EXPOSED SOIL AND NO CONSTRUCTION ACTIVITY IS OCCURRING ANYWHERE ON THE SITE, INSPECTIONS CAN BE REDUCED TO ONCE PER MONTH AND, AFTER 12 MONTHS, MAY BE SUSPENDED COMPLETELY UNTIL CONSTRUCTION ACTIVITY RESUMES. THE MPCA MAY REQUIRE INSPECTIONS TO RESUME IF CONDITIONS WARRANT.
 - c. WHERE CONSTRUCTION ACTIVITY HAS BEEN SUSPENDED DUE TO FROZEN GROUND CONDITIONS, INSPECTIONS MAY BE SUSPENDED UNTIL CONDITIONS IMPROVE WITHIN 24 HOURS OF RUNOFF OCCURRING, OR UPON RESUMING CONSTRUCTION, WHICHEVER COMES FIRST.
10. PERMITEES MUST RECORD ALL INSPECTIONS AND MAINTENANCE ACTIVITIES WITHIN 24 HOURS OF BEING CONDUCTED AND THESE RECORDS MUST BE RETAINED WITH THE SWPPP. THESE RECORDS MUST INCLUDE:
 - a. DATE AND TIME OF INSPECTIONS; AND

- b. NAME OF PERSONS CONDUCTING INSPECTIONS; AND
- c. ACCURATE FINDINGS OF INSPECTIONS, INCLUDING THE SPECIFIC LOCATION WHERE CORRECTIVE ACTIONS ARE NEEDED; AND
- d. CORRECTIVE ACTIONS TAKEN (INCLUDING DATES, TIMES, AND PARTY COMPLETING MAINTENANCE ACTIVITIES); AND
- e. DATE OF ALL RAINFALL EVENTS GREATER THAN 1/2 INCHES IN 24 HOURS, AND THE AMOUNT OF RAINFALL FOR EACH EVENT. PERMITEES MUST OBTAIN RAINFALL AMOUNTS BY EITHER A PROPERLY MAINTAINED RAIN GAUGE INSTALLED ONSITE, A WEATHER STATION THAT IS WITHIN ONE (1) MILE OF YOUR LOCATION, OR A WEATHER REPORTING SYSTEM THAT PROVIDES SITE SPECIFIC RAINFALL DATA FROM RADAR SUMMARIES; AND
- f. IF PERMITEES OBSERVE A DISCHARGE DURING THE INSPECTION, THEY MUST RECORD AND SHOULD PHOTOGRAPH AND DESCRIBE THE LOCATION OF THE DISCHARGE (I.E., COLOR, ODOR, SETTLED OR SUSPENDED SOLIDS, OIL SHEEN, AND OTHER OBVIOUS INDICATORS OF POLLUTANTS); AND
- g. ANY AMENDMENTS TO THE SWPPP PROPOSED AS A RESULT OF THE INSPECTION MUST BE DOCUMENTED AS REQUIRED IN SECTION 6 WITHIN SEVEN (7) CALENDAR DAYS.

POLLUTION PREVENTION MANAGEMENT (SECTION 12):

1. PERMITEES MUST PLACE BUILDING PRODUCTS AND LANDSCAPE MATERIALS UNDER COVER (E.G., PLASTIC SHEETING OR TEMPORARY ROOFS) OR PROTECT THEM BY SIMILARLY EFFECTIVE MEANS DESIGNED TO MINIMIZE CONTACT WITH STORMWATER. PERMITEES ARE NOT REQUIRED TO COVER OR PROTECT PRODUCTS WHICH ARE EITHER NOT A SOURCE OF CONTAMINATION TO STORMWATER OR ARE DESIGNED TO BE EXPOSED TO STORMWATER.
2. PERMITEES MUST PLACE PESTICIDES, FERTILIZERS AND TREATMENT CHEMICALS UNDER COVER (E.G., PLASTIC SHEETING OR TEMPORARY ROOFS) OR PROTECT THEM BY SIMILARLY EFFECTIVE MEANS DESIGNED TO MINIMIZE CONTACT WITH STORMWATER.
3. PERMITEES MUST STORE HAZARDOUS MATERIALS AND TOXIC WASTE, (INCLUDING OIL, DIESEL FUEL, GASOLINE, HYDRAULIC FLUIDS, PAINT SOLVENTS, PETROLEUM-BASED PRODUCTS, WOOD PRESERVATIVES, ADDITIVES, CURING COMPOUNDS, AND ACIDS) IN SEALED CONTAINERS TO PREVENT SPILLS, LEAKS OR OTHER DISCHARGE. STORAGE AND DISPOSAL OF HAZARDOUS WASTE MATERIALS MUST BE IN COMPLIANCE WITH MINN. R. CH 7045 INCLUDING SECONDARY CONTAINMENT AS APPLICABLE.
4. PERMITEES MUST PROPERLY STORE, COLLECT AND DISPOSE SOLID WASTE IN COMPLIANCE WITH MINN. R. CH. 7035.
5. PERMITEES MUST POSITION PORTABLE TOILETS SO THEY ARE SECURE AND WILL NOT TIP OR BE KNOCKED OVER. PERMITEES MUST PROPERLY DISPOSE SANITARY WASTE IN ACCORDANCE WITH MINN. R. CH. 7041.
6. PERMITEES MUST TAKE REASONABLE STEPS TO PREVENT THE DISCHARGE OF SPILLED OR LEAKED CHEMICALS, INCLUDING FUEL, FROM ANY AREA WHERE CHEMICALS OR FUEL WILL BE LOADED OR UNLOADED INCLUDING THE USE OF DRIP PANS OR ABSORBENTS UNLESS INFEASIBLE. PERMITEES MUST ENSURE ADEQUATE SUPPLIES ARE AVAILABLE AT ALL TIMES TO CLEAN UP DISCHARGED MATERIALS AND THAT AN APPROPRIATE DISPOSAL METHOD IS AVAILABLE FOR RECOVERED SPILLED MATERIALS. PERMITEES MUST REPORT AND CLEAN UP SPILLS IMMEDIATELY AS REQUIRED BY MINN. STAT. 115.061, USING DRY CLEAN UP MEASURES WHERE POSSIBLE.
7. PERMITEES MUST LIMIT VEHICLE EXTERIOR WASHING AND EQUIPMENT TO A DEFINED AREA OF THE SITE. PERMITEES MUST CONTAIN RUNOFF FROM THE WASHING AREA IN A SEDIMENT BASIN OR OTHER SIMILARLY EFFECTIVE CONTROLS AND MUST DISPOSE WASTE FROM THE WASHING ACTIVITY PROPERLY. PERMITEES MUST PROPERLY USE AND STORE SOAPS, DETERGENTS, OR SOLVENTS.
8. PERMITEES MUST PROVIDE EFFECTIVE CONTAINMENT FOR ALL LIQUID AND SOLID WASTES GENERATED BY WASHOUT OPERATIONS (E.G., CONCRETE, STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS) RELATED TO THE CONSTRUCTION ACTIVITY. PERMITEES MUST PREVENT LIQUID AND SOLID WASHOUT WASTES FROM CONTACTING THE GROUND AND MUST DESIGN THE CONTAINMENT SO IT DOES NOT RESULT IN RUNOFF FROM THE WASHOUT OPERATIONS OR AREAS. PERMITEES MUST PROPERLY DISPOSE LIQUID AND SOLID WASTES IN COMPLIANCE WITH MPCA RULES. PERMITEES MUST INSTALL A SIGN INDICATING THE LOCATION OF THE WASHOUT FACILITY.

PERMIT TERMINATION (SECTION 4 AND SECTION 13):

1. PERMITEES MUST SUBMIT A NOT WITHIN 30 DAYS AFTER ALL TERMINATION CONDITIONS LISTED IN SECTION 13 ARE COMPLETE.
2. PERMITEES MUST SUBMIT A NOT WITHIN 30 DAYS AFTER SELLING OR OTHERWISE LEGALLY TRANSFERRING THE ENTIRE SITE, INCLUDING PERMIT RESPONSIBILITY FOR ROADS (E.G., STREET SWEEPING) AND STORMWATER INFRASTRUCTURE FINAL CLEAN OUT, OR TRANSFERRING PORTIONS OF A SITE TO ANOTHER PARTY. THE PERMITEES' COVERAGE UNDER THIS PERMIT TERMINATES AT MIDNIGHT ON THE SUBMISSION DATE OF THE NOT.
3. PERMITEES MUST COMPLETE ALL CONSTRUCTION ACTIVITY AND MUST INSTALL PERMANENT COVER OVER ALL AREAS PRIOR TO SUBMITTING THE NOT. VEGETATIVE COVER MUST CONSIST OF A UNIFORM PERENNIAL VEGETATION WITH A DENSITY OF 70 PERCENT OF ITS EXPECTED FINAL GROWTH. VEGETATION IS NOT REQUIRED WHERE THE FUNCTION OF A SPECIFIC AREA DICTATES NO VEGETATION, SUCH AS IMPERVIOUS SURFACES OR THE BASE OF A SAND FILTER.
4. PERMITEES MUST CLEAN THE PERMANENT STORMWATER TREATMENT SYSTEM OF ANY ACCUMULATED SEDIMENT AND MUST ENSURE THE SYSTEM MEETS ALL APPLICABLE REQUIREMENTS IN SECTION 15 THROUGH 19 AND IS OPERATING AS DESIGNED.
5. PERMITEES MUST REMOVE ALL SEDIMENT FROM CONVEYANCE SYSTEMS PRIOR TO SUBMITTING THE NOT.
6. PERMITEES MUST REMOVE ALL TEMPORARY SYNTHETIC EROSION PREVENTION AND SEDIMENT CONTROL BMP'S PRIOR TO SUBMITTING THE NOT. PERMITEES MAY LEAVE BMP'S DESIGNED TO DECOMPOSE ON-SITE IN PLACE.
7. FOR RESIDENTIAL CONSTRUCTION ONLY, PERMIT COVERAGE TERMINATES ON INDIVIDUAL LOTS IF THE STRUCTURES ARE FINISHED AND TEMPORARY EROSION PREVENTION AND DOWNGRADIENT PERIMETER CONTROL IS COMPLETE, THE RESIDENCE SELLS TO THE HOMEOWNER, AND THE PERMITEE DISTRIBUTES THE MPCA'S "HOMEOWNER FACT SHEET" TO THE HOMEOWNER.
8. FOR CONSTRUCTION PROJECTS ON AGRICULTURAL LAND (E.G., PIPELINES ACROSS CROPLAND), PERMITEES MUST RETURN THE DISTURBED LAND TO ITS PRECONSTRUCTION AGRICULTURAL USE PRIOR TO SUBMITTING THE NOT.

SEED NOTES:

ALL SEED MIXES AND APPLICATION SHALL BE IN ACCORDANCE WITH THE MNDOT SEEDING MANUAL.

GENERAL RECOMMENDATIONS:

THE CONTRACTOR IS RESPONSIBLE TO SALVAGE AND PRESERVE EXISTING TOPSOIL NECESSARY FOR FINAL STABILIZATION AND TO ALSO MINIMIZE COMPACTION IN ALL LANDSCAPE AREAS. IMMEDIATELY BEFORE SEEDING THE SOIL SHALL BE TILLED TO A MINIMUM DEPTH OF 3 INCHES.

TEMPORARY EROSION CONTROL SEEDING, MULCHING & BLANKET.

SEED

- TEMPORARY SEED SHALL BE MNDOT SEED MIX 21-112 (WINTER WHEAT COVER CROP) FOR WINTER AND 21-111 (OATS COVER CROP) FOR SPRING/SUMMER APPLICATIONS. BOTH SEED MIXES SHALL BE APPLIED AT A SEEDING RATE OF 100 LBS/ACRE.

MULCH

- IMMEDIATELY AFTER SEEDING, WITHIN 24 HOURS, MNDOT TYPE 1 MULCH SHALL BE APPLIED TO PROTECT AND ENHANCE SEED GERMINATION. MULCH SHALL BE APPLIED AT 90% COVERAGE (2 TONS PER ACRE OF STRAW MULCH)

SLOPES

- 3:1 (HORIZ/VERT.) OR FLATTER MUCH SHALL BE COVERED WITH MULCH.
- SLOPES STEEPER THAN 3:1 OR DITCH BOTTOMS SHALL BE COVERED WITH EROSION CONTROL BLANKET.
- SEE PLAN FOR MORE DETAILED DITCH AND STEEP SLOPE EROSION CONTROL TREATMENTS.

TRAINING SECTION 21

DESIGN ENGINEER: DAVID J. KNAEBLE P.E.
TRAINING COURSE: DESIGN OF SWPPP
TRAINING ENTITY: UNIVERSITY OF MINNESOTA
INSTRUCTOR: JOHN CHAPMAN
DATES OF TRAINING COURSE: 8/22/2012- 8/23/2012
TOTAL TRAINING HOURS: 12
DATE OF RECERTIFICATION: 4/22/22
EXPIRATION: 5/31/2025

AREAS AND QUANTITIES:

SITE AREA CALCULATIONS	EXISTING CONDITION	PROPOSED CONDITION
IMPERVIOUS SURFACES		
BUILDING COVERAGE	632 SF 1.1%	16,516 SF 28.4%
PAVEMENT	2,414 SF 4.1%	5,869 SF 10.1%
TOTAL	3,046 SF 5.2%	22,385 SF 38.5%
PERVIOUS SURFACES		
TOTAL	55,158 SF 94.8%	35,819 SF 61.5%
TOTAL SITE AREA (SURVEYED LINE EXCLUDING COUNTY ROW)	343,555 SF 7.9 AC	343,555 SF 7.9 AC
TOTAL SITE AREA (ABOVE OHV)	58,204 SF 100.0%	58,204 SF 100.0%
DIFFERENCE (EX. VS PROP.)	19,339 SF 33.2%	
DISTURBED AREA	39,156 SF 0.9 AC	67%

EROSION CONTROL QUANTITIES

DISTURBED AREA	39,156 SF
SILT FENCE/BIO-ROLL	±1400 LF
EROSION CONTROL BLANKET	8,294 SF
INLET PROTECTION DEVICES	±3 EA

NOTE: QUANTITIES ARE FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR SHALL DETERMINE FOR THEMSELVES THE EXACT QUANTITIES FOR BIDDING AND CONSTRUCTION.

SWPPP CONTACT PERSON

CONTRACTOR:

SWPPP INSPECTOR TRAINING:
ALL SWPPP INSPECTIONS MUST BE PERFORMED BY A PERSON THAT MEETS THE TRAINING REQUIREMENTS OF THE NPDES CONSTRUCTION SITE PERMIT. TRAINING CREDENTIALS SHALL BE PROVIDED BY THE CONTRACTOR AND KEPT ON SITE WITH THE SWPPP

PARTY RESPONSIBLE FOR LONG TERM OPERATION AND MAINTENANCE OF PERMANENT STORM WATER MANAGEMENT SYSTEM

PERMANENT STORMWATER MANAGEMENT IS NOT REQUIRED AS PART OF THIS PROJECT TO MEET NPDES PERMIT REQUIREMENTS. THE PROPERTY OWNER IS RESPONSIBLE FOR THE LONG TERM OPERATION AND MAINTENANCE OF THE PROPOSED STORMWATER SYSTEM.

SWPPP ATTACHMENTS (ONLY APPLICABLE IF SITE IS 1 ACRE OR GREATER):

CONTRACTOR SHALL OBTAIN A COPY OF THE FOLLOWING SWPPP ATTACHMENTS WHICH ARE A PART OF THE OVERALL SWPPP PACKAGE:
ATTACHMENT A. CONSTRUCTION SWPPP TEMPLATE - SITE SPECIFIC SWPPP DOCUMENT
ATTACHMENT B. CONSTRUCTION STORMWATER INSPECTION CHECKLIST
ATTACHMENT C. MAINTENANCE PLAN FOR PERMANENT STORM WATER TREATMENT SYSTEMS
ATTACHMENT D. STORMWATER MANAGEMENT REPORT - ON FILE AT THE OFFICE OF PROJECT ENGINEER. AVAILABLE UPON REQUEST.
ATTACHMENT E. GEOTECHNICAL EVALUATION REPORT - ON FILE AT THE OFFICE OF PROJECT ENGINEER. AVAILABLE UPON REQUEST.

SUPPLEMENTARY SITE SPECIFIC EROSION CONTROL NOTES:

THESE NOTES SUPERCEDE ANY GENERAL SWPPP NOTES.

THIS PROJECT IS GREATER THAN 1.0 ACRES SO AN NPDES PERMIT IS REQUIRED AND NEEDS TO BE SUBMITTED TO THE MPCA. THE CONTRACTOR IS REQUIRED TO FOLLOW THE GUIDELINES IN THE NPDES PERMIT THROUGHOUT CONSTRUCTION.

PROJECT NARRATIVE:

PROJECT IS THE REDEVELOPMENT OF AN EXISTING VACATED LOT INTO 3 ROWHOMES. SITE, GRADING, UTILITY AND LANDSCAPE IMPROVEMENTS WILL OCCUR.

NATIVE BUFFER NARRATIVE:

PRESERVING A 50 FOOT NATURAL BUFFER AROUND WATER BODIES IS PROVIDED IN THESE PLANS.

INFILTRATION NARRATIVE:

INFILTRATION IS NOT PROVIDED AS PART OF THE PROJECT'S PERMANENT STORMWATER MANAGEMENT SYSTEM DUE TO THE TYPES OF SOILS PRESENT. THE SOILS PRESENT ARE CONSIDERED HYDROLOGIC SOIL GROUP "D" AND ARE NOT CONDUCIVE TO INFILTRATION. FILTRATION WILL BE PROVIDED IN LIEU OF INFILTRATION.

SOIL CONTAMINATION NARRATIVE:

SOILS ONSITE HAVE NOT BEEN IDENTIFIED AS CONTAMINATED.

SPECIAL TMDL BMP REQUIREMENTS SITE SPECIFIC (IF REQUIRED):

THIS PROJECT IS WITHIN ONE MILE AND DISCHARGES TO MINNETONKA UPPER LAKE - MINNETONKA UPPER LAKE IS IDENTIFIED AS AN IMPAIRED WATER BODY PER THE MPCA'S 303(D) IMPAIRED WATERS LIST. MINNETONKA UPPER LAKE IS IMPAIRED FOR MERCURY IN FISH TISSUE. THIS IMPAIRMENT IS CONSIDERED A NON-CONSTRUCTION RELATED ISSUE AND DOES NOT REQUIRE ANY ADDITIONAL BMP'S. BECAUSE THIS WATER BODY IS LOCATED WITHIN ONE MILE OF THE SITE, BMP'S AS DEFINED IN THE NPDES PERMIT ITEMS 23.9 AND 23.10 APPLY. THESE ARE AS FOLLOWS:

1. DURING CONSTRUCTION:
 - A. STABILIZATION OF ALL EXPOSED SOIL AREAS MUST BE INITIATED IMMEDIATELY TO LIMIT SOIL EROSION BUT IN NO CASE COMPLETED LATER THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED.
 - B. TEMPORARY SEDIMENT BASIN REQUIREMENTS DESCRIBED IN SECTION 14. MUST BE USED FOR COMMON DRAINAGE LOCATIONS THAT SERVE AN AREA WITH FIVE (5) OR MORE ACRES DISTURBED AT ONE TIME.

PERMANENT STABILIZATION NOTES SITE SPECIFIC:

- PERMANENT SEED MIX
- FOR THIS PROJECT ALL AREAS THAT ARE NOT TO BE SODDED OR LANDSCAPED SHALL RECEIVE A NATIVE PERMANENT SEED MIX.
 - AREAS IN BUFFERS AND ADJACENT TO OR IN WET AREAS MNDOT SEED MIX 33-261 (STORMWATER SOUTH AND WEST) AT 35 LBS PER ACRE.
 - DRY AREAS MNDOT SEED MIX 35-221 (DRY PRAIRIE GENERAL) AT 40 LBS PER ACRE.
- MAINTENANCE SHALL BE IN ACCORDANCE TO THE MNDOT SEEDING MANUAL.

CivilSite
Group
Civil Engineering • Surveying • Landscape Architecture
5000 Glenwood Avenue
Golden Valley, MN 55422
civilsitegroup.com
612-615-0

ATTACHMENT B: SWPPP INSPECTION FORM

NOTE: THIS INSPECTION REPORT DOES NOT ADDRESS ALL ASPECTS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM/STATE DISPOSAL SYSTEM (NPDES/SDS) CONSTRUCTION STORMWATER PERMIT (PERMIT) ISSUED ON AUGUST 1, 2018. THE COMPLETION OF THIS CHECKLIST DOES NOT GUARANTEE THAT ALL PERMIT REQUIREMENTS ARE IN COMPLIANCE; IT IS THE RESPONSIBILITY OF THE PERMITTEE(S) TO READ AND UNDERSTAND THE PERMIT REQUIREMENTS.

FACILITY INFORMATION

SITE NAME: _____
 SITE ADDRESS: _____ PERMIT NUMBER: _____
 CITY: _____ STATE: _____ ZIP CODE: _____

INSPECTION INFORMATION

INSPECTOR NAME: _____ PHONE NUMBER: _____
 ORGANIZATION/COMPANY MAN: _____
 DATE (MM/DD/YYYY): _____ TIME: _____ AM / PM Y N
 IS THE INSPECTOR CERTIFIED IN SEDIMENT AND EROSION CONTROL AND IS IT DOCUMENTED IN THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP)?
 IS THIS INSPECTION ROUTINE OR IN RESPONSE TO A STORM EVENT:
 7 DAY RAIN

RAINFALL AMOUNT (IF APPLICABLE): _____ Y N
 IS SITE WITHIN ONE AERIAL MILE OF SPECIAL OR IMPAIRED WATER THAT CAN POTENTIALLY RECEIVE DISCHARGE FROM THE SITE?
 IF YES, FOLLOW SECTION 23 AND OTHER APPLICABLE PERMIT REQUIREMENTS

NOTE: IF N/A IS SELECTED AT ANY TIME, SPECIFY WHY IN THE COMMENT AREA FOR THAT SECTION.

EROSION CONTROL REQUIREMENT (SECTION 8.1)

	Y	N	N/A
1. ARE SOILS STABILIZED WHERE NO CONSTRUCTION ACTIVITY HAS OCCURRED FOR 14 DAYS (INCLUDING STOCKPILES)? (7 DAYS WHERE APPLICABLE, OR 24 HOURS DURING MINNESOTA DEPARTMENT OF NATURAL RESOURCES [DNR] FISH SPAWNING RESTRICTIONS)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. HAS THE NEED TO DISTURB STEEP SLOPES BEEN MINIMIZED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. IF STEEP SLOPES ARE DISTURBED, ARE STABILIZATION PRACTICES DESIGNED FOR STEEP SLOPES USED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. ALL DITCHES/SWALES STABILIZED 200' BACK FROM POINT OF DISCHARGE OR PROPERTY EDGE WITHIN 24 HOURS? (MULCH, HYDROMULCH, TACKIFIER, OR SIMILAR BEST MANAGEMENT PRACTICES [BMPs] ARE NOT ACCEPTABLE IN DITCHES/SWALES IF THE SLOPE IS GREATER THAN 2%) ARE APPROPRIATE BMPs INSTALLED PROTECTING INLETS/OUTLETS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. DO PIPE OUTLETS HAVE ENERGY DISSIPATION (WITHIN 24 HOURS OF CONNECTION)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. IS CONSTRUCTION PHASING BEING FOLLOWED IN ACCORDANCE WITH THE SWPPP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ARE AREAS NOT TO BE DISTURBED MARKED OFF (FLAGS, SIGNS, ETC.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COMMENTS:

SEDIMENT CONTROL REQUIREMENTS (SECTION 9.1)

	Y	N	N/A
1. ARE PERIMETER SEDIMENT CONTROLS INSTALLED PROPERLY ON ALL DOWN GRADIENT PERIMETERS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ARE APPROPRIATE BMPs INSTALLED PROTECTING INLETS, CATCH BASINS, AND CULVERT INLETS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. IS A 50 FOOT NATURAL BUFFER PRESERVED AROUND ALL SURFACE WATERS DURING CONSTRUCTION?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1. IF NO, HAVE REDUNDANT SEDIMENT CONTROLS BEEN INSTALLED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. DO ALL ERODIBLE STOCKPILES HAVE PERIMETER CONTROL IN PLACE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. IS THERE A TEMPORARY SEDIMENT BASIN ON SITE, AND IS IT BUILT AS REQUIRED IN SECTION 14 OF THE PERMIT?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. IS SOIL COMPACTION BEING MINIMIZED WHERE NOT DESIGNED FOR COMPACTION?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. IS TOPSOIL BEING PRESERVED UNLESS INFEASIBLE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. IF CHEMICAL FLOCCULANTS ARE USED, IS THERE A CHEMICAL FLOCCULANT PLAN IN PLACE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COMMENTS:

MAINTENANCE AND INSPECTIONS (SECTION 11)

	Y	N	N/A
1. ARE ALL PREVIOUSLY STABILIZED AREAS MAINTAINING GROUND COVER?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ARE PERIMETER CONTROLS MAINTAINED AND FUNCTIONING PROPERLY, SEDIMENT REMOVED WHEN ONE-HALF FULL?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ARE INLET PROTECTION DEVICES MAINTAINED AND ADEQUATELY PROTECTING INLETS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. ARE THE TEMPORARY SEDIMENT BASINS BEING MAINTAINED AND FUNCTIONING PROPERLY?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. ARE VEHICLE TRACKING BMPs AT SITE EXISTS IN PLACE AND MAINTAINED AND FUNCTIONING PROPERLY?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. IS ALL TRACKED SEDIMENT BEING REMOVED WITHIN 24 HOURS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. HAVE ALL SURFACE WATERS, DITCHES, CONVEYANCES, AND DISCHARGE POINTS BEEN INSPECTED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. WERE ANY DISCHARGES SEEN DURING THIS INSPECTION (I.E., SEDIMENT, TURBID WATER, OR OTHERWISE)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

IF YES, RECORD THE LOCATION OF ALL POINTS OF DISCHARGE. PHOTOGRAPH AND DESCRIBE THE DISCHARGE (SIZE, COLOR, ODOR, FOAM, OIL SHEEN, TIME, ETC.). DESCRIBE HOW THE DISCHARGE WILL BE ADDRESSED. WAS THE DISCHARGE A SEDIMENT DELTA? IF YES, WILL THE DELTA BE RECOVERED WITHIN SEVEN DAYS AND IN ACCORDANCE WITH ITEM 11.5 OF THE PERMIT?

COMMENTS:

POLLUTION PREVENTION (SECTION 12)

	Y	N	N/A
1. ARE ALL CONSTRUCTION MATERIALS THAT CAN LEACH POLLUTANTS UNDER COVER OR PROTECTED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ARE HAZARDOUS MATERIALS BEING PROPERLY STORED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ARE APPROPRIATE BMPs BEING USED TO PREVENT DISCHARGES ASSOCIATED WITH FUELING AND MAINTENANCE OF EQUIPMENT OR VEHICLES?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. ARE ALL SOLID WASTES BEING PROPERLY CONTAINED AND DISPOSED OF?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. IS THERE A CONCRETE/OTHER MATERIAL WASHOUT AREA ON SITE AND IS IT BEING USED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. IS THE CONCRETE WASHOUT AREA MARKED WITH A SIGN?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ARE THE CONCRETE/OTHER MATERIAL WASHOUT AREAS PROPERLY MAINTAINED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COMMENTS:

OTHER

	Y	N	N/A
1. IS A COPY OF THE SWPPP, INSPECTION RECORDS, AND TRAINING DOCUMENTATION LOCATED ON THE CONSTRUCTION SITE, OR CAN IT BE MADE AVAILABLE WITHIN 72 HOURS?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. HAS THE SWPPP BEEN FOLLOWED AND IMPLEMENTED ON SITE, AND AMENDED AS NEEDED?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. IS ANY DEWATERING OCCURRING ON SITE? IF YES, WHAT BMPs ARE BEING USED TO ENSURE THAT CLEAN WATER IS LEAVING THE SITE AND THE DISCHARGE IS NOT CAUSING EROSION OR SCOUR?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. WILL A PERMANENT STORMWATER MANAGEMENT SYSTEM BE CREATED FOR THIS PROJECT IF REQUIRED AND IN ACCORDANCE WITH SECTION 15 OF THE PERMIT (IF ADDING AN ACRE OR MORE OF NEW IMPERVIOUS SURFACE)? IF YES, DESCRIBE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------	--------------------------

5. IF INFILTRATION/FILTRATION SYSTEMS ARE BEING CONSTRUCTED, ARE THEY MARKED AND PROTECTED FROM COMPACTION AND SEDIMENTATION?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
---	--------------------------	--------------------------	--------------------------

6. DESCRIPTION OF AREAS OF NON-COMPLIANCE NOTED DURING THE INSPECTION, REQUIRED CORRECTIVE ACTIONS, AND RECOMMENDED DATE OF COMPLETION OF CORRECTIVE ACTIONS:			
---	--	--	--

7. PROPOSED AMENDMENTS TO THE SWPPP:			
--------------------------------------	--	--	--

8. POTENTIAL AREAS OF FUTURE CONCERN:			
---------------------------------------	--	--	--

9. ADDITIONAL COMMENTS			
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DISCLOSURES:

- AFTER DISCOVERY, THE PERMIT REQUIRES MANY OF THE DEFICIENCIES THAT MAY BE FOUND ON SITE BE CORRECTED WITHIN A SPECIFIED PERIOD OF TIME. SEE PERMIT FOR MORE DETAILS.
- THE PERMITTEE(S) IS/ARE RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE OF TEMPORARY AND PERMANENT WATER QUALITY MANAGEMENT BMPs AS WELL AS EROSION PREVENTION AND SEDIMENT CONTROL BMPs UNTIL ANOTHER PERMITTEE HAS OBTAINED COVERAGE UNDER THIS PERMIT ACCORDING TO SECTION 3, OR THE PROJECT HAS MET THE TERMINATION CONDITIONS OF THE PERMIT AND A NOTICE OF TERMINATION HAS BEEN SUBMITTED TO THE MINNESOTA POLLUTION CONTROL AGENCY.

ATTACHMENT C: MAINTENANCE PLAN FOR PERMANENT STORM WATER TREATMENT SYSTEM

**ATTACHMENT C - CHAMBER
FACILITY MANAGEMENT SCHEDULE**

- ALL GRIT CHAMBERS, SUMP CATCH BASINS, SUMP MANHOLES, OUTLET STRUCTURES, CULVERTS, OUTFALL STRUCTURES AND OTHER STORM WATER FACILITIES FOR WHICH MAINTENANCE REQUIREMENTS ARE NOT OTHERWISE SPECIFIED HEREIN MUST BE INSPECTED IN THE SPRING, SUMMER AND FALL OF EACH YEAR. WITHIN 30 DAYS OF THE INSPECTION DATE, ALL ACCUMULATED SEDIMENT AND DEBRIS MUST BE REMOVED SUCH THAT EACH STORM WATER FACILITY OPERATES AS DESIGNED AND PERMITTED. CONTRIBUTING DRAINAGE AREAS MUST BE KEPT CLEAR OF LITTER AND VEGETATIVE DEBRIS, INFLOW PIPES AND OVERFLOW SPILLWAYS KEPT CLEAR, INLET AREAS KEPT CLEAN, AND UNDESIRABLE VEGETATION REMOVED. EROSION IMPAIRING THE FUNCTION OR INTEGRITY OF THE FACILITIES, IF ANY, WILL BE CORRECTED, AND ANY STRUCTURAL DAMAGE IMPAIRING OR THREATENING TO IMPAIR THE FUNCTION OF THE FACILITIES MUST BE REPAIRED.
- VOLUME CONTROL FACILITIES AND CONTRIBUTING DRAINAGE AREAS MUST BE INSPECTED EVERY THREE MONTHS DURING THE OPERATIONAL PERIOD (BETWEEN SPRING SNOWMELT AND FIRST SUBSTANTIAL SNOWFALL) AND MONITORED AFTER RAINFALL EVENTS OF 1 INCH OR MORE TO ENSURE THAT THE CONTRIBUTING DRAINAGE AREA IS CLEAR OF LITTER AND DEBRIS, INFLOW PIPES AND OVERFLOW SPILLWAYS ARE CLEAR, INLET AREAS ARE CLEAN, UNDESIRABLE VEGETATION IS REMOVED AND THERE IS NO EROSION IMPAIRING OR THREATENING TO IMPAIR THE FUNCTION OF A FACILITY. IF SEDIMENT HAS ACCUMULATED IN A INFILTRATION FEATURE, WITHIN 30 DAYS OF INSPECTION DEPOSITED SEDIMENTS MUST BE REMOVED, THE INFILTRATION CAPACITY OF THE UNDERLYING SOILS MUST BE RESTORED, AND ANY SURFACE DISTURBANCE MUST BE STABILIZED. INSPECTION MUST ENSURE THAT SEDIMENT TRAPS AND FOREBAYS ARE TRAPPING SEDIMENT AND THAT MORE THAN 50 PERCENT OF THE STORAGE VOLUME REMAINS, THE CONTRIBUTING DRAINAGE AREA IS STABLE (I.E., NO EROSION IS OBSERVED), AND INLETS AND OUTLET/OVERFLOW SPILLWAYS ARE IN GOOD CONDITIONS WITH NO EROSION. MAINTENANCE TECHNIQUES USED MUST PROTECT THE INFILTRATION CAPACITY OF THE PRACTICE BY LIMITING SOIL COMPACTION TO THE GREATEST EXTENT POSSIBLE (E.G., BY USING LOW-IMPACT EARTH-MOVING EQUIPMENT).
- UNDERGROUND STORAGE CHAMBERS MUST BE INSPECTED AT LEAST ONCE A YEAR TO ENSURE THAT ADEQUATE STORAGE CAPACITY REMAINS. CAPACITY WILL BE CONSIDERED INADEQUATE IF SEDIMENT HAS DECREASED THE STORAGE VOLUME BY 50 PERCENT OF ITS ORIGINAL DESIGN VOLUME. ACCUMULATED DEBRIS AND SEDIMENT WILL BE REMOVED, AND INLET AND OUTLET STRUCTURES WILL BE CLEARED OF ANY FLOW IMPEDIMENTS.



LAKE MINNETONKA FLATS
 2400-2420 COMMERCE BLVD., MOUND, MN 55364
MONARCH DEVELOPMENT PARTNERS, LLC
 441 SECOND STREET, EXCELSIOR, MN 55331

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.

Matthew R. Pavlek
 Matthew R. Pavlek
 DATE 09/25/24 LICENSE NO. 44263

DATE	DESCRIPTION
07/31/24	CITY SUBMITTAL
08/01/24	WATERSHED SUBMITTAL
08/27/24	CITY RESUBMITTAL
09/06/24	CITY/WATERSHED RESUBMITTAL
09/18/24	CITY RESUBMITTAL
09/25/24	WATERSHED RESUBMITTAL

PROJECT MANAGER	MATT PAVLEK
CONTACT NUMBER	612-615-0060 x701
DRAWN BY	MD, MP, RB
REVIEWED BY	MP, RB
PROJECT NUMBER	23360

REVISION SUMMARY	
DATE	DESCRIPTION

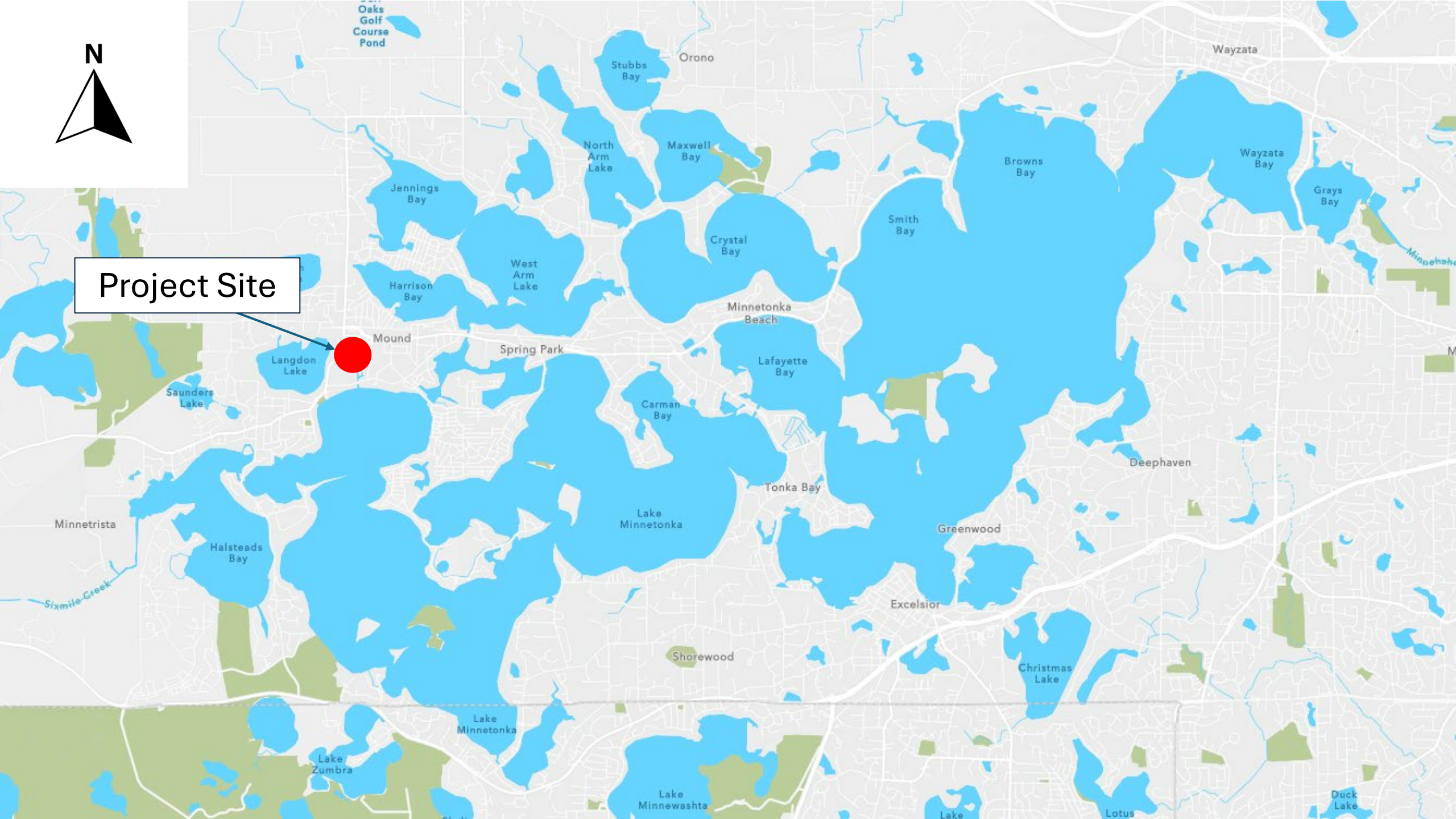
SWPPP - ATTACHMENTS

SW1.5
 © COPYRIGHT 2023 CIVIL SITE GROUP INC.

Attachment B: Site Maps



Project Site





Attachment C: Stormwater Management Report

Stormwater Management Report

Owner:

Monarch Development Partners, LLC.
441 Second Street
Excelsior, MN 55331

Project:

Lake Minnetonka Flats
2400-2420 Commerce Blvd
Mound, MN 55364

Engineer's Certification:

All plans and supporting Documentation contained in this report have been reviewed by me and it is hereby certified that to the best of my knowledge the plans comply with the requirements of the ordinance.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.



Matthew R. Pavsek P.E.

Registration Number: 44263

Date:

7-31-24
9-6-24
9-25-24

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- 2.0 Summary Analysis / Narrative
 - 2.1 Introduction
 - 2.2 Existing Site Conditions
 - 2.3 Proposed Site Conditions
 - 2.4 Stormwater Requirements – City
 - 2.5 Stormwater Requirements – Watershed
 - 2.6 Stormwater Requirements – MPCA / NPDES
- 3.0 Stormwater Calculations
 - 3.1 Proposed Stormwater Management Strategy & Facilities Description
 - 3.2 Rate Control
 - 3.3 Water Quality
 - 3.4 Volume Control
- 4.0 Conclusions

Figures:

- Figure 1 – Drainage Calculations Summary Table
- Figure 2 – Existing Conditions Drainage Area Map
- Figure 3 – Proposed Conditions Drainage Area Map

Appendices:

- HydroCAD
 - Existing Conditions HydroCAD Modeling
 - Proposed Conditions HydroCAD Modeling
- MIDS modeling
 - Existing Conditions Site
 - Existing Conditions Street
 - Proposed Conditions Site
 - Proposed Conditions Street
- Geotechnical Report (On File at the Office of the Engineer)

2.0 Summary Analysis / Narrative:

2.1 Introduction:

This stormwater management report accompanies the Civil Engineering Plans prepared by Civil Site Group for the subject project dated 9/25/2024. This report includes a summary of the existing and proposed site conditions, the stormwater requirements of relevant regulatory agencies, and proposed design calculations and data to meet the requirements.

2.2 Existing Site Conditions:

Site Description:

The existing site is currently a vacated lot with a garage and driveway. The existing site surface coverage areas are shown in the table below:

Existing Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
EX1	3046	98	56454	74	59500	75
EX2	42143	98	2232	74	44375	97
EX3	31086	98	21978	74	53064	88

Existing Soils:

A geotechnical evaluation report was completed by Haugo Geotechnical Services dated May 15, 2024. This report determined the soils on site consist of clayey sand, silty clayey sand, sandy lean clay, silty clay, sandy clayey silt, silty sand, and poorly graded sand with silt. For the purposes of this report, soils have been assumed to have a hydrologic soil group "C" designation.

Groundwater:

Groundwater encountered in the soil borings at elevations ranging from 918.50 to 932.50.

2.3 Proposed Site Conditions:

Site Description:

The proposed site is a development of the parcel into 3 new townhouse buildings with underground parking, landscaping, and aboveground/underground stormwater management. The proposed site surface coverage areas are shown in the table below:

Proposed Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
PR1	289	98	33021	61	33310	61
PR2	21079	98	5111	61	26190	91
PR3	42677	98	1698	61	44375	97
PR4	31086	98	21978	61	53064	83

2.4 Stormwater Requirements City (Mound):

The City of Mound defers to the Minnehaha Creek Watershed District requirements.

2.5 Stormwater Requirements Watershed (Minnehaha Creek Watershed District):

Requirement threshold – Site size, over 1 acre, site disturbance 67% (over 40%)

Rate Control – Runoff rate may not exceed existing conditions for the 2, 10, and 100-yr storm events. Utilize Atlas-14 rainfall data.

Water Quality – Water quality is provided by filtration (2" over impervious surfaces, double the required volume for infiltration).

Volume Control – Stormwater runoff volume must be reduced by 1.0” over all new and reconstructed impervious surfaces (includes all newly constructed impervious surfaces, i.e. all impervious disturbed and reconstructed as well as new impervious). Volume Control alternative is **FILTRATION** since site has clay soils and infiltration is not feasible. Site to provide filtration volume (2” over impervious surfaces, double the required volume for infiltration).

2.6 Stormwater Requirements - Minnesota Pollution Control Agency – NPPDES permit (MPCA):

Requirement threshold - A permit is required for projects with a disturbed area over 1 acre in size, Stormwater management is required for a project adding 1-acre of more of NEW impervious surface (reconstructed impervious is not included). **This project does not trigger MPCA stormwater management requirements since proposed site impervious surface is less than 1 acre)**

Rate Control – No specific regulation, may not degrade downstream facilities.

Water Quality – Stormwater water quality treatment volume must be provided equal to 1.0” over all new impervious surfaces (includes all newly constructed impervious surfaces only, re-constructed impervious surfaces are not included). **This project does not trigger MPCA stormwater management requirements since proposed site impervious surface is less than 1 acre)**

Volume Control – Must consider volume reduction if feasible and not prohibited on site. The required infiltration volume is equal to the water quality volume described above. **This project does not trigger MPCA stormwater management requirements since proposed site impervious surface is less than 1 acre)**

3.0 Stormwater Calculations:

3.1 Proposed Stormwater Management Strategy & Facilities Description

This project is disturbing approximately 0.9 acres of land. The project will be constructing 0.61 acres of new/reconstructed impervious surfaces. This land disturbance and creation of impervious surfaces will trigger stormwater management requirements from the Minnehaha Creek Watershed District. The proposed stormwater strategy for this project is directing both the adjacent off site public street and the site’s stormwater runoff via surface drainage and storm sewer piping to a rate control chamber system and a cartridge stormwater filtration device. The chamber system will discharge into a proposed jellyfish filter then into the existing wetland/lake. This stormwater system has been designed to provide filtration for the volume requirement and the required water quality and rate control.

In addition (over and above requirements): This site is required to treat 2” of water from the proposed on-site impervious surface, however the site stormwater system has been oversized to also include 0.5” of stormwater from the off-site public street impervious surface that currently drains to the lake untreated. This is the maximum off site stormwater treatment volume that could be accomplished with the site’s limited land area.

3.2 Rate Control

Peak runoff rate may not exceed existing conditions for the 2-YR, 10- YR, 25-YR, and 100- YR 24-hour rainfall events, utilize Atlas 14 rainfall data.

Rate control is provided by live storage within the proposed underground stormwater chamber. This information was derived using HydroCAD stormwater modeling software. The existing and proposed runoff rates are shown in the summary table below.

Overall Stormwater Rate Summary

	Existing Conditions Rate (cfs)	Proposed Conditions Rate (cfs)
2-Year Event	8.54	4.97
10-Year Event	14.61	14.56
100-Year Event	28.76	27.78

The proposed runoff rates are less than the existing peak runoff rates – REQUIREMENT SATISFIED

3.3 Water Quality

The proposed stormwater BMP's have been designed to capture the prescribed water quality volume meeting the watershed requirements (2" over impervious surface on site) as well as off-site oversizing (0.5" over offsite impervious).

MIDS modeling shows the "before and after" TSS and TP removal efficiencies and quantities for both on-site (required) and off-site (additional benefit) pollutant removals.

MIDS demonstrates that due to the project stormwater oversizing an additional 243.8 lbs (80%) TSS and 0.839 lbs TP (50%) is removed by the project that would otherwise not be required.

Water quality treatment is provided by the proposed stormwater system meeting the watershed's water quality requirements. See attached MIDS modeling – REQUIREMENT SATISFIED

3.4 Volume Control

Stormwater runoff volume must be reduced by 1.0" over all new and reconstructed impervious surfaces (includes all newly constructed impervious surfaces, i.e. all impervious disturbed and reconstructed as well as new impervious). If volume reduction is not feasible due to poor soils, then 2.0" of filtration is an acceptable alternative.

Water quality and volume control requirements are met by providing filtration onsite in the amount equal to 2.0 inches of runoff from the new or reconstructed impervious surfaces. The proposed chamber and filtration system will be utilized to meet these requirements.

The system is also oversized to include off-site stormwater treatment equivalent to 0.5" of runoff over the adjacent contributing public street impervious surface area.

Stormwater Water Quality and Volume Summary

Drainage Area	Required Infiltration Vol. Summary		Filtration Volume = 2x1.0"*Dist. Impv. 2" 2" 0.5" N/A
	New Impv. Area (sf)	Required Volume (cf)	
PR1	289	48	
PR2	21079	3513	
PR3	42677	1778	
PR4	0		
TOTAL	21368	5340	

Proposed BMP Area	Provided Vol (cf) (elev=934.70)	Drawdown Time Calculations (0.8"/Hour)		
		Volume (cf)	Treatment rate (cfs)	Drawdown Time (h)
Underground Rate Control Basin	5827	5340	0.89	1.67
TOTAL	5827			

As shown in the tables above, the proposed volume of 5,827 CF is larger than the required volume of 5,340 CF (3,561 is actual requirement) – REQUIREMENT SATISFIED, AND OVERSIZED FOR OFF-SITE AREA

4.0 Conclusions:

To the best of our knowledge, this project meets all State, City, and Watershed stormwater management requirements.

**Lake Minnetonka Flats
Civil Site Group - Stormwater Calculations**

Existing Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
EX1	3046	98	56454	74	59500	75
EX2	42143	98	2232	74	44375	97
EX3	31086	98	21978	74	53064	88

Proposed Conditions

Drainage Area	Impervious Area		Pervious Area		Total Area	
	Area [SF]	CN Value	Area [SF]	CN Value	Area [SF]	CN Value
PR1	289	98	33021	61	33310	61
PR2	21079	98	5111	61	26190	91
PR3	42677	98	1698	61	44375	97
PR4	31086	98	21978	61	53064	83

Site Area Summary

	Impervious [SF]	Impervious [AC]	Pervious [SF]	Pervious [AC]	Total [SF]	Total [AC]
Existing Site	76275	1.75	80664	1.85	156939	3.60
Proposed Site	95131	2.18	61808	1.42	156939	3.60

Stormwater Rate Summary

Drainage Area	Existing Rate (cfs)		
	2-YR [2.86"]	10-YR [4.26"]	100-YR [7.32"]
EX1	1.83	3.97	9.33
EX2	3.55	5.38	9.39
EX3	3.18	5.26	10.05
TOTAL (REACH)	8.54	14.61	28.76

Drainage Area	Proposed Conditions Rate (cfs)		
	2-YR [2.86"]	10-YR [4.26"]	100-YR [7.32"]
PR1	0.95	2.14	5.13
1P (PR2, 3, 4)	4.40	12.52	22.82
TOTAL (REACH)	4.97	14.56	27.78

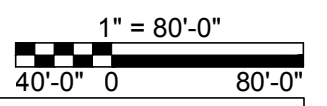
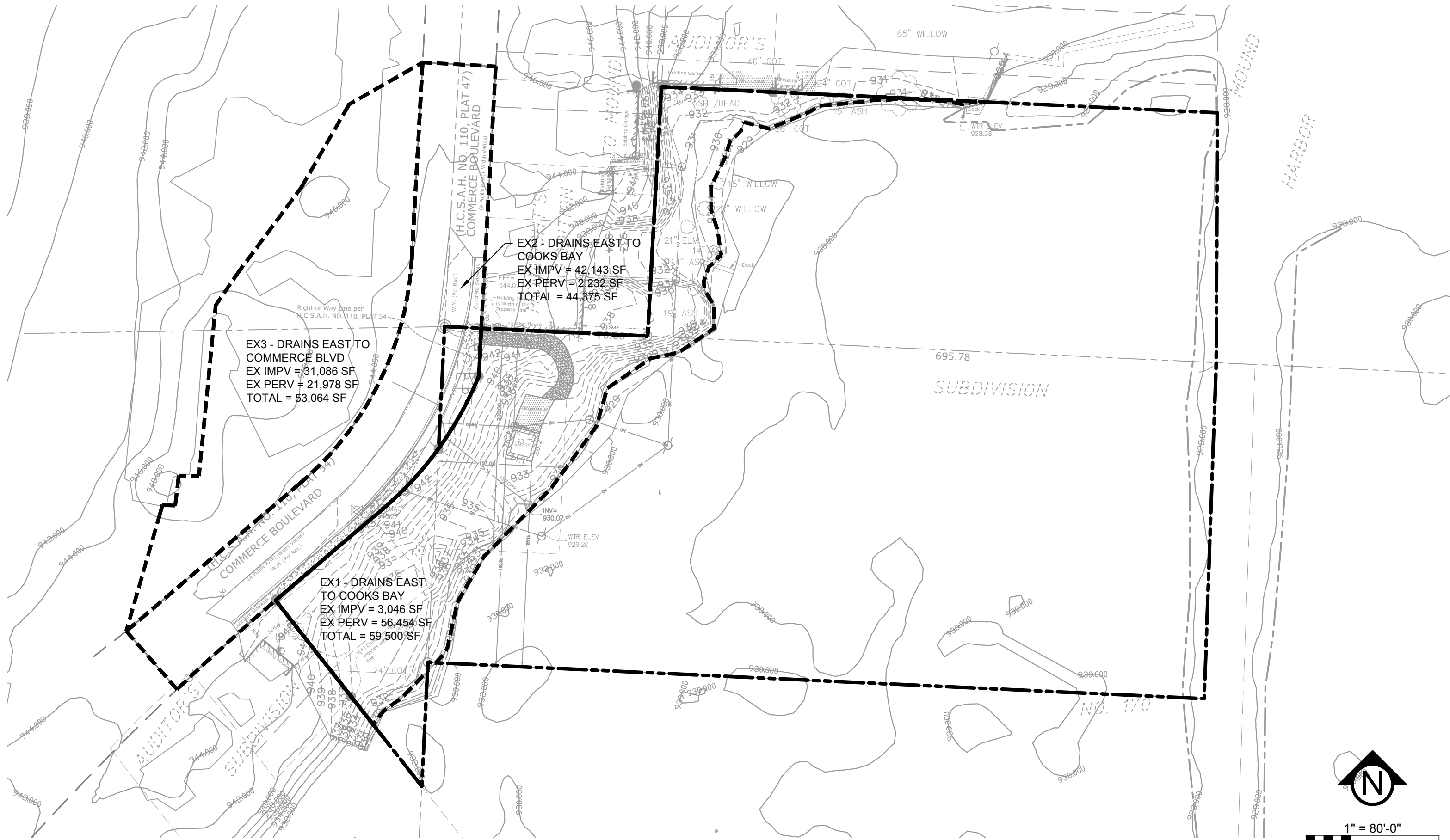
Overall Stormwater Rate Summary

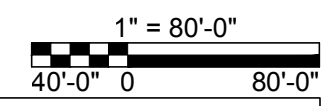
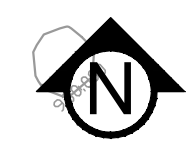
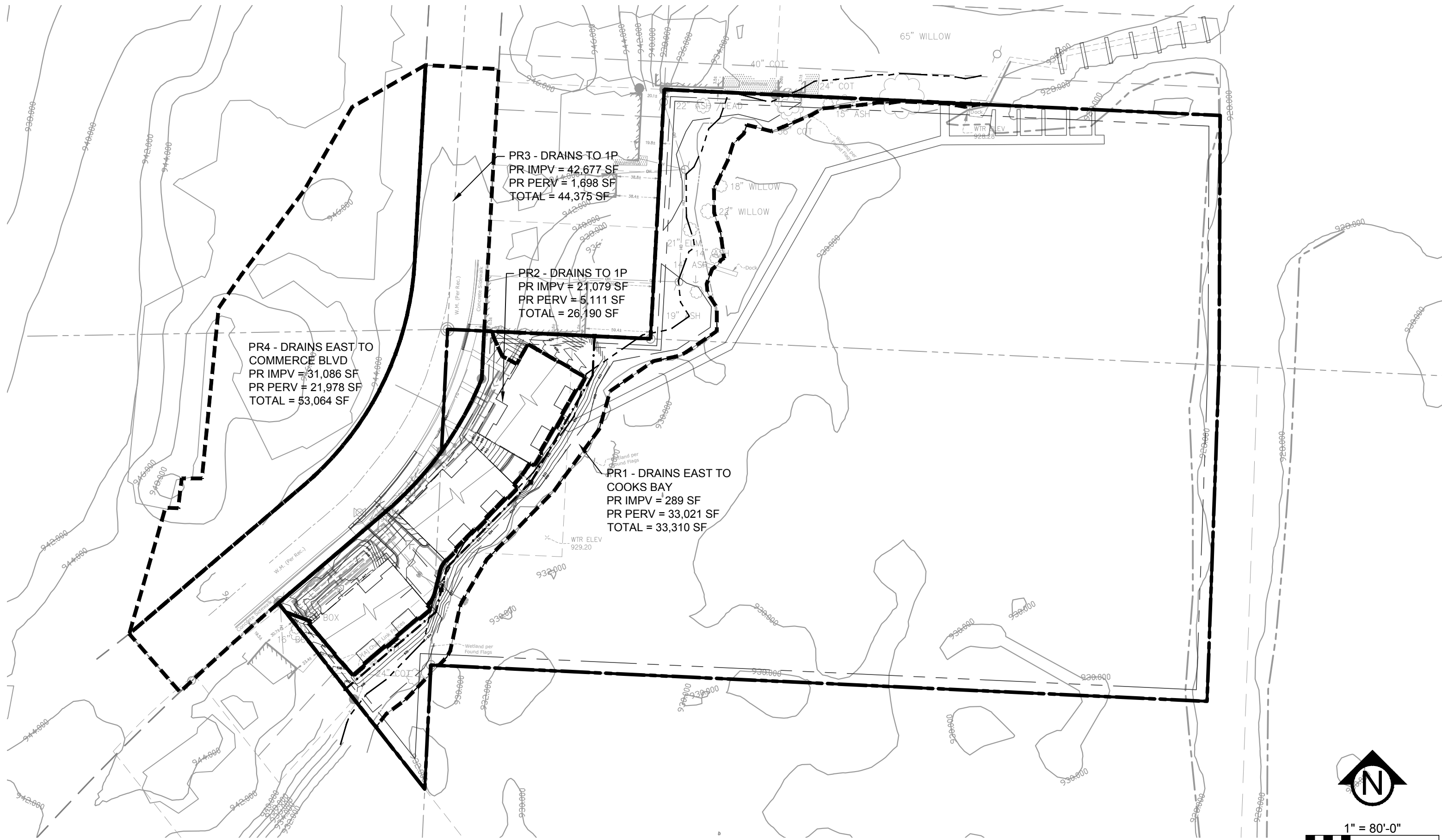
	Existing Conditions Rate (cfs)	Proposed Conditions Rate (cfs)
2-Year Event	8.54	4.97
10-Year Event	14.61	14.56
100-Year Event	28.76	27.78

Stormwater Water Quality and Volume Summary

Drainage Area	Required Infiltration Vol. Summary		Filtration Volume = 2x1.0**Dist. Impv. Area
	New Impv. Area (sf)	Required Volume (cf)	
PR1	289	48	2"
PR2	21079	3513	2"
PR3	42677	1778	0.5"
PR4	0		N/A
TOTAL	21368	5340	

Proposed BMP Area	Provided Vol (cf) (elev=934.70)	Drawdown Time Calculations (0.8"/Hour)		
		Volume (cf)	Treatment rate (cfs)	Drawdown Time (h)
Underground Rate Control Basin	5827	5340	0.89	1.67
TOTAL	5827			



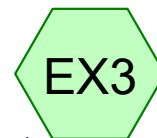




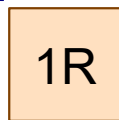
EX 1 - DRAINS EAST TO COOKS BAY



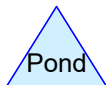
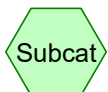
EX 2 - DRAINS EAST TO COOKS BAY



EX 3 - DRAINS EAST TO COMMERCE BLVD



TOTAL TO COOKS BAY



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Project Notes

Rainfall events imported from "Atlas-14-Rain.txt" for 543 MN Hennepin

Rainfall events imported from "Atlas-14-Rain.txt" for 543 MN Hennepin

Rainfall events imported from "Atlas-14-Rain.txt" for 543 MN Hennepin

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	2.86	2
2	10-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	4.26	2
3	100-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	7.32	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.852	74	>75% Grass cover, Good, HSG C (EX1, EX2, EX3)
1.751	98	Paved parking, HSG C (EX1, EX2, EX3)
3.603	86	TOTAL AREA

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Soil Listing (selected nodes)

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

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.852	0.000	0.000	1.852	>75% Grass cover, Good	EX1, EX2, EX3
0.000	0.000	1.751	0.000	0.000	1.751	Paved parking	EX1, EX2, EX3
0.000	0.000	3.603	0.000	0.000	3.603	TOTAL AREA	

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentEX1: EX 1 - DRAINS EAST Runoff Area=59,500 sf 5.12% Impervious Runoff Depth=0.91"
Tc=10.0 min CN=WQ Runoff=1.83 cfs 0.104 af

SubcatchmentEX2: EX 2 - DRAINS EAST Runoff Area=44,375 sf 94.97% Impervious Runoff Depth=2.54"
Tc=10.0 min CN=WQ Runoff=3.55 cfs 0.215 af

SubcatchmentEX3: EX 3 - DRAINS EAST Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=1.88"
Tc=10.0 min CN=WQ Runoff=3.18 cfs 0.191 af

Reach 1R: TOTAL TO COOKS BAY Inflow=8.54 cfs 0.510 af
Outflow=8.54 cfs 0.510 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.510 af Average Runoff Depth = 1.70"
51.40% Pervious = 1.852 ac 48.60% Impervious = 1.751 ac

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Runoff = 1.83 cfs @ 12.18 hrs, Volume= 0.104 af, Depth= 0.91"
Routed to Reach 1R : TOTAL TO COOKS BAY

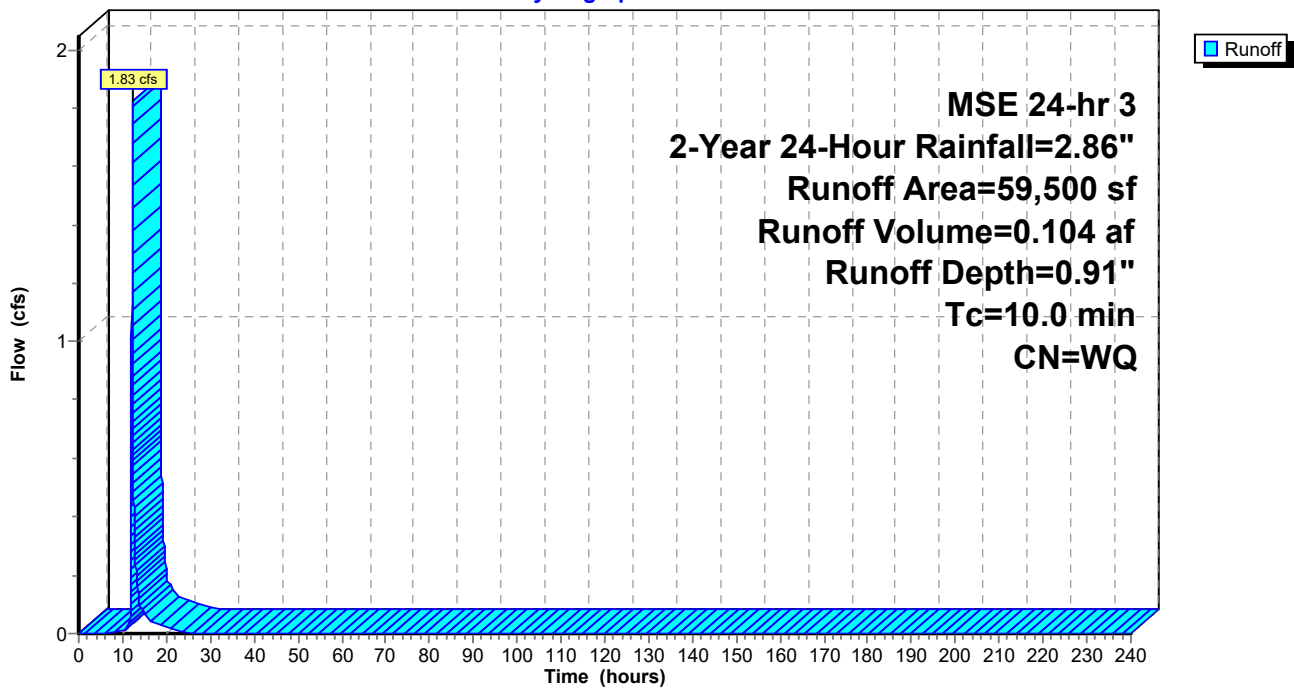
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
3,046	98	Paved parking, HSG C
56,454	74	>75% Grass cover, Good, HSG C
59,500		Weighted Average
56,454		94.88% Pervious Area
3,046		5.12% Impervious Area

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

Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

Runoff = 3.55 cfs @ 12.17 hrs, Volume= 0.215 af, Depth= 2.54"
Routed to Reach 1R : TOTAL TO COOKS BAY

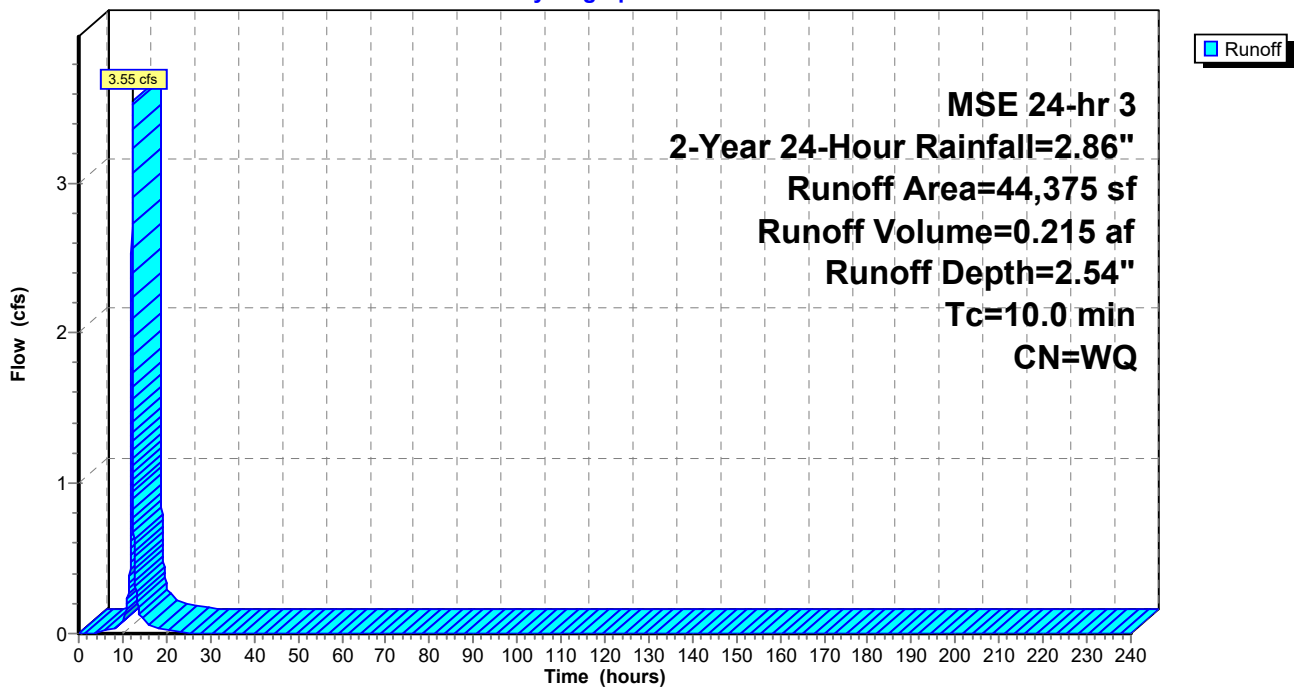
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
42,143	98	Paved parking, HSG C
2,232	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
2,232		5.03% Pervious Area
42,143		94.97% Impervious Area

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

Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Runoff = 3.18 cfs @ 12.17 hrs, Volume= 0.191 af, Depth= 1.88"
 Routed to Reach 1R : TOTAL TO COOKS BAY

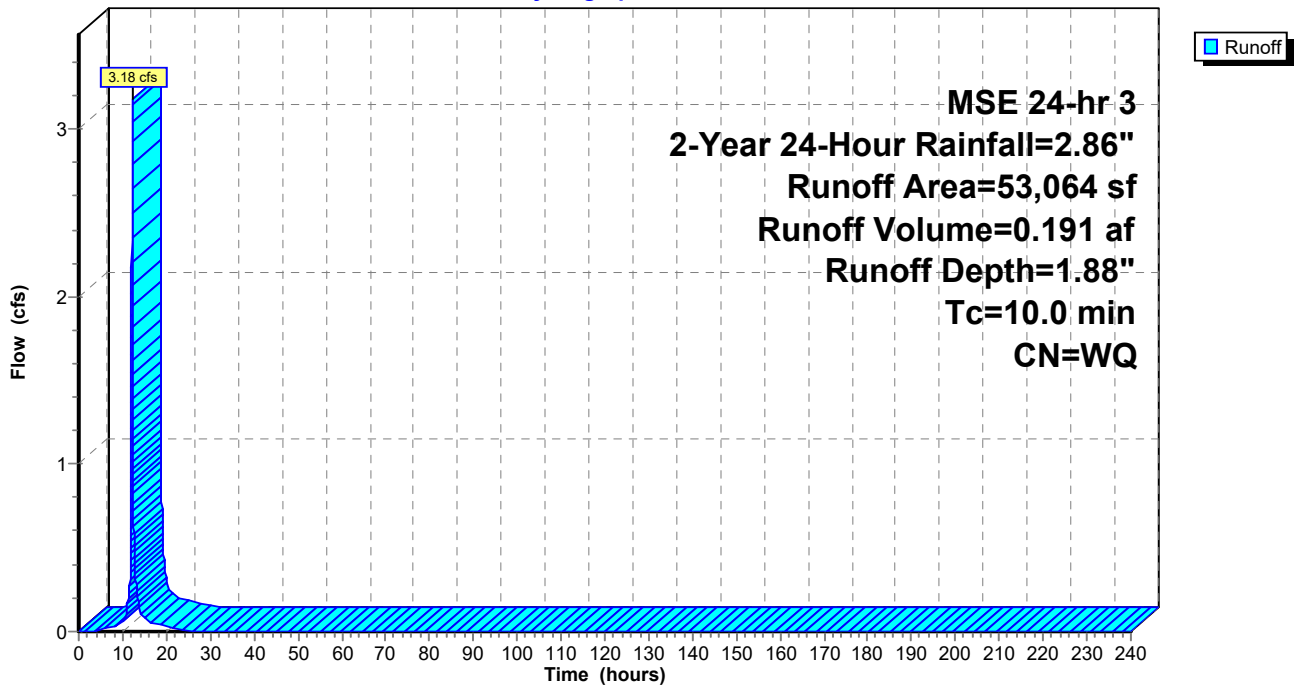
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Hydrograph



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EXISTING
MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Reach 1R: TOTAL TO COOKS BAY

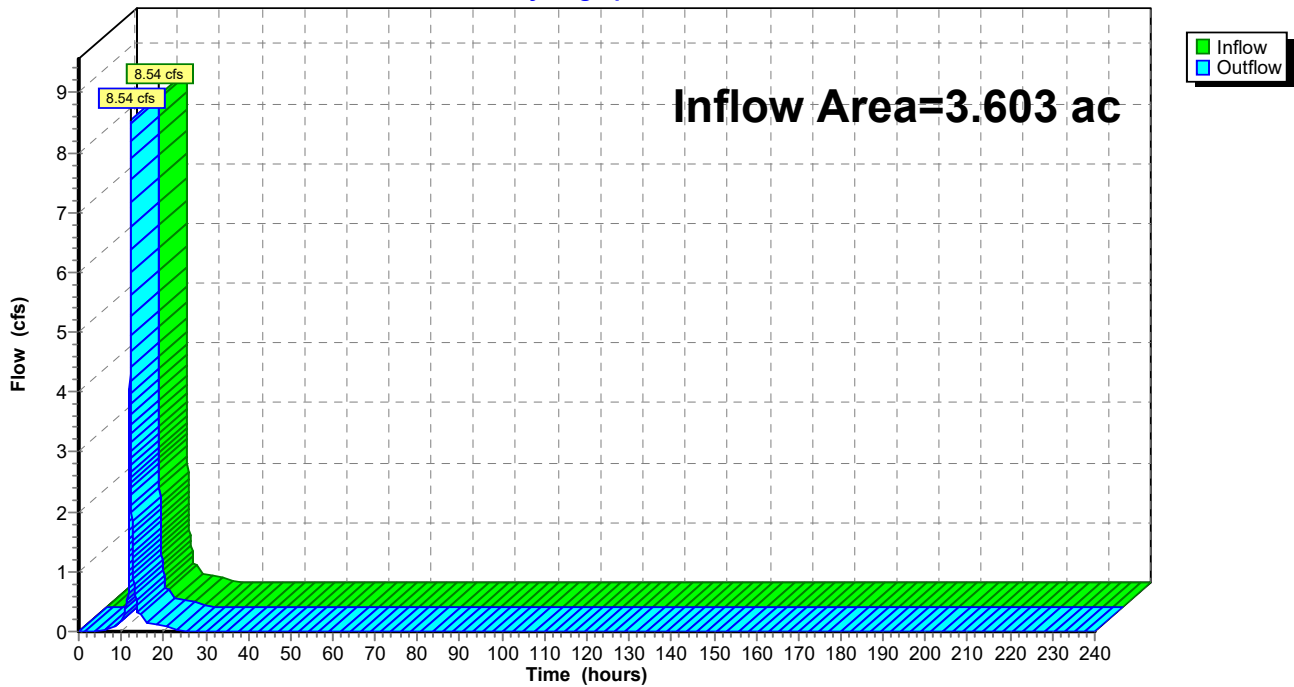
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 48.60% Impervious, Inflow Depth = 1.70" for 2-Year 24-Hour event
Inflow = 8.54 cfs @ 12.17 hrs, Volume= 0.510 af
Outflow = 8.54 cfs @ 12.17 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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EXISTING
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentEX1: EX 1 - DRAINS EAST Runoff Area=59,500 sf 5.12% Impervious Runoff Depth=1.90"
Tc=10.0 min CN=WQ Runoff=3.97 cfs 0.217 af

SubcatchmentEX2: EX 2 - DRAINS EAST Runoff Area=44,375 sf 94.97% Impervious Runoff Depth=3.91"
Tc=10.0 min CN=WQ Runoff=5.38 cfs 0.332 af

SubcatchmentEX3: EX 3 - DRAINS EAST Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=3.10"
Tc=10.0 min CN=WQ Runoff=5.26 cfs 0.315 af

Reach 1R: TOTAL TO COOKS BAY Inflow=14.61 cfs 0.863 af
Outflow=14.61 cfs 0.863 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.863 af Average Runoff Depth = 2.88"
51.40% Pervious = 1.852 ac 48.60% Impervious = 1.751 ac

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EXISTING
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Runoff = 3.97 cfs @ 12.18 hrs, Volume= 0.217 af, Depth= 1.90"
Routed to Reach 1R : TOTAL TO COOKS BAY

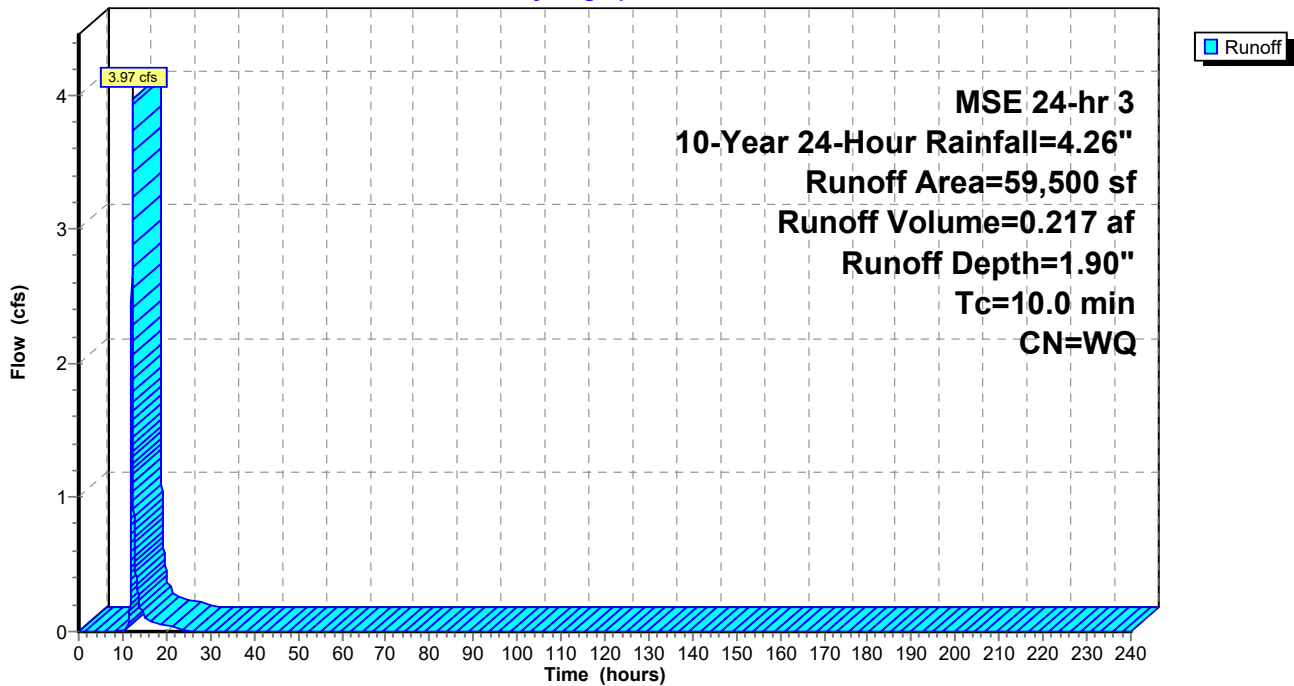
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
3,046	98	Paved parking, HSG C
56,454	74	>75% Grass cover, Good, HSG C
59,500		Weighted Average
56,454		94.88% Pervious Area
3,046		5.12% Impervious Area

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

Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Hydrograph



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EXISTING
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

Runoff = 5.38 cfs @ 12.17 hrs, Volume= 0.332 af, Depth= 3.91"
Routed to Reach 1R : TOTAL TO COOKS BAY

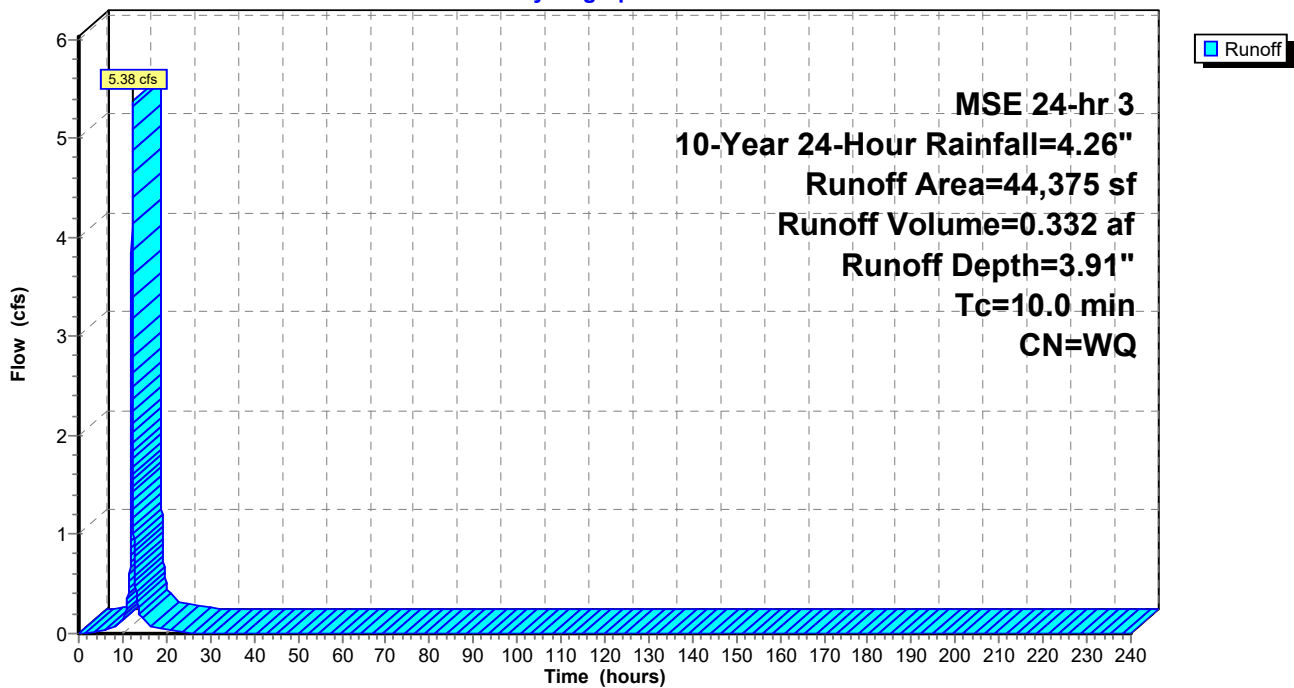
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
42,143	98	Paved parking, HSG C
2,232	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
2,232		5.03% Pervious Area
42,143		94.97% Impervious Area

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

Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

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EXISTING
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Runoff = 5.26 cfs @ 12.17 hrs, Volume= 0.315 af, Depth= 3.10"
Routed to Reach 1R : TOTAL TO COOKS BAY

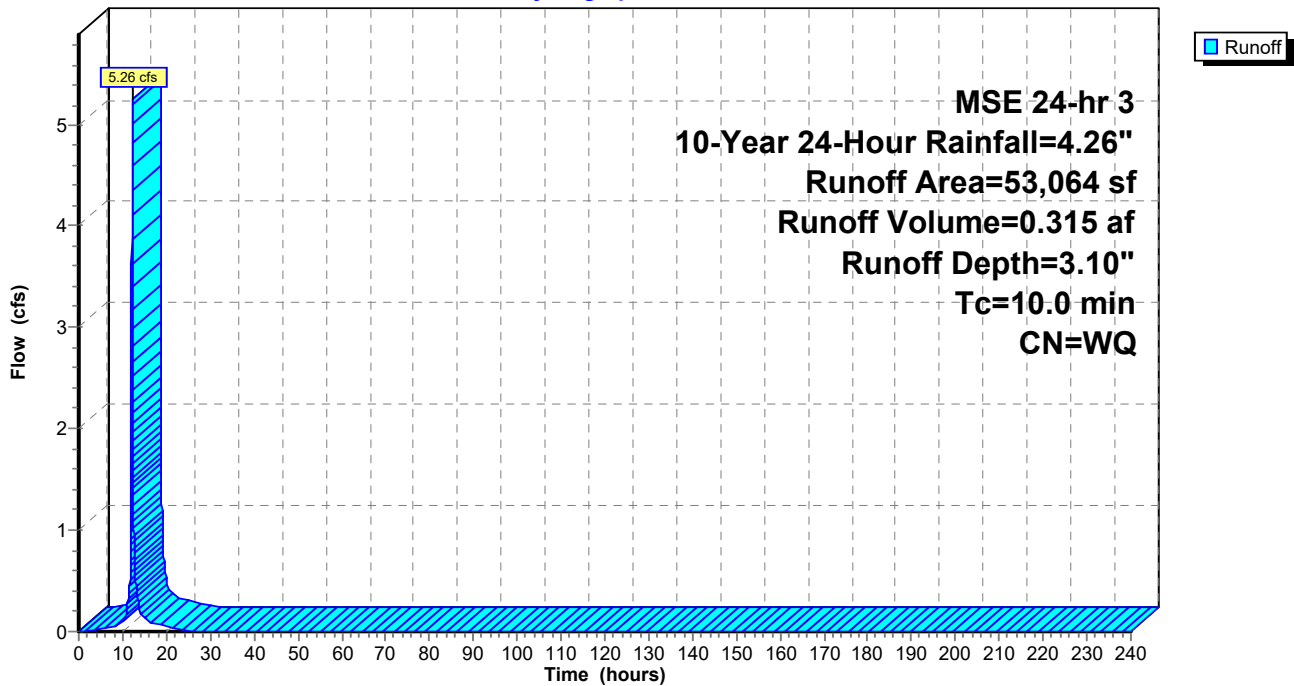
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Hydrograph



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EXISTING
MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Reach 1R: TOTAL TO COOKS BAY

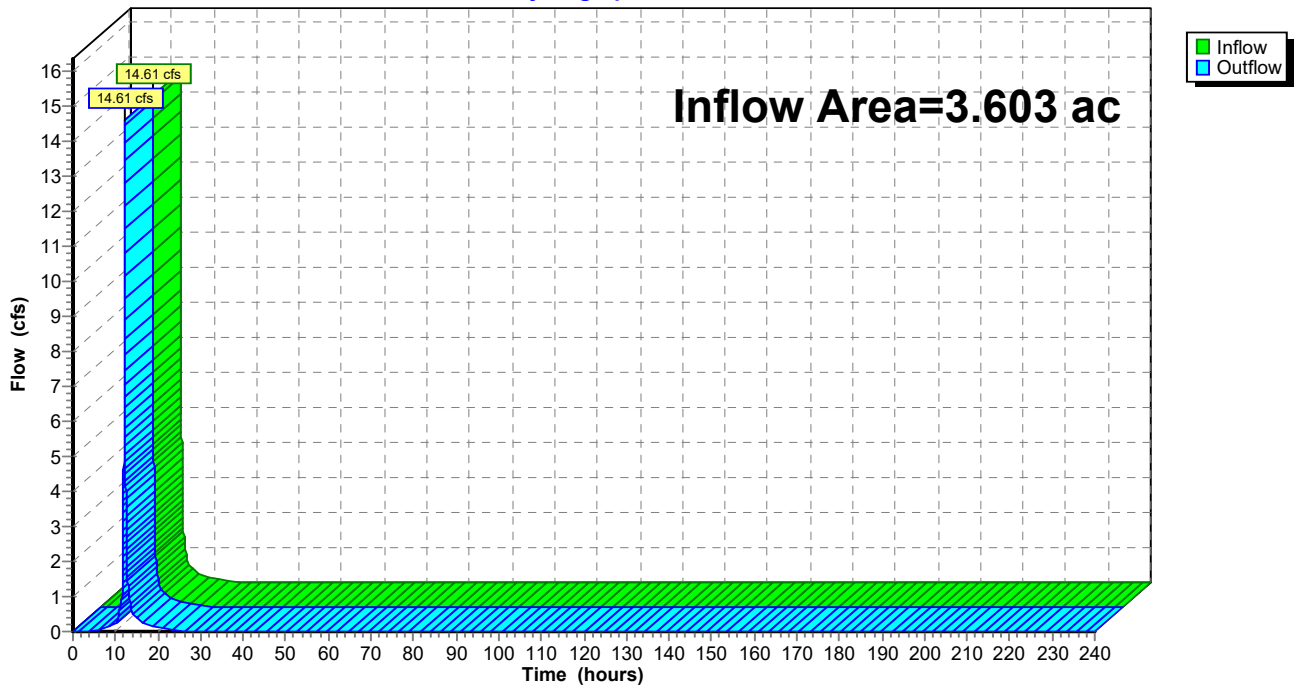
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 48.60% Impervious, Inflow Depth = 2.88" for 10-Year 24-Hour event
Inflow = 14.61 cfs @ 12.17 hrs, Volume= 0.863 af
Outflow = 14.61 cfs @ 12.17 hrs, Volume= 0.863 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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EXISTING
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentEX1: EX 1 - DRAINS EAST Runoff Area=59,500 sf 5.12% Impervious Runoff Depth=4.46"
Tc=10.0 min CN=WQ Runoff=9.33 cfs 0.508 af

SubcatchmentEX2: EX 2 - DRAINS EAST Runoff Area=44,375 sf 94.97% Impervious Runoff Depth=6.94"
Tc=10.0 min CN=WQ Runoff=9.39 cfs 0.589 af

SubcatchmentEX3: EX 3 - DRAINS EAST Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=5.94"
Tc=10.0 min CN=WQ Runoff=10.05 cfs 0.603 af

Reach 1R: TOTAL TO COOKS BAY Inflow=28.76 cfs 1.700 af
Outflow=28.76 cfs 1.700 af

Total Runoff Area = 3.603 ac Runoff Volume = 1.700 af Average Runoff Depth = 5.66"
51.40% Pervious = 1.852 ac 48.60% Impervious = 1.751 ac

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EXISTING
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Runoff = 9.33 cfs @ 12.18 hrs, Volume= 0.508 af, Depth= 4.46"
Routed to Reach 1R : TOTAL TO COOKS BAY

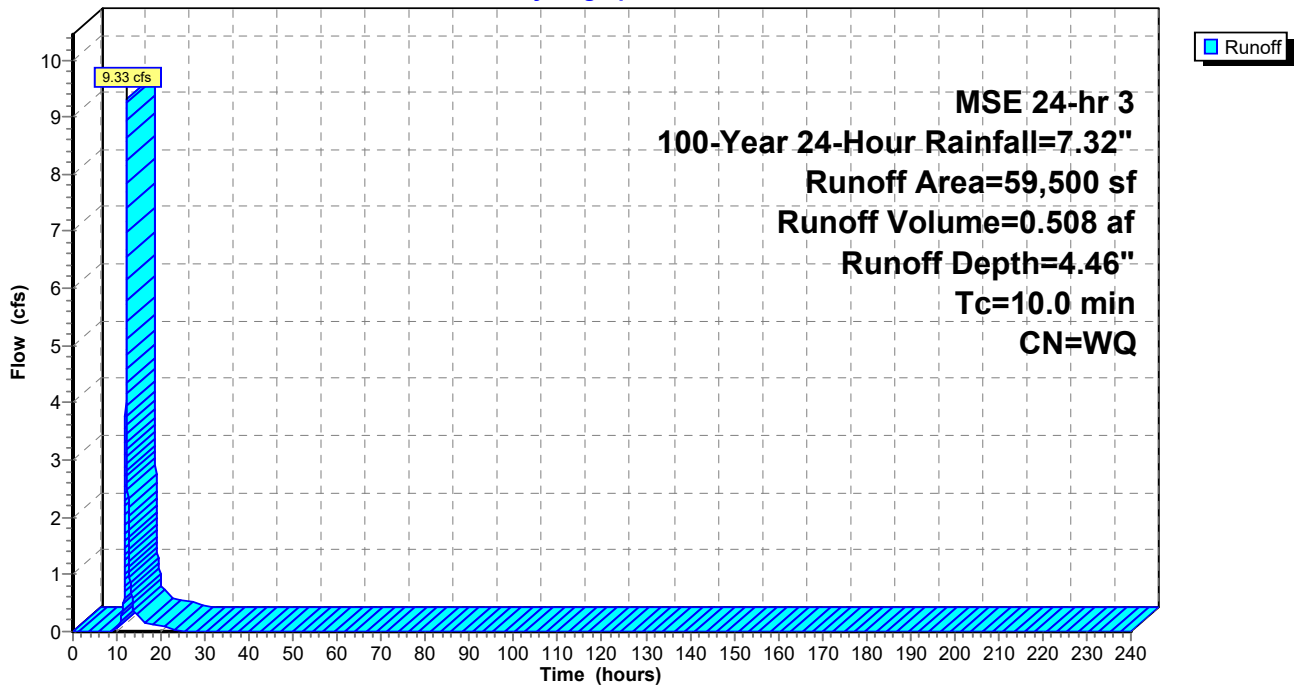
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
3,046	98	Paved parking, HSG C
56,454	74	>75% Grass cover, Good, HSG C
59,500		Weighted Average
56,454		94.88% Pervious Area
3,046		5.12% Impervious Area

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

Subcatchment EX1: EX 1 - DRAINS EAST TO COOKS BAY

Hydrograph



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EXISTING
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Summary for Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

Runoff = 9.39 cfs @ 12.17 hrs, Volume= 0.589 af, Depth= 6.94"
Routed to Reach 1R : TOTAL TO COOKS BAY

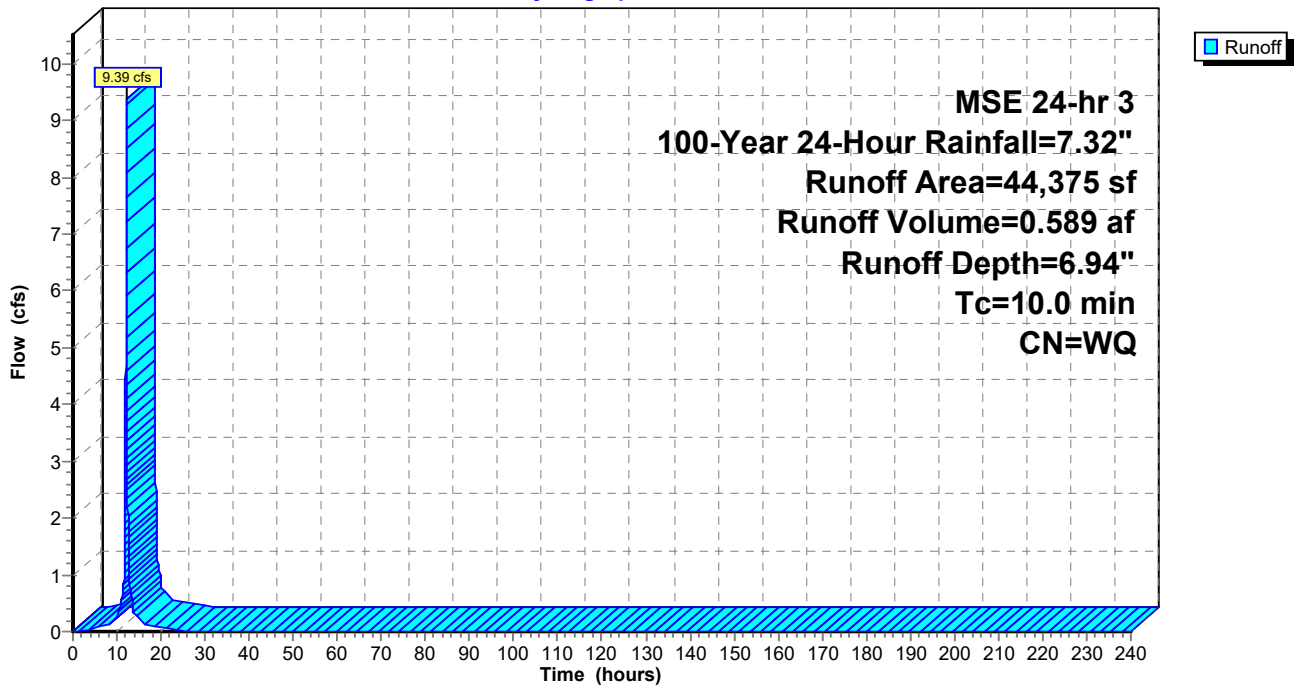
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
42,143	98	Paved parking, HSG C
2,232	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
2,232		5.03% Pervious Area
42,143		94.97% Impervious Area

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

Subcatchment EX2: EX 2 - DRAINS EAST TO COOKS BAY

Hydrograph



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EXISTING
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Runoff = 10.05 cfs @ 12.17 hrs, Volume= 0.603 af, Depth= 5.94"
Routed to Reach 1R : TOTAL TO COOKS BAY

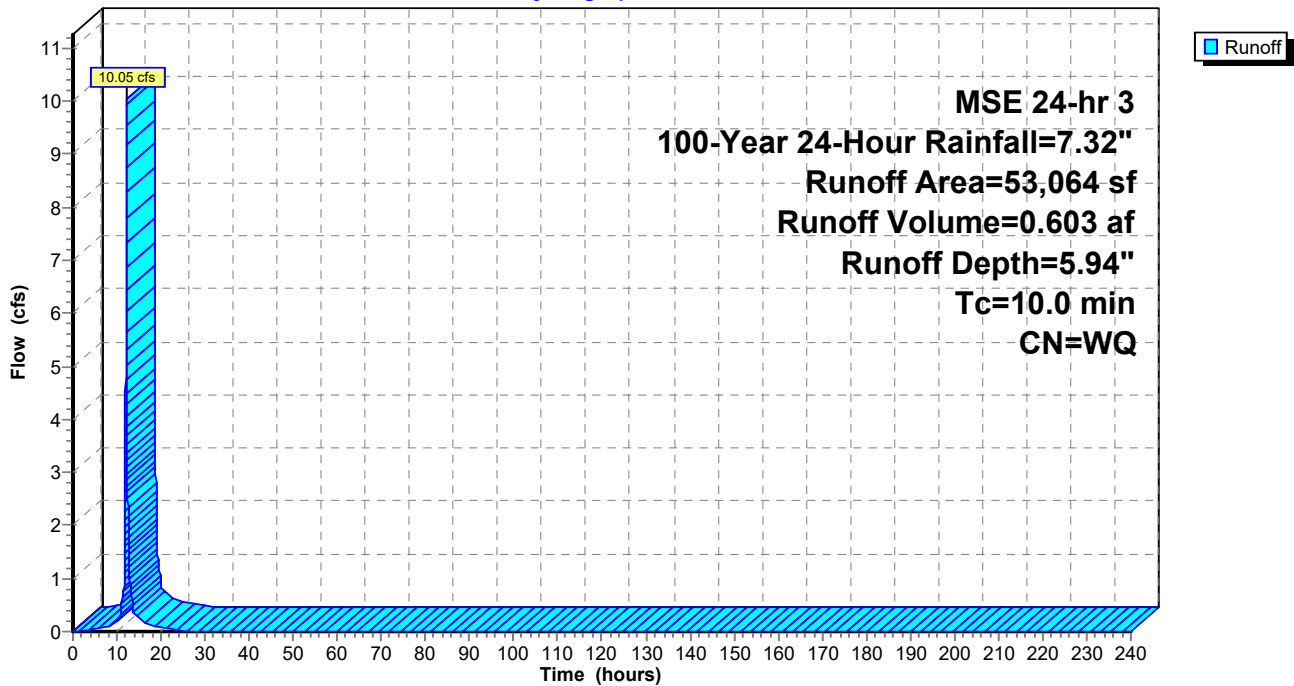
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment EX3: EX 3 - DRAINS EAST TO COMMERCE BLVD

Hydrograph



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EXISTING
MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Reach 1R: TOTAL TO COOKS BAY

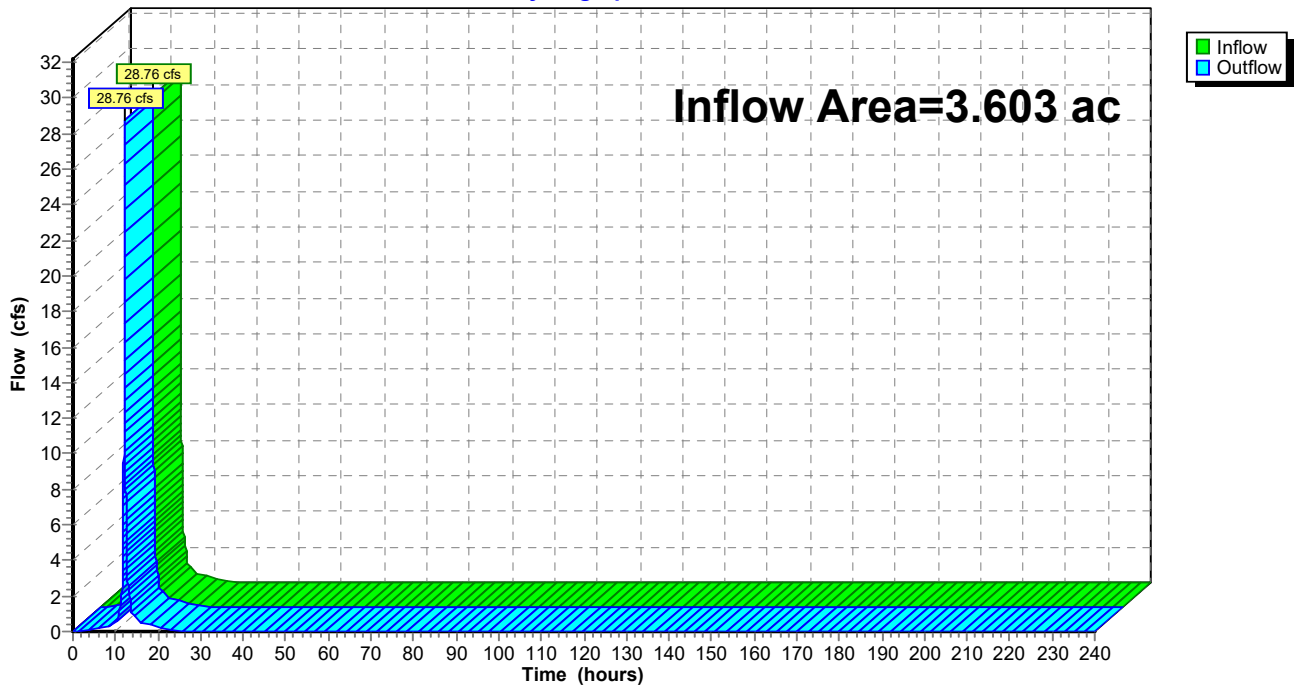
[40] Hint: Not Described (Outflow=Inflow)

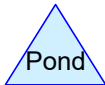
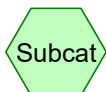
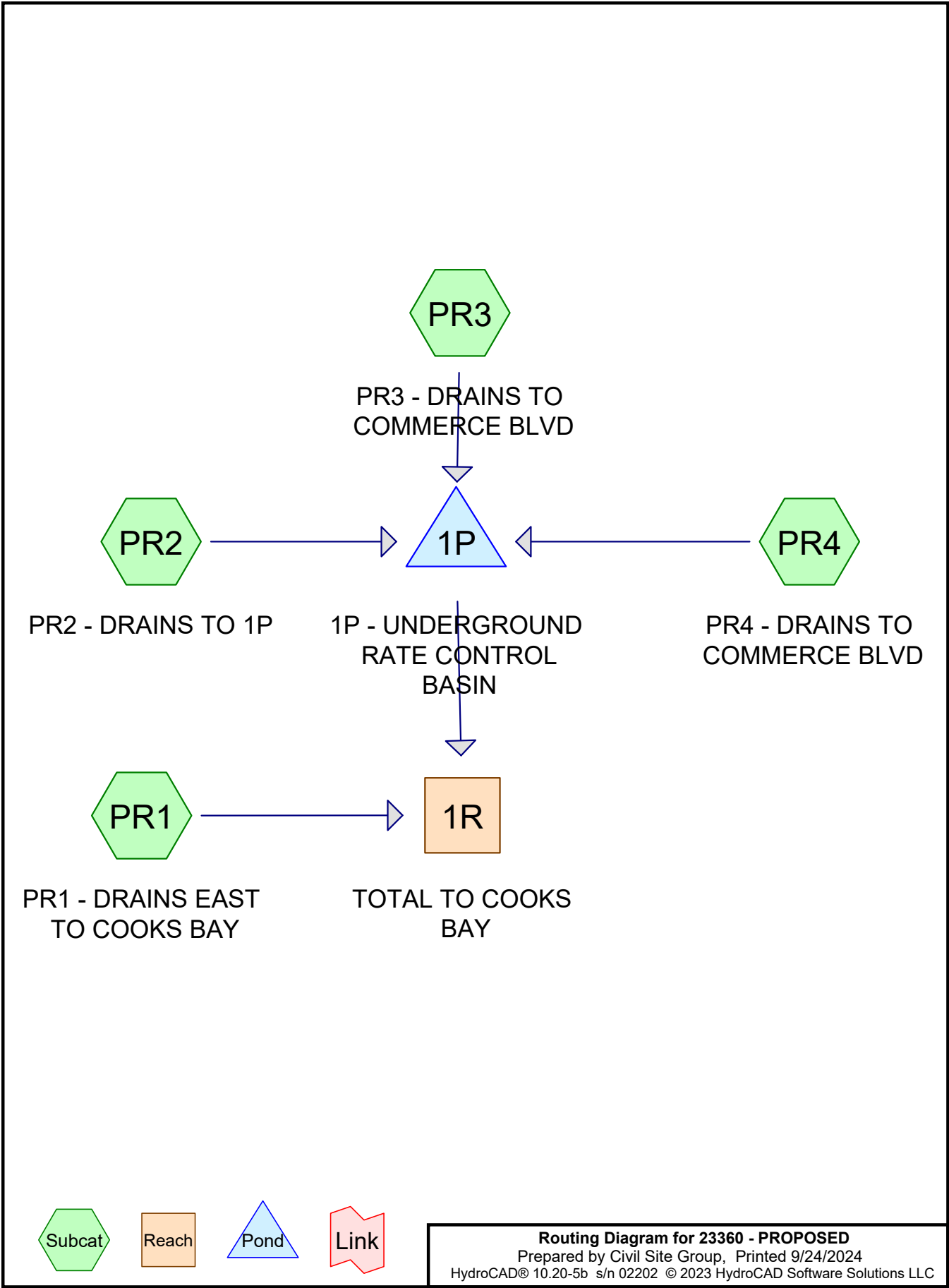
Inflow Area = 3.603 ac, 48.60% Impervious, Inflow Depth = 5.66" for 100-Year 24-Hour event
Inflow = 28.76 cfs @ 12.17 hrs, Volume= 1.700 af
Outflow = 28.76 cfs @ 12.17 hrs, Volume= 1.700 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph





Routing Diagram for 23360 - PROPOSED
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	2.86	2
2	10-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	4.26	2
3	100-Year 24-Hour	MSE 24-hr	3	Default	24.00	1	7.32	2
4	2" WQ	MSE 24-hr	3	Default	24.00	1	2.00	2
5	1" WQ	MSE 24-hr	3	Default	24.00	1	1.00	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.419	74	>75% Grass cover, Good, HSG C (PR1, PR2, PR3, PR4)
2.184	98	Paved parking, HSG C (PR1, PR2, PR3, PR4)
3.603	89	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.603	HSG C	PR1, PR2, PR3, PR4
0.000	HSG D	
0.000	Other	
3.603		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.419	0.000	0.000	1.419	>75% Grass cover, Good	PR1, PR2, PR3, PR4
0.000	0.000	2.184	0.000	0.000	2.184	Paved parking	PR1, PR2, PR3, PR4
0.000	0.000	3.603	0.000	0.000	3.603	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	929.86	929.50	56.0	0.0064	0.012	0.0	21.0	0.0	

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentPR1: PR1 - DRAINS EAST Runoff Area=33,310 sf 0.87% Impervious Runoff Depth=0.84"
Tc=10.0 min CN=WQ Runoff=0.95 cfs 0.053 af

SubcatchmentPR2: PR2 - DRAINS TO 1P Runoff Area=26,190 sf 80.48% Impervious Runoff Depth=2.28"
Tc=10.0 min CN=WQ Runoff=1.89 cfs 0.114 af

SubcatchmentPR3: PR3 - DRAINS TO Runoff Area=44,375 sf 96.17% Impervious Runoff Depth=2.56"
Tc=10.0 min CN=WQ Runoff=3.58 cfs 0.217 af

SubcatchmentPR4: PR4 - DRAINS TO Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=1.88"
Tc=10.0 min CN=WQ Runoff=3.18 cfs 0.191 af

Reach 1R: TOTAL TO COOKS BAY Inflow=4.97 cfs 0.575 af
Outflow=4.97 cfs 0.575 af

Pond 1P: 1P - UNDERGROUND RATE Peak Elev=935.22' Storage=6,556 cf Inflow=8.64 cfs 0.522 af
Outflow=4.40 cfs 0.522 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.575 af Average Runoff Depth = 1.92"
39.38% Pervious = 1.419 ac 60.62% Impervious = 2.184 ac

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Runoff = 0.95 cfs @ 12.19 hrs, Volume= 0.053 af, Depth= 0.84"
 Routed to Reach 1R : TOTAL TO COOKS BAY

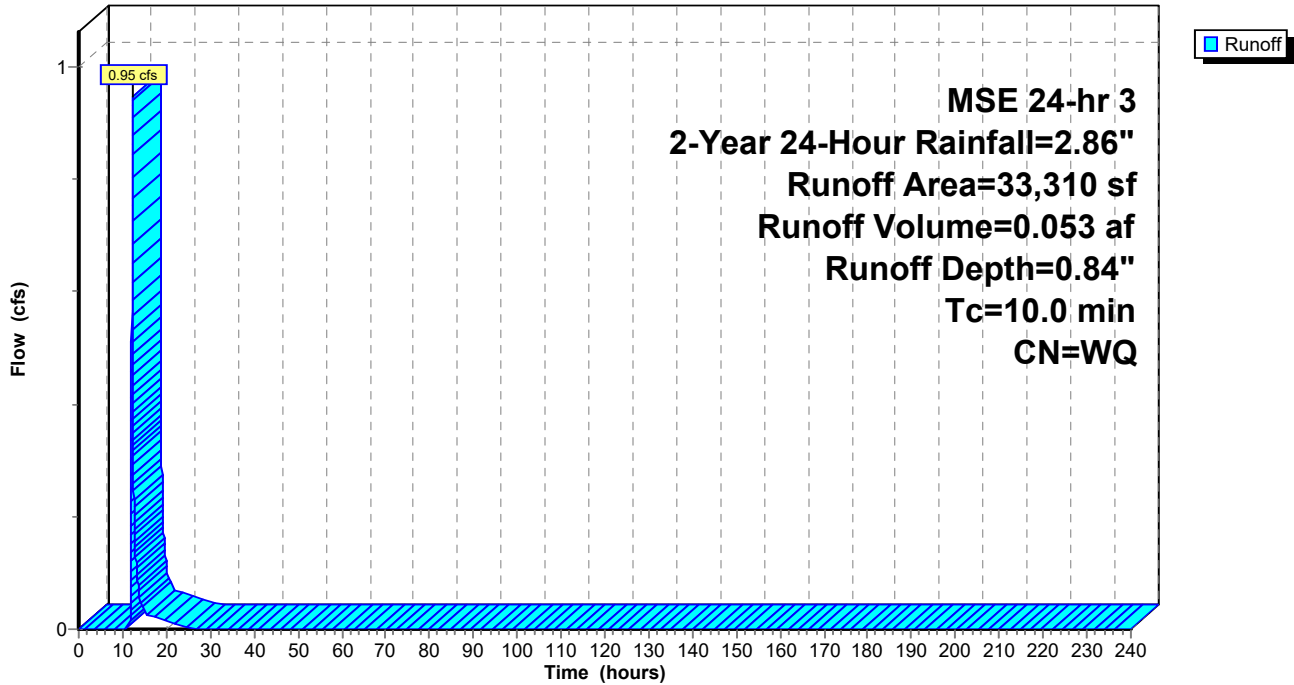
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
289	98	Paved parking, HSG C
33,021	74	>75% Grass cover, Good, HSG C
33,310		Weighted Average
33,021		99.13% Pervious Area
289		0.87% Impervious Area

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

Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment PR2: PR2 - DRAINS TO 1P

Runoff = 1.89 cfs @ 12.17 hrs, Volume= 0.114 af, Depth= 2.28"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

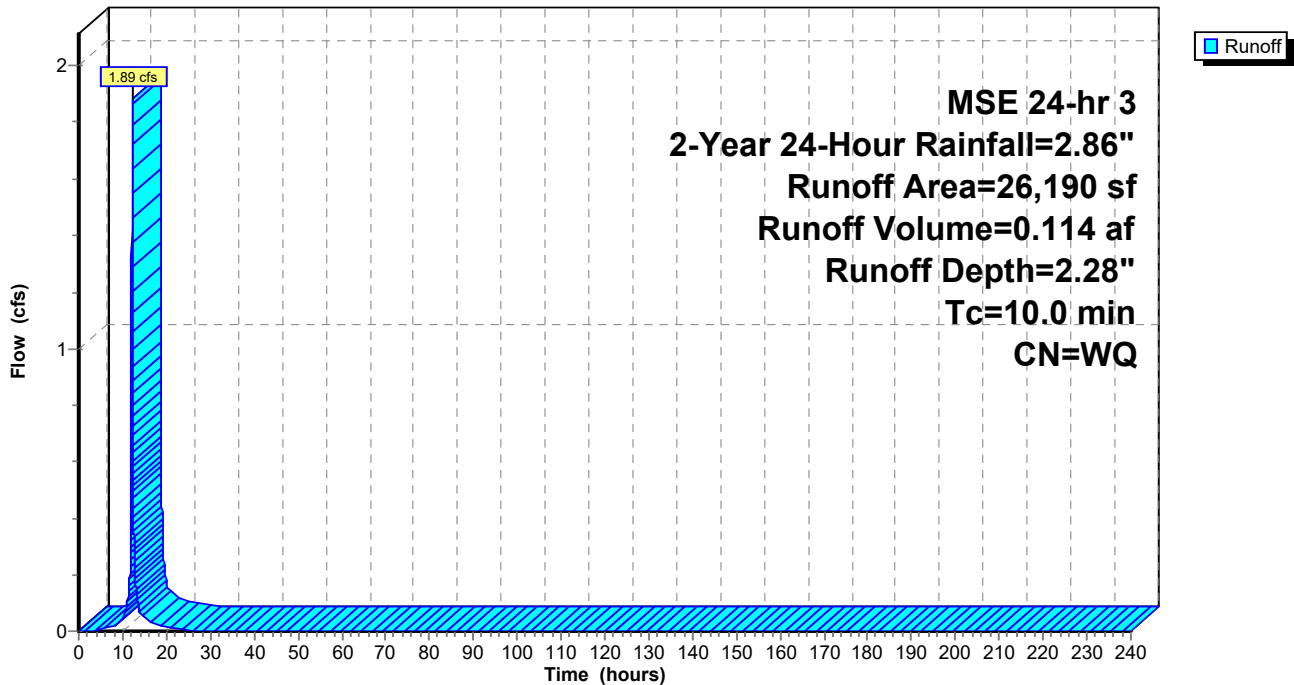
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
21,079	98	Paved parking, HSG C
5,111	74	>75% Grass cover, Good, HSG C
26,190		Weighted Average
5,111		19.52% Pervious Area
21,079		80.48% Impervious Area

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

Subcatchment PR2: PR2 - DRAINS TO 1P

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Runoff = 3.58 cfs @ 12.17 hrs, Volume= 0.217 af, Depth= 2.56"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

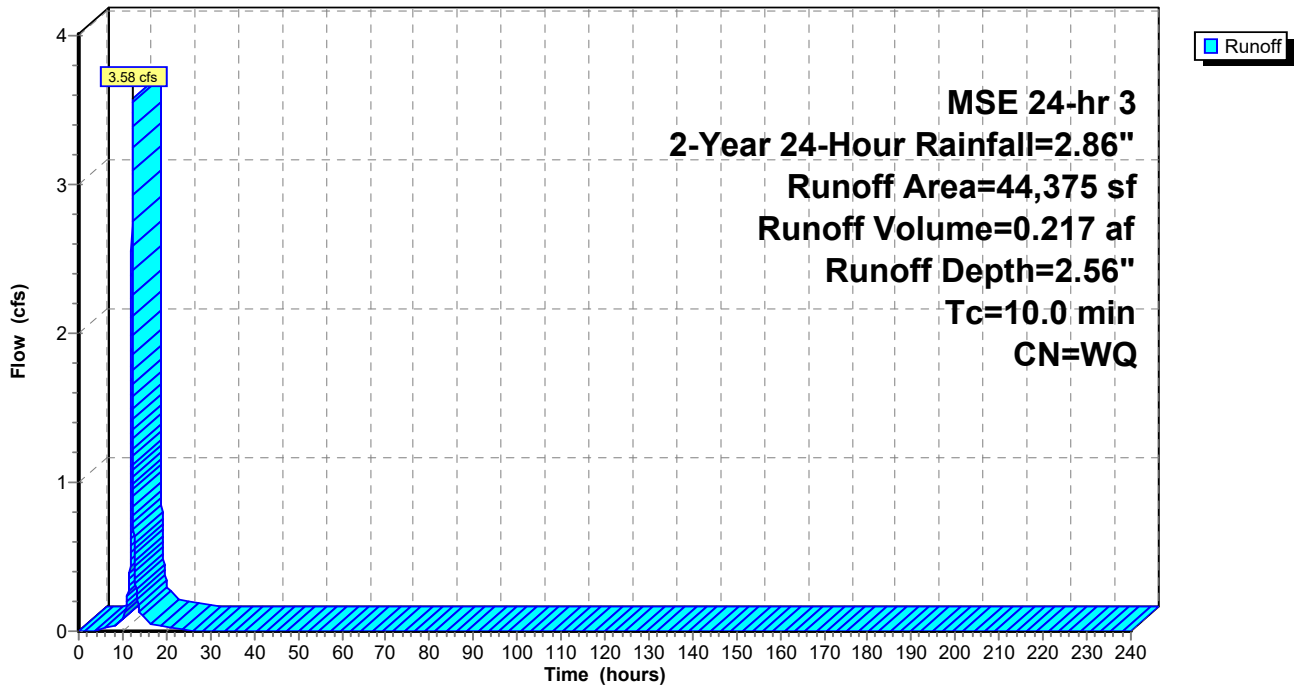
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
42,677	98	Paved parking, HSG C
1,698	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
1,698		3.83% Pervious Area
42,677		96.17% Impervious Area

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

Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Summary for Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Runoff = 3.18 cfs @ 12.17 hrs, Volume= 0.191 af, Depth= 1.88"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

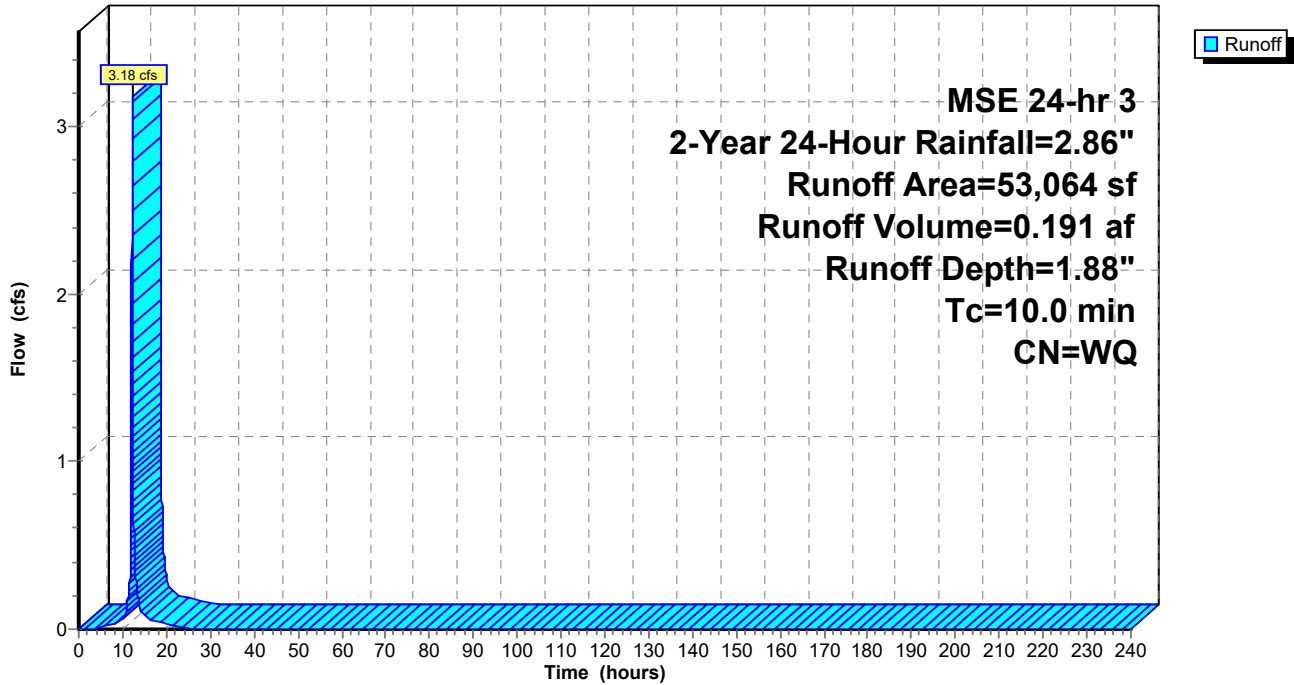
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Hydrograph



Summary for Reach 1R: TOTAL TO COOKS BAY

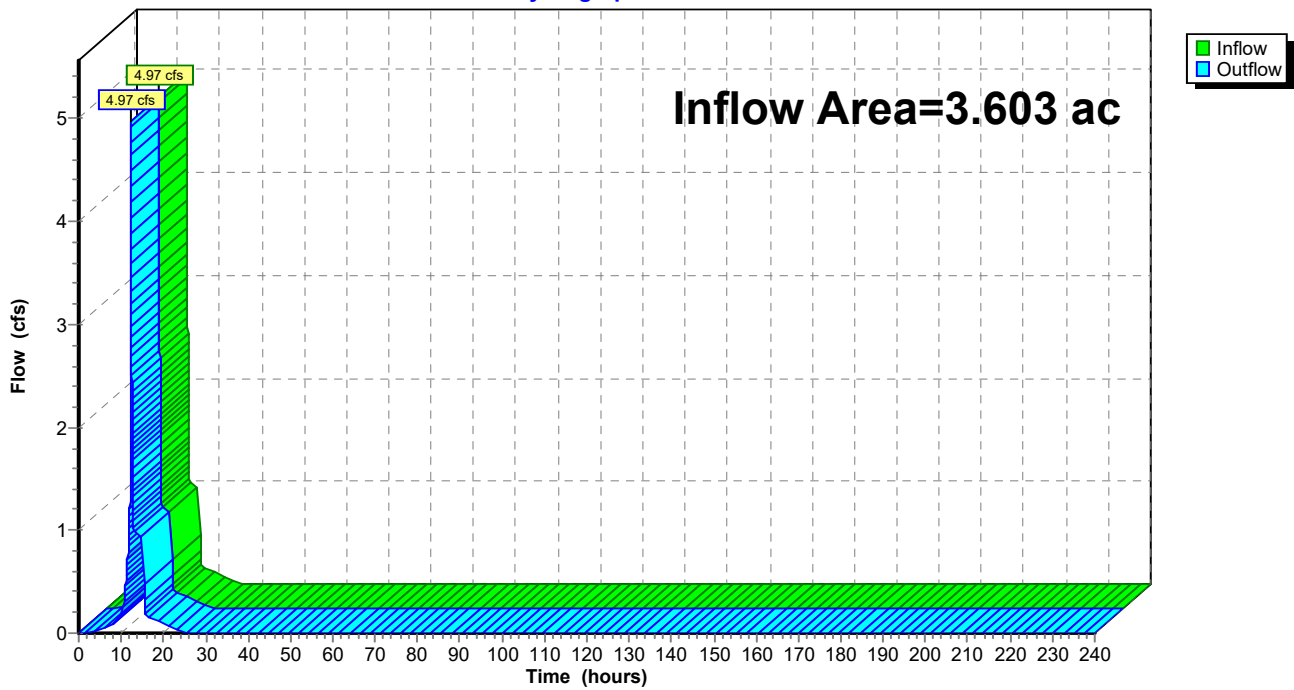
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 60.62% Impervious, Inflow Depth = 1.92" for 2-Year 24-Hour event
 Inflow = 4.97 cfs @ 12.30 hrs, Volume= 0.575 af
 Outflow = 4.97 cfs @ 12.30 hrs, Volume= 0.575 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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Summary for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Inflow Area = 2.838 ac, 76.72% Impervious, Inflow Depth = 2.21" for 2-Year 24-Hour event
 Inflow = 8.64 cfs @ 12.17 hrs, Volume= 0.522 af
 Outflow = 4.40 cfs @ 12.31 hrs, Volume= 0.522 af, Atten= 49%, Lag= 8.1 min
 Primary = 4.40 cfs @ 12.31 hrs, Volume= 0.522 af
 Routed to Reach 1R : TOTAL TO COOKS BAY

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Peak Elev= 935.22' @ 12.31 hrs Surf.Area= 1,853 sf Storage= 6,556 cf

Plug-Flow detention time= 39.2 min calculated for 0.522 af (100% of inflow)
 Center-of-Mass det. time= 39.2 min (803.6 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	930.50'	3,015 cf	17.00'W x 109.00'L x 7.33'H Field A 13,589 cf Overall - 6,051 cf Embedded = 7,538 cf x 40.0% Voids
#2A	930.50'	6,051 cf	CMP Round 72 x 10 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L Row Length Adjustment= +7.00' x 28.27 sf x 2 rows
		9,066 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 4	930.50'	0.890 cfs Constant Flow/Skimmer
#2	Primary	929.86'	21.0" Round Culvert L= 56.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 929.86' / 929.50' S= 0.0064 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.41 sf
#3	Device 4	934.70'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	929.86'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.39 cfs @ 12.31 hrs HW=935.22' (Free Discharge)

- ↑ **2=Culvert** (Passes 4.39 cfs of 21.63 cfs potential flow)
- ↑ **4=Orifice/Grate** (Passes 4.39 cfs of 19.69 cfs potential flow)
- ↑ **1=Constant Flow/Skimmer** (Constant Controls 0.89 cfs)
- ↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 3.50 cfs @ 2.35 fps)

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)

Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf

Overall Size= 72.0"W x 72.0"H x 20.00'L

Row Length Adjustment= +7.00' x 28.27 sf x 2 rows

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

5 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 107.00' Row Length +12.0" End Stone x 2 = 109.00' Base Length

2 Rows x 72.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 17.00' Base Width

72.0" Chamber Height + 16.0" Stone Cover = 7.33' Field Height

10 Chambers x 565.5 cf +7.00' Row Adjustment x 28.27 sf x 2 Rows = 6,050.7 cf Chamber Storage

13,588.7 cf Field - 6,050.7 cf Chambers = 7,538.0 cf Stone x 40.0% Voids = 3,015.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,065.9 cf = 0.208 af

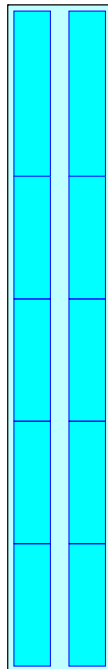
Overall Storage Efficiency = 66.7%

Overall System Size = 109.00' x 17.00' x 7.33'

10 Chambers

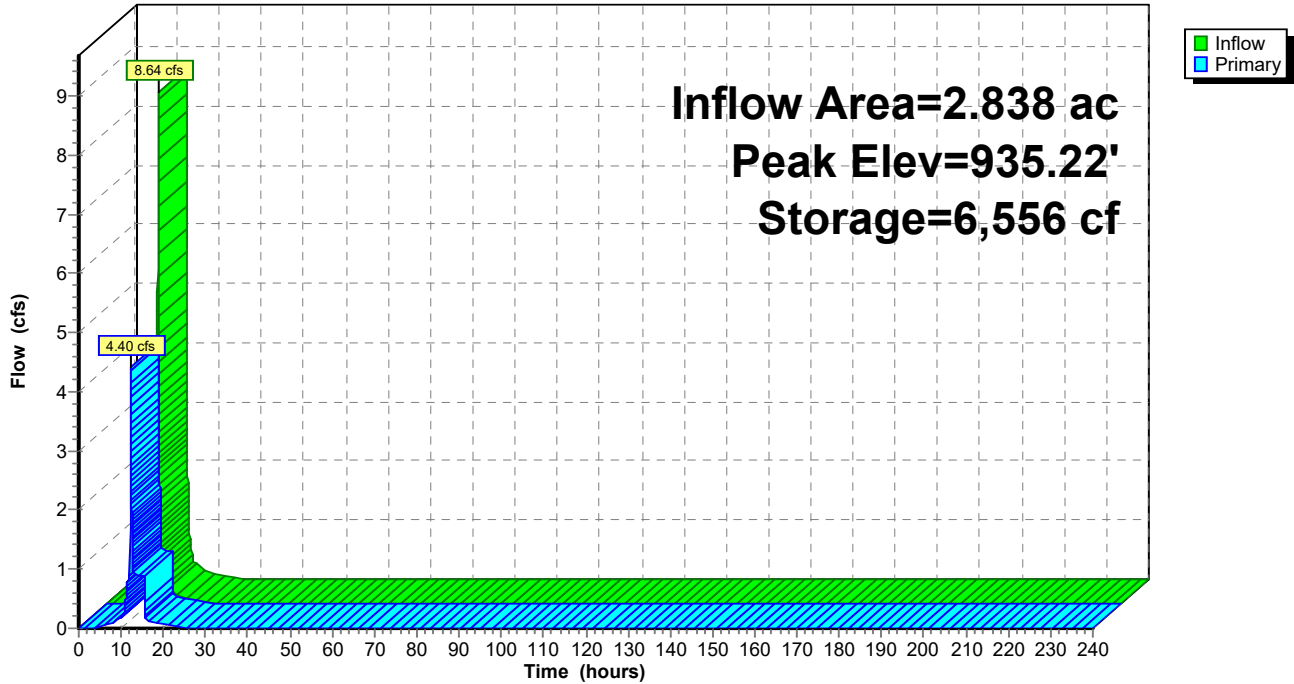
503.3 cy Field

279.2 cy Stone



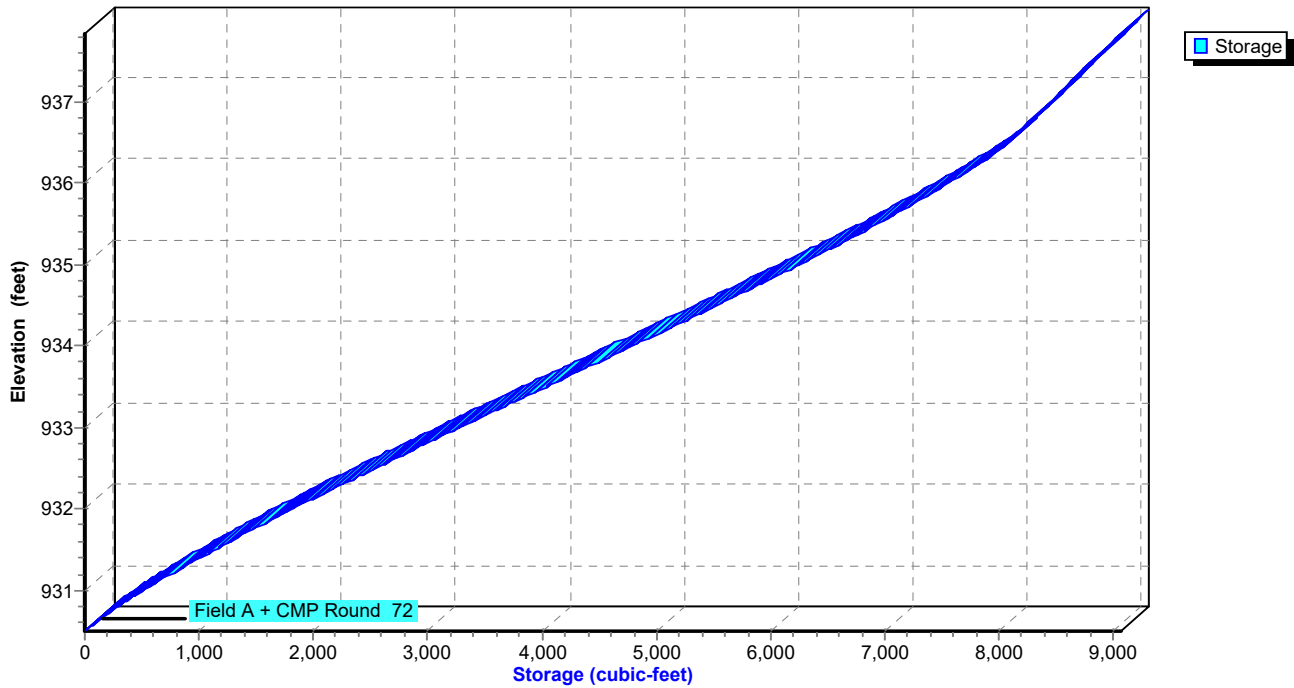
Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Hydrograph



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Stage-Area-Storage



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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Stage-Discharge for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
930.50	0.00	933.10	0.89	935.70	10.05
930.55	0.89	933.15	0.89	935.75	10.71
930.60	0.89	933.20	0.89	935.80	11.38
930.65	0.89	933.25	0.89	935.85	12.06
930.70	0.89	933.30	0.89	935.90	12.75
930.75	0.89	933.35	0.89	935.95	13.46
930.80	0.89	933.40	0.89	936.00	14.17
930.85	0.89	933.45	0.89	936.05	14.89
930.90	0.89	933.50	0.89	936.10	15.62
930.95	0.89	933.55	0.89	936.15	16.36
931.00	0.89	933.60	0.89	936.20	17.11
931.05	0.89	933.65	0.89	936.25	17.86
931.10	0.89	933.70	0.89	936.30	18.63
931.15	0.89	933.75	0.89	936.35	19.39
931.20	0.89	933.80	0.89	936.40	20.17
931.25	0.89	933.85	0.89	936.45	20.95
931.30	0.89	933.90	0.89	936.50	21.74
931.35	0.89	933.95	0.89	936.55	22.01
931.40	0.89	934.00	0.89	936.60	22.09
931.45	0.89	934.05	0.89	936.65	22.17
931.50	0.89	934.10	0.89	936.70	22.25
931.55	0.89	934.15	0.89	936.75	22.33
931.60	0.89	934.20	0.89	936.80	22.42
931.65	0.89	934.25	0.89	936.85	22.50
931.70	0.89	934.30	0.89	936.90	22.58
931.75	0.89	934.35	0.89	936.95	22.66
931.80	0.89	934.40	0.89	937.00	22.74
931.85	0.89	934.45	0.89	937.05	22.82
931.90	0.89	934.50	0.89	937.10	22.89
931.95	0.89	934.55	0.89	937.15	22.97
932.00	0.89	934.60	0.89	937.20	23.05
932.05	0.89	934.65	0.89	937.25	23.13
932.10	0.89	934.70	0.89	937.30	23.21
932.15	0.89	934.75	1.00	937.35	23.29
932.20	0.89	934.80	1.20	937.40	23.36
932.25	0.89	934.85	1.45	937.45	23.44
932.30	0.89	934.90	1.76	937.50	23.52
932.35	0.89	934.95	2.10	937.55	23.60
932.40	0.89	935.00	2.47	937.60	23.67
932.45	0.89	935.05	2.87	937.65	23.75
932.50	0.89	935.10	3.31	937.70	23.82
932.55	0.89	935.15	3.76	937.75	23.90
932.60	0.89	935.20	4.24	937.80	23.98
932.65	0.89	935.25	4.74		
932.70	0.89	935.30	5.27		
932.75	0.89	935.35	5.81		
932.80	0.89	935.40	6.37		
932.85	0.89	935.45	6.94		
932.90	0.89	935.50	7.54		
932.95	0.89	935.55	8.14		
933.00	0.89	935.60	8.76		
933.05	0.89	935.65	9.40		

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MSE 24-hr 3 2-Year 24-Hour Rainfall=2.86"

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Stage-Area-Storage for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
930.50	0	933.10	3,435	935.70	7,197
930.55	40	933.15	3,510	935.75	7,260
930.60	87	933.20	3,586	935.80	7,322
930.65	135	933.25	3,661	935.85	7,383
930.70	185	933.30	3,737	935.90	7,444
930.75	237	933.35	3,812	935.95	7,504
930.80	290	933.40	3,888	936.00	7,563
930.85	345	933.45	3,963	936.05	7,620
930.90	400	933.50	4,039	936.10	7,677
930.95	457	933.55	4,114	936.15	7,733
931.00	515	933.60	4,190	936.20	7,787
931.05	574	933.65	4,266	936.25	7,841
931.10	634	933.70	4,341	936.30	7,892
931.15	694	933.75	4,416	936.35	7,942
931.20	756	933.80	4,492	936.40	7,990
931.25	818	933.85	4,567	936.45	8,036
931.30	881	933.90	4,643	936.50	8,078
931.35	944	933.95	4,718	936.55	8,115
931.40	1,009	934.00	4,793	936.60	8,152
931.45	1,073	934.05	4,868	936.65	8,189
931.50	1,139	934.10	4,943	936.70	8,226
931.55	1,205	934.15	5,017	936.75	8,263
931.60	1,272	934.20	5,092	936.80	8,300
931.65	1,339	934.25	5,166	936.85	8,337
931.70	1,406	934.30	5,241	936.90	8,374
931.75	1,474	934.35	5,315	936.95	8,411
931.80	1,543	934.40	5,389	937.00	8,448
931.85	1,612	934.45	5,462	937.05	8,485
931.90	1,681	934.50	5,536	937.10	8,522
931.95	1,751	934.55	5,609	937.15	8,559
932.00	1,822	934.60	5,682	937.20	8,596
932.05	1,892	934.65	5,755	937.25	8,634
932.10	1,963	934.70	5,827	937.30	8,671
932.15	2,034	934.75	5,900	937.35	8,708
932.20	2,106	934.80	5,972	937.40	8,745
932.25	2,178	934.85	6,043	937.45	8,782
932.30	2,250	934.90	6,115	937.50	8,819
932.35	2,323	934.95	6,185	937.55	8,856
932.40	2,395	935.00	6,256	937.60	8,893
932.45	2,468	935.05	6,326	937.65	8,930
932.50	2,542	935.10	6,396	937.70	8,967
932.55	2,615	935.15	6,466	937.75	9,004
932.60	2,689	935.20	6,535	937.80	9,041
932.65	2,763	935.25	6,603		
932.70	2,837	935.30	6,671		
932.75	2,911	935.35	6,739		
932.80	2,986	935.40	6,806		
932.85	3,060	935.45	6,873		
932.90	3,135	935.50	6,939		
932.95	3,210	935.55	7,004		
933.00	3,285	935.60	7,069		
933.05	3,360	935.65	7,133		

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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentPR1: PR1 - DRAINS EAST Runoff Area=33,310 sf 0.87% Impervious Runoff Depth=1.81"
Tc=10.0 min CN=WQ Runoff=2.14 cfs 0.115 af

SubcatchmentPR2: PR2 - DRAINS TO 1P Runoff Area=26,190 sf 80.48% Impervious Runoff Depth=3.59"
Tc=10.0 min CN=WQ Runoff=2.95 cfs 0.180 af

SubcatchmentPR3: PR3 - DRAINS TO Runoff Area=44,375 sf 96.17% Impervious Runoff Depth=3.94"
Tc=10.0 min CN=WQ Runoff=5.41 cfs 0.334 af

SubcatchmentPR4: PR4 - DRAINS TO Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=3.10"
Tc=10.0 min CN=WQ Runoff=5.26 cfs 0.315 af

Reach 1R: TOTAL TO COOKS BAY Inflow=14.56 cfs 0.944 af
Outflow=14.56 cfs 0.944 af

Pond 1P: 1P - UNDERGROUND RATE Peak Elev=935.88' Storage=7,424 cf Inflow=13.62 cfs 0.829 af
Outflow=12.52 cfs 0.829 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.944 af Average Runoff Depth = 3.14"
39.38% Pervious = 1.419 ac 60.62% Impervious = 2.184 ac

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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Runoff = 2.14 cfs @ 12.18 hrs, Volume= 0.115 af, Depth= 1.81"
 Routed to Reach 1R : TOTAL TO COOKS BAY

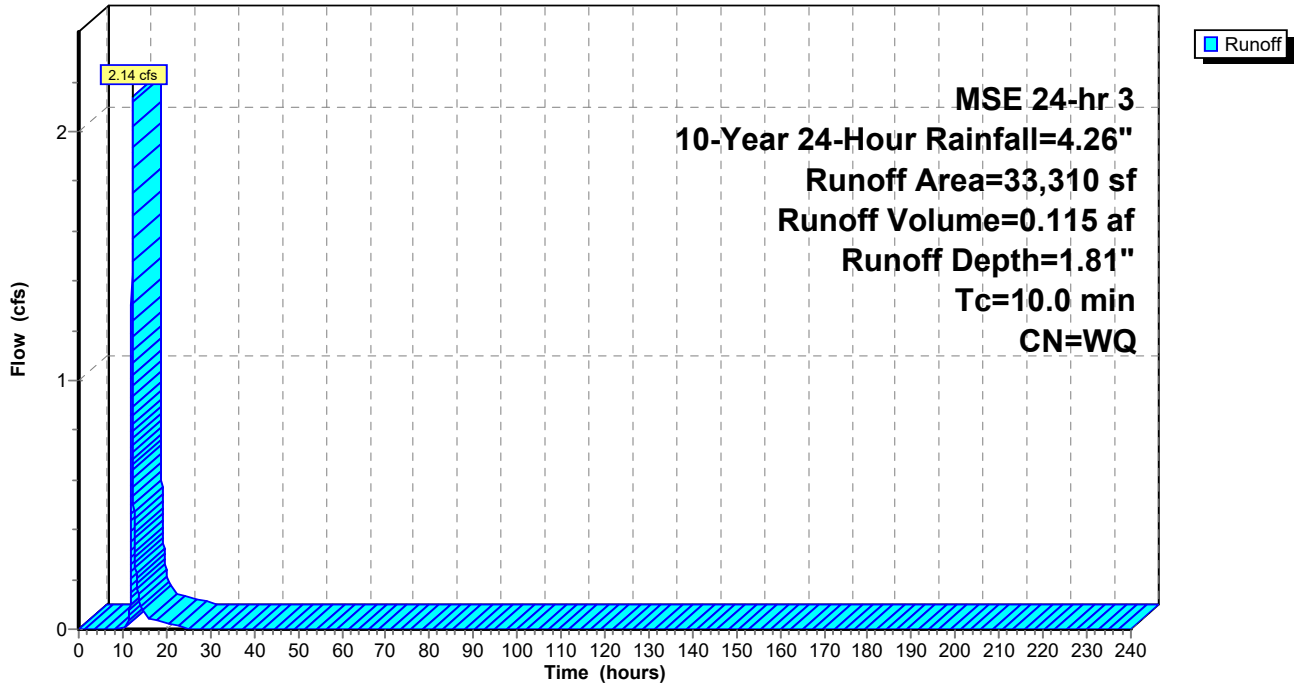
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
289	98	Paved parking, HSG C
33,021	74	>75% Grass cover, Good, HSG C
33,310		Weighted Average
33,021		99.13% Pervious Area
289		0.87% Impervious Area

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

Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment PR2: PR2 - DRAINS TO 1P

Runoff = 2.95 cfs @ 12.17 hrs, Volume= 0.180 af, Depth= 3.59"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

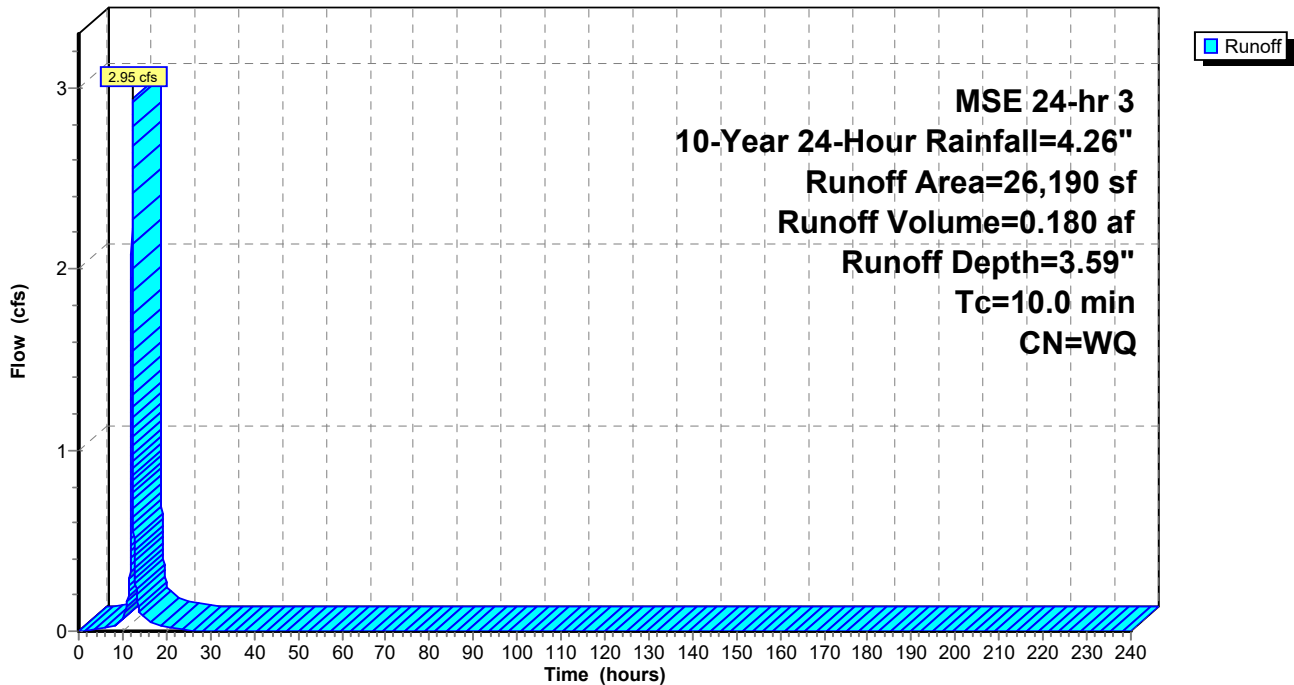
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
21,079	98	Paved parking, HSG C
5,111	74	>75% Grass cover, Good, HSG C
26,190		Weighted Average
5,111		19.52% Pervious Area
21,079		80.48% Impervious Area

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

Subcatchment PR2: PR2 - DRAINS TO 1P

Hydrograph



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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Runoff = 5.41 cfs @ 12.17 hrs, Volume= 0.334 af, Depth= 3.94"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

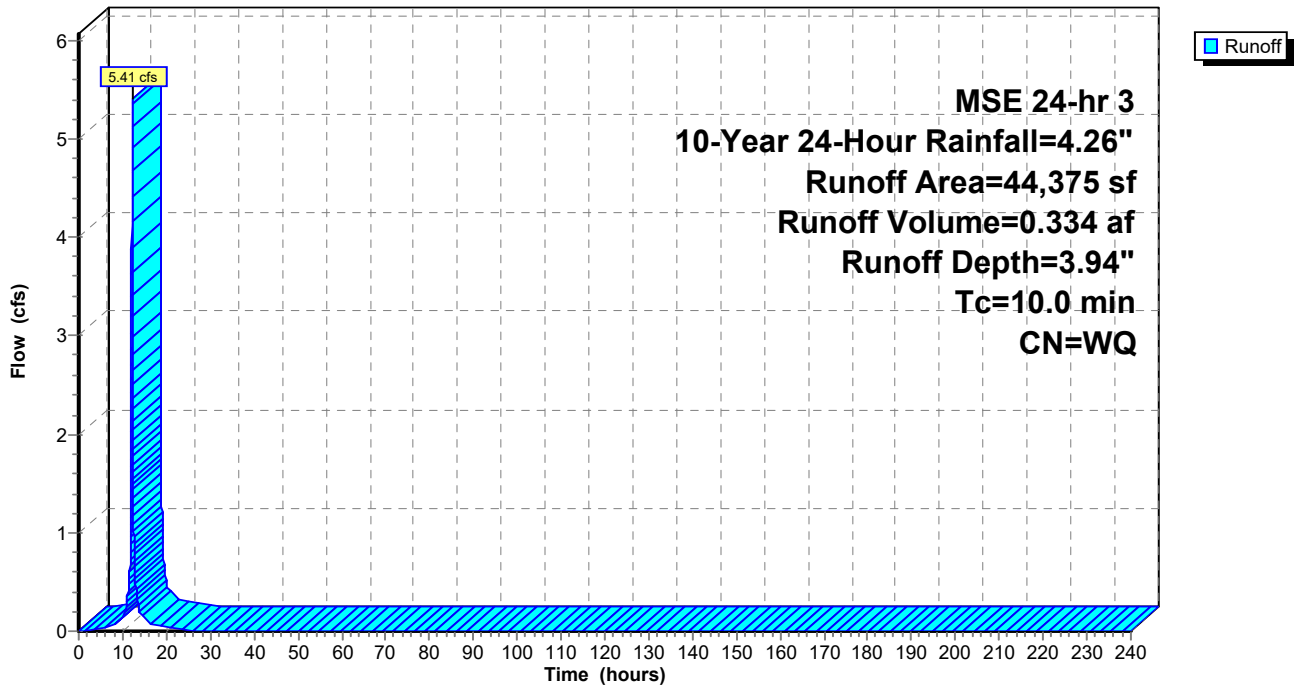
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
42,677	98	Paved parking, HSG C
1,698	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
1,698		3.83% Pervious Area
42,677		96.17% Impervious Area

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

Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Summary for Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Runoff = 5.26 cfs @ 12.17 hrs, Volume= 0.315 af, Depth= 3.10"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

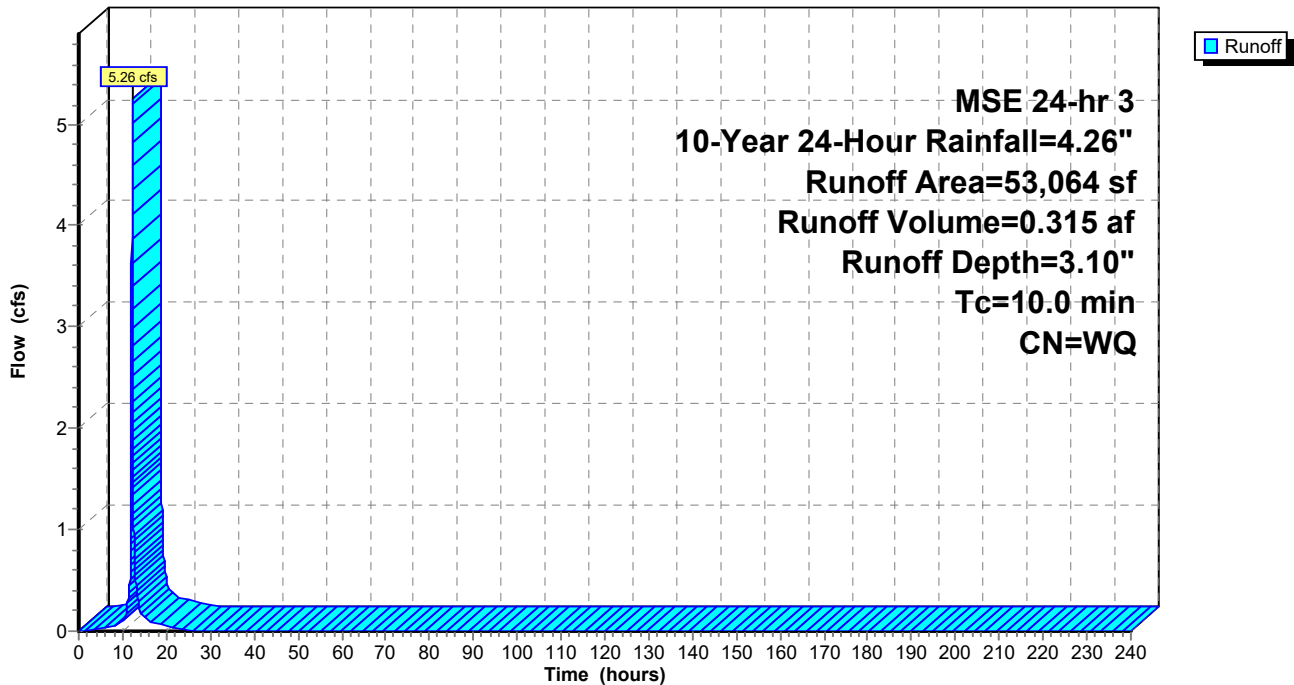
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Hydrograph



Summary for Reach 1R: TOTAL TO COOKS BAY

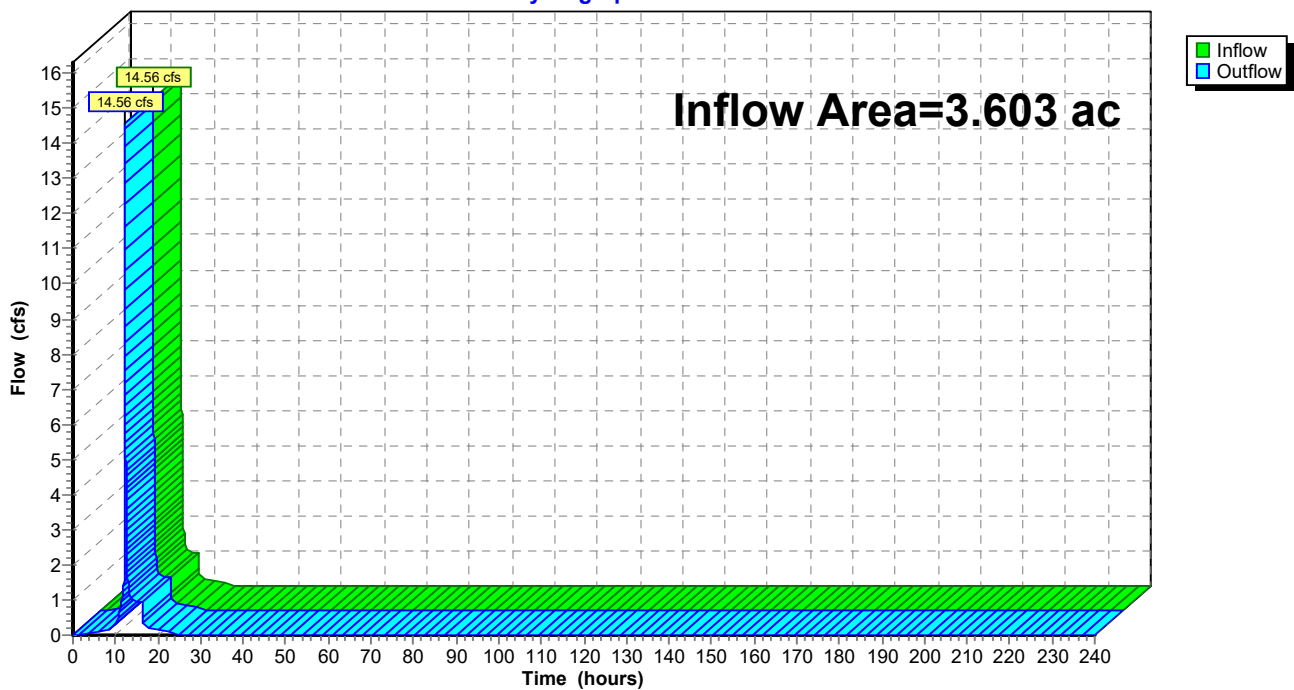
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 60.62% Impervious, Inflow Depth = 3.14" for 10-Year 24-Hour event
Inflow = 14.56 cfs @ 12.21 hrs, Volume= 0.944 af
Outflow = 14.56 cfs @ 12.21 hrs, Volume= 0.944 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



Summary for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Inflow Area = 2.838 ac, 76.72% Impervious, Inflow Depth = 3.50" for 10-Year 24-Hour event
 Inflow = 13.62 cfs @ 12.17 hrs, Volume= 0.829 af
 Outflow = 12.52 cfs @ 12.21 hrs, Volume= 0.829 af, Atten= 8%, Lag= 2.2 min
 Primary = 12.52 cfs @ 12.21 hrs, Volume= 0.829 af
 Routed to Reach 1R : TOTAL TO COOKS BAY

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Peak Elev= 935.88' @ 12.21 hrs Surf.Area= 1,853 sf Storage= 7,424 cf

Plug-Flow detention time= 32.0 min calculated for 0.829 af (100% of inflow)
 Center-of-Mass det. time= 32.0 min (791.3 - 759.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	930.50'	3,015 cf	17.00'W x 109.00'L x 7.33'H Field A 13,589 cf Overall - 6,051 cf Embedded = 7,538 cf x 40.0% Voids
#2A	930.50'	6,051 cf	CMP Round 72 x 10 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L Row Length Adjustment= +7.00' x 28.27 sf x 2 rows
		9,066 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 4	930.50'	0.890 cfs Constant Flow/Skimmer
#2	Primary	929.86'	21.0" Round Culvert L= 56.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 929.86' / 929.50' S= 0.0064 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.41 sf
#3	Device 4	934.70'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	929.86'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.51 cfs @ 12.21 hrs HW=935.88' (Free Discharge)
 ↳ **2=Culvert** (Passes 12.51 cfs of 23.18 cfs potential flow)
 ↳ ↳ **4=Orifice/Grate** (Passes 12.51 cfs of 20.88 cfs potential flow)
 ↳ ↳ ↳ **1=Constant Flow/Skimmer** (Constant Controls 0.89 cfs)
 ↳ ↳ ↳ **3=Sharp-Crested Rectangular Weir** (Weir Controls 11.62 cfs @ 3.56 fps)

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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)

Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf

Overall Size= 72.0"W x 72.0"H x 20.00'L

Row Length Adjustment= +7.00' x 28.27 sf x 2 rows

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

5 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 107.00' Row Length +12.0" End Stone x 2 = 109.00' Base Length

2 Rows x 72.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 17.00' Base Width

72.0" Chamber Height + 16.0" Stone Cover = 7.33' Field Height

10 Chambers x 565.5 cf +7.00' Row Adjustment x 28.27 sf x 2 Rows = 6,050.7 cf Chamber Storage

13,588.7 cf Field - 6,050.7 cf Chambers = 7,538.0 cf Stone x 40.0% Voids = 3,015.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,065.9 cf = 0.208 af

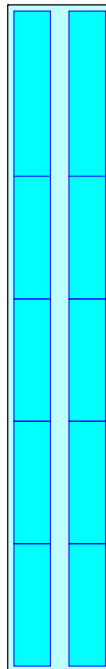
Overall Storage Efficiency = 66.7%

Overall System Size = 109.00' x 17.00' x 7.33'

10 Chambers

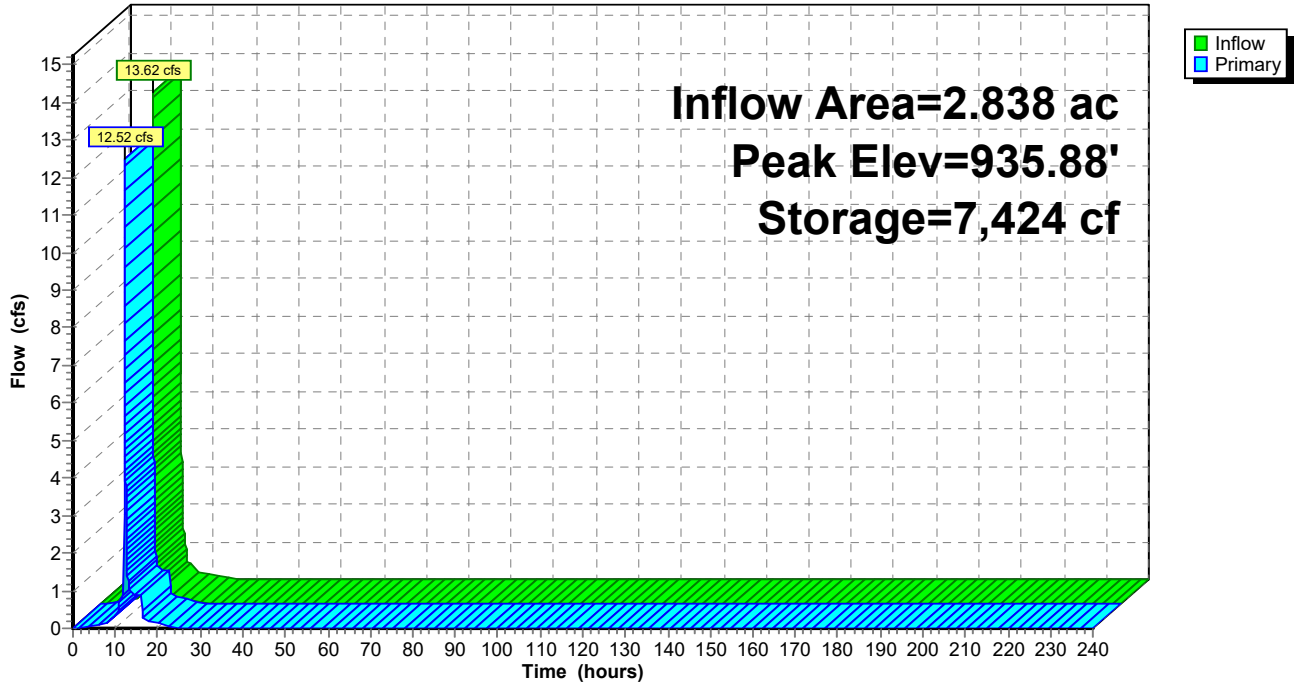
503.3 cy Field

279.2 cy Stone



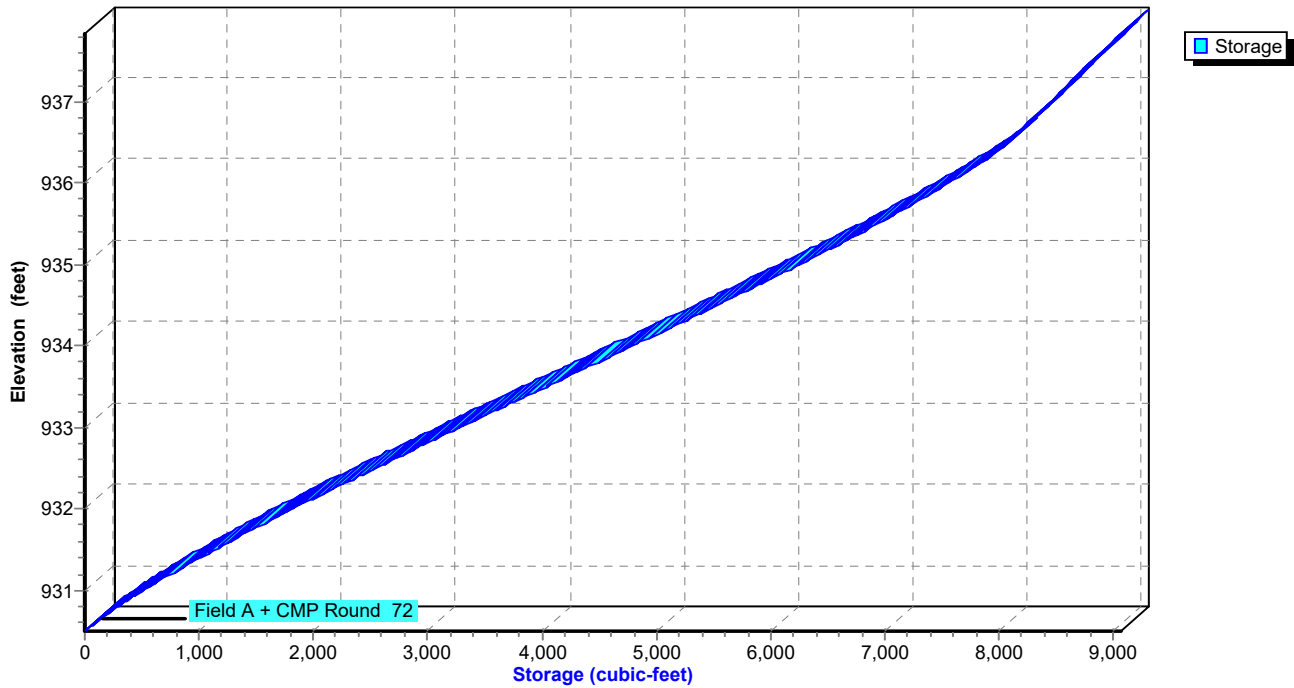
Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Hydrograph



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Stage-Area-Storage



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MSE 24-hr 3 10-Year 24-Hour Rainfall=4.26"

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Stage-Discharge for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
930.50	0.00	933.10	0.89	935.70	10.05
930.55	0.89	933.15	0.89	935.75	10.71
930.60	0.89	933.20	0.89	935.80	11.38
930.65	0.89	933.25	0.89	935.85	12.06
930.70	0.89	933.30	0.89	935.90	12.75
930.75	0.89	933.35	0.89	935.95	13.46
930.80	0.89	933.40	0.89	936.00	14.17
930.85	0.89	933.45	0.89	936.05	14.89
930.90	0.89	933.50	0.89	936.10	15.62
930.95	0.89	933.55	0.89	936.15	16.36
931.00	0.89	933.60	0.89	936.20	17.11
931.05	0.89	933.65	0.89	936.25	17.86
931.10	0.89	933.70	0.89	936.30	18.63
931.15	0.89	933.75	0.89	936.35	19.39
931.20	0.89	933.80	0.89	936.40	20.17
931.25	0.89	933.85	0.89	936.45	20.95
931.30	0.89	933.90	0.89	936.50	21.74
931.35	0.89	933.95	0.89	936.55	22.01
931.40	0.89	934.00	0.89	936.60	22.09
931.45	0.89	934.05	0.89	936.65	22.17
931.50	0.89	934.10	0.89	936.70	22.25
931.55	0.89	934.15	0.89	936.75	22.33
931.60	0.89	934.20	0.89	936.80	22.42
931.65	0.89	934.25	0.89	936.85	22.50
931.70	0.89	934.30	0.89	936.90	22.58
931.75	0.89	934.35	0.89	936.95	22.66
931.80	0.89	934.40	0.89	937.00	22.74
931.85	0.89	934.45	0.89	937.05	22.82
931.90	0.89	934.50	0.89	937.10	22.89
931.95	0.89	934.55	0.89	937.15	22.97
932.00	0.89	934.60	0.89	937.20	23.05
932.05	0.89	934.65	0.89	937.25	23.13
932.10	0.89	934.70	0.89	937.30	23.21
932.15	0.89	934.75	1.00	937.35	23.29
932.20	0.89	934.80	1.20	937.40	23.36
932.25	0.89	934.85	1.45	937.45	23.44
932.30	0.89	934.90	1.76	937.50	23.52
932.35	0.89	934.95	2.10	937.55	23.60
932.40	0.89	935.00	2.47	937.60	23.67
932.45	0.89	935.05	2.87	937.65	23.75
932.50	0.89	935.10	3.31	937.70	23.82
932.55	0.89	935.15	3.76	937.75	23.90
932.60	0.89	935.20	4.24	937.80	23.98
932.65	0.89	935.25	4.74		
932.70	0.89	935.30	5.27		
932.75	0.89	935.35	5.81		
932.80	0.89	935.40	6.37		
932.85	0.89	935.45	6.94		
932.90	0.89	935.50	7.54		
932.95	0.89	935.55	8.14		
933.00	0.89	935.60	8.76		
933.05	0.89	935.65	9.40		

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Stage-Area-Storage for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
930.50	0	933.10	3,435	935.70	7,197
930.55	40	933.15	3,510	935.75	7,260
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931.05	574	933.65	4,266	936.25	7,841
931.10	634	933.70	4,341	936.30	7,892
931.15	694	933.75	4,416	936.35	7,942
931.20	756	933.80	4,492	936.40	7,990
931.25	818	933.85	4,567	936.45	8,036
931.30	881	933.90	4,643	936.50	8,078
931.35	944	933.95	4,718	936.55	8,115
931.40	1,009	934.00	4,793	936.60	8,152
931.45	1,073	934.05	4,868	936.65	8,189
931.50	1,139	934.10	4,943	936.70	8,226
931.55	1,205	934.15	5,017	936.75	8,263
931.60	1,272	934.20	5,092	936.80	8,300
931.65	1,339	934.25	5,166	936.85	8,337
931.70	1,406	934.30	5,241	936.90	8,374
931.75	1,474	934.35	5,315	936.95	8,411
931.80	1,543	934.40	5,389	937.00	8,448
931.85	1,612	934.45	5,462	937.05	8,485
931.90	1,681	934.50	5,536	937.10	8,522
931.95	1,751	934.55	5,609	937.15	8,559
932.00	1,822	934.60	5,682	937.20	8,596
932.05	1,892	934.65	5,755	937.25	8,634
932.10	1,963	934.70	5,827	937.30	8,671
932.15	2,034	934.75	5,900	937.35	8,708
932.20	2,106	934.80	5,972	937.40	8,745
932.25	2,178	934.85	6,043	937.45	8,782
932.30	2,250	934.90	6,115	937.50	8,819
932.35	2,323	934.95	6,185	937.55	8,856
932.40	2,395	935.00	6,256	937.60	8,893
932.45	2,468	935.05	6,326	937.65	8,930
932.50	2,542	935.10	6,396	937.70	8,967
932.55	2,615	935.15	6,466	937.75	9,004
932.60	2,689	935.20	6,535	937.80	9,041
932.65	2,763	935.25	6,603		
932.70	2,837	935.30	6,671		
932.75	2,911	935.35	6,739		
932.80	2,986	935.40	6,806		
932.85	3,060	935.45	6,873		
932.90	3,135	935.50	6,939		
932.95	3,210	935.55	7,004		
933.00	3,285	935.60	7,069		
933.05	3,360	935.65	7,133		

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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentPR1: PR1 - DRAINS EAST Runoff Area=33,310 sf 0.87% Impervious Runoff Depth=4.35"
 Tc=10.0 min CN=WQ Runoff=5.13 cfs 0.277 af

SubcatchmentPR2: PR2 - DRAINS TO 1P Runoff Area=26,190 sf 80.48% Impervious Runoff Depth=6.54"
 Tc=10.0 min CN=WQ Runoff=5.31 cfs 0.328 af

SubcatchmentPR3: PR3 - DRAINS TO Runoff Area=44,375 sf 96.17% Impervious Runoff Depth=6.98"
 Tc=10.0 min CN=WQ Runoff=9.42 cfs 0.592 af

SubcatchmentPR4: PR4 - DRAINS TO Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=5.94"
 Tc=10.0 min CN=WQ Runoff=10.05 cfs 0.603 af

Reach 1R: TOTAL TO COOKS BAY Inflow=27.78 cfs 1.800 af
 Outflow=27.78 cfs 1.800 af

Pond 1P: 1P - UNDERGROUND RATE Peak Elev=937.05' Storage=8,485 cf Inflow=24.78 cfs 1.523 af
 Outflow=22.82 cfs 1.523 af

Total Runoff Area = 3.603 ac Runoff Volume = 1.800 af Average Runoff Depth = 5.99"
39.38% Pervious = 1.419 ac 60.62% Impervious = 2.184 ac

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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Runoff = 5.13 cfs @ 12.18 hrs, Volume= 0.277 af, Depth= 4.35"
 Routed to Reach 1R : TOTAL TO COOKS BAY

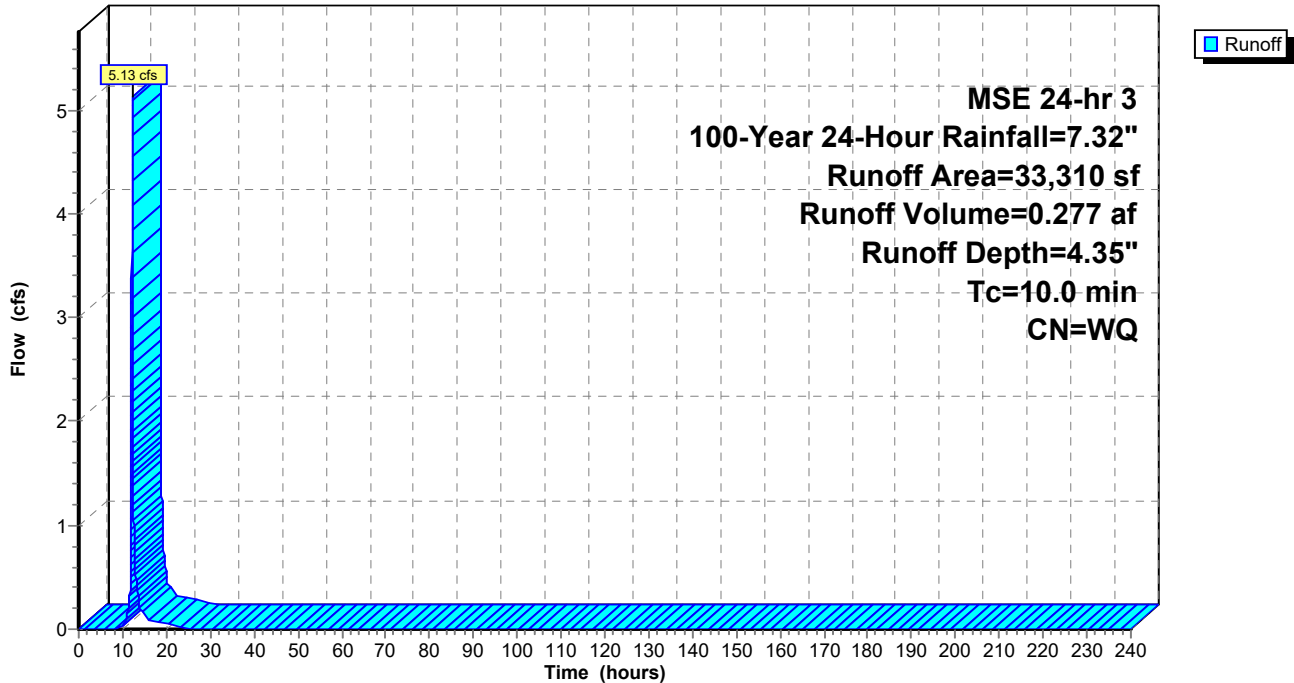
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
289	98	Paved parking, HSG C
33,021	74	>75% Grass cover, Good, HSG C
33,310		Weighted Average
33,021		99.13% Pervious Area
289		0.87% Impervious Area

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

Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment PR2: PR2 - DRAINS TO 1P

Runoff = 5.31 cfs @ 12.17 hrs, Volume= 0.328 af, Depth= 6.54"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

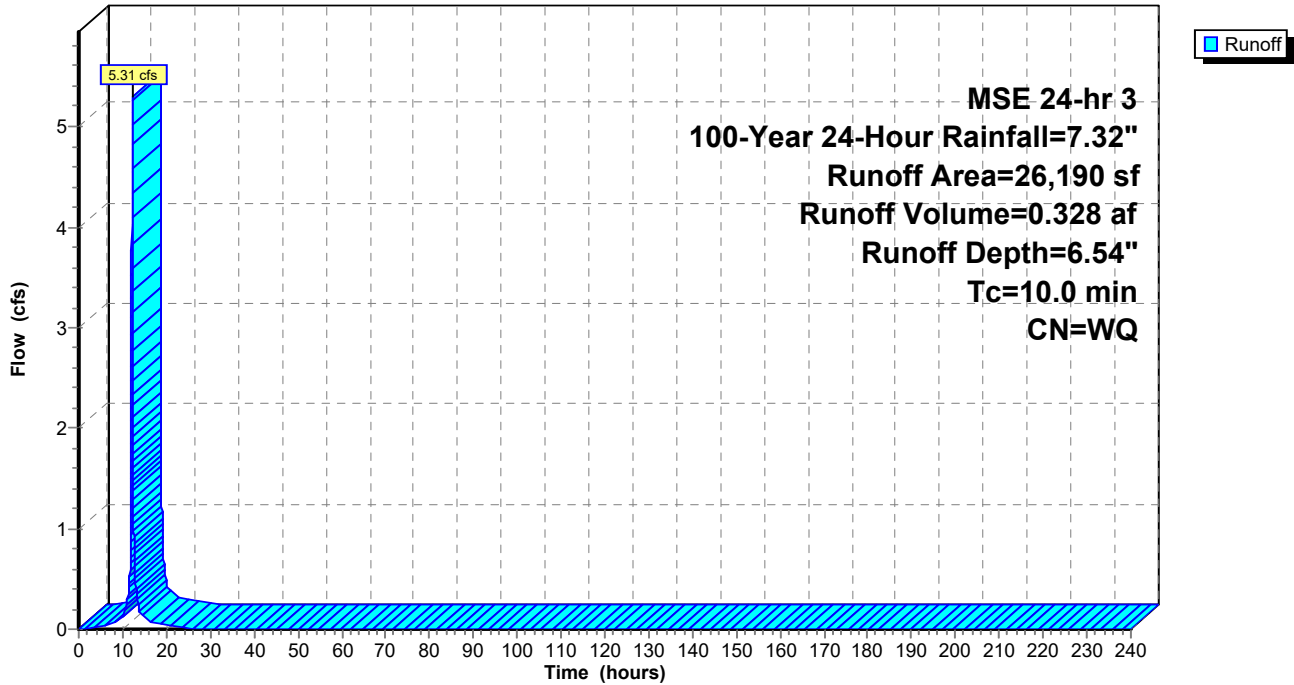
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
21,079	98	Paved parking, HSG C
5,111	74	>75% Grass cover, Good, HSG C
26,190		Weighted Average
5,111		19.52% Pervious Area
21,079		80.48% Impervious Area

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

Subcatchment PR2: PR2 - DRAINS TO 1P

Hydrograph



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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Runoff = 9.42 cfs @ 12.17 hrs, Volume= 0.592 af, Depth= 6.98"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

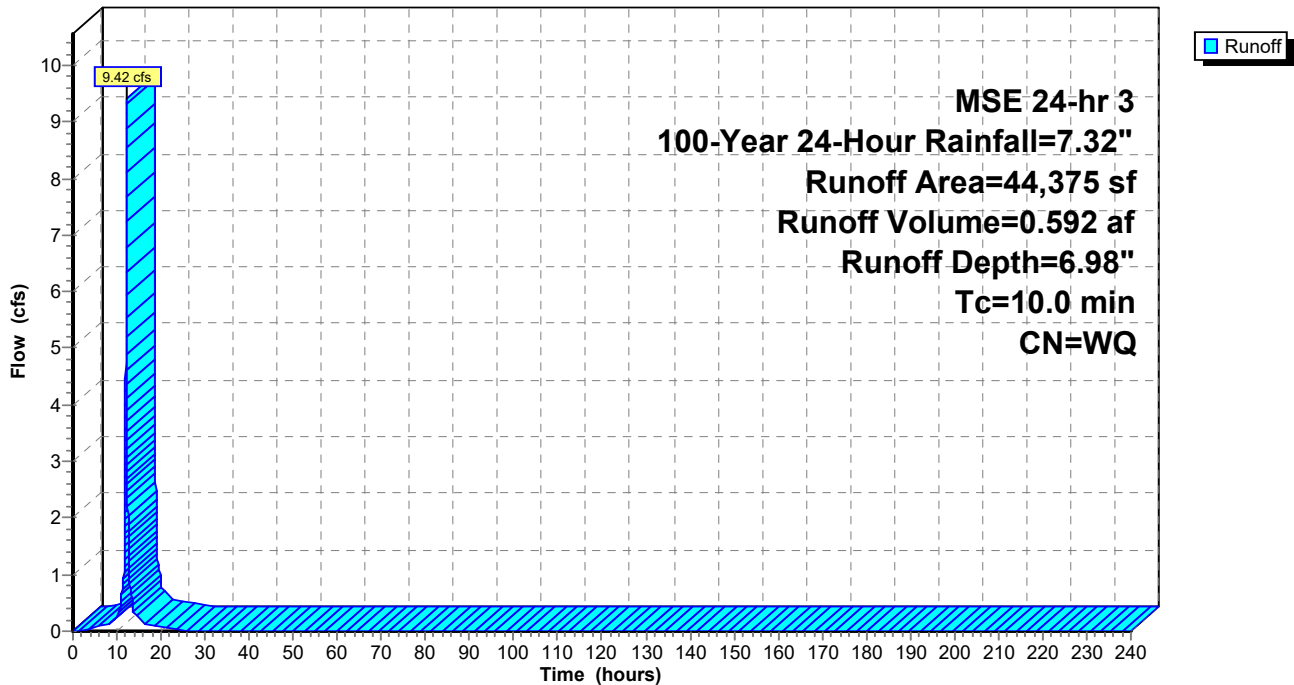
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
42,677	98	Paved parking, HSG C
1,698	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
1,698		3.83% Pervious Area
42,677		96.17% Impervious Area

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

Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Runoff = 10.05 cfs @ 12.17 hrs, Volume= 0.603 af, Depth= 5.94"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

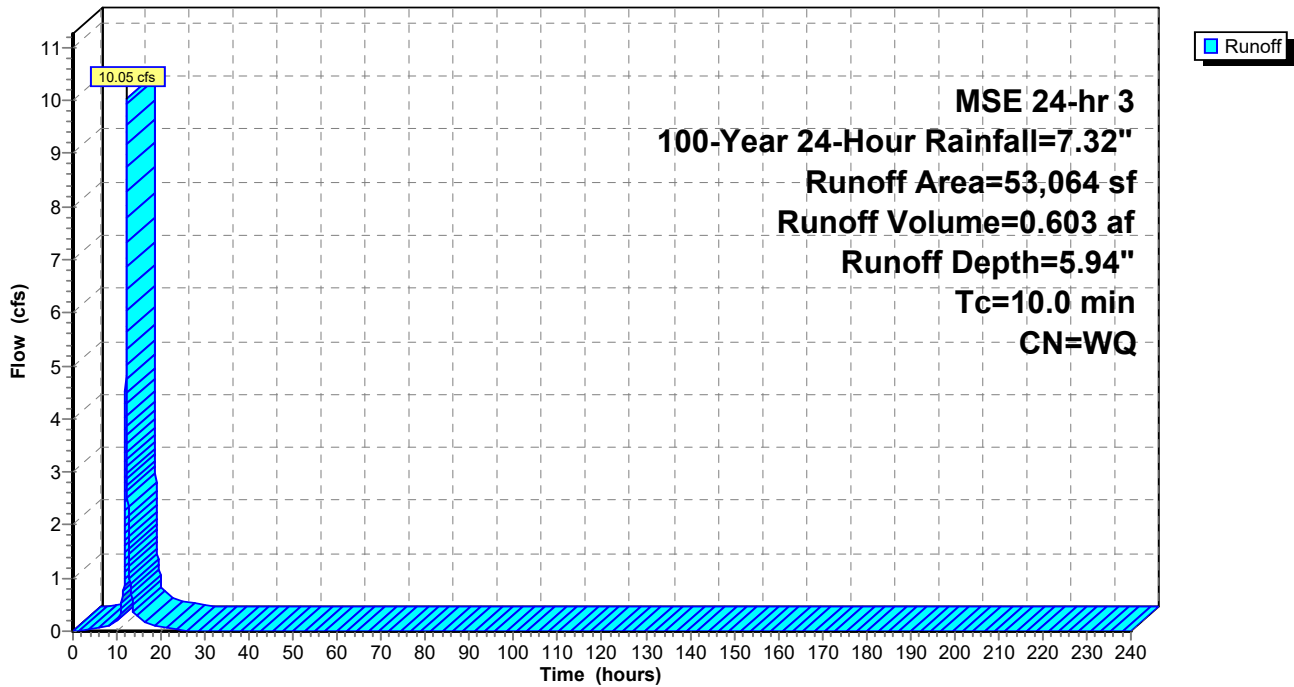
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Hydrograph



Summary for Reach 1R: TOTAL TO COOKS BAY

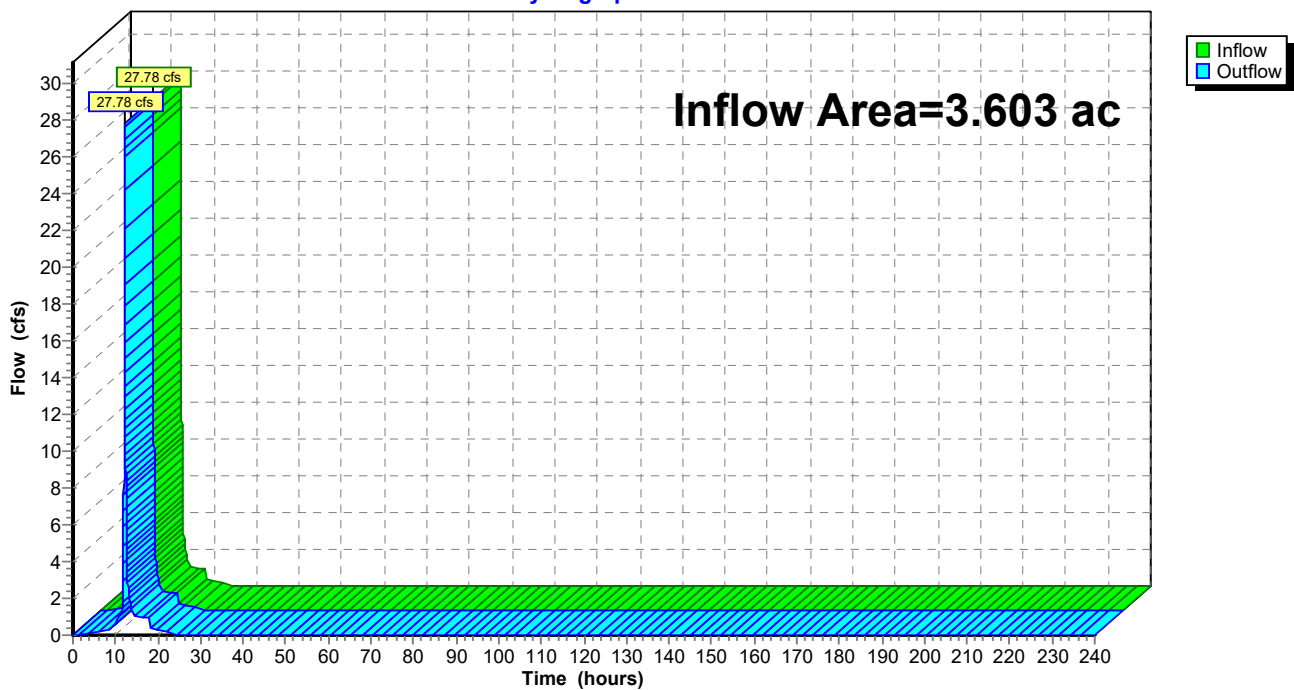
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 60.62% Impervious, Inflow Depth = 5.99" for 100-Year 24-Hour event
Inflow = 27.78 cfs @ 12.19 hrs, Volume= 1.800 af
Outflow = 27.78 cfs @ 12.19 hrs, Volume= 1.800 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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MSE 24-hr 3 100-Year 24-Hour Rainfall=7.32"

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Summary for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Inflow Area = 2.838 ac, 76.72% Impervious, Inflow Depth = 6.44" for 100-Year 24-Hour event
 Inflow = 24.78 cfs @ 12.17 hrs, Volume= 1.523 af
 Outflow = 22.82 cfs @ 12.21 hrs, Volume= 1.523 af, Atten= 8%, Lag= 2.1 min
 Primary = 22.82 cfs @ 12.21 hrs, Volume= 1.523 af
 Routed to Reach 1R : TOTAL TO COOKS BAY

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Peak Elev= 937.05' @ 12.21 hrs Surf.Area= 1,853 sf Storage= 8,485 cf

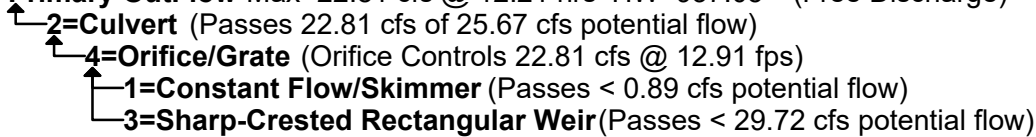
Plug-Flow detention time= 25.9 min calculated for 1.523 af (100% of inflow)
 Center-of-Mass det. time= 25.9 min (779.2 - 753.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	930.50'	3,015 cf	17.00'W x 109.00'L x 7.33'H Field A 13,589 cf Overall - 6,051 cf Embedded = 7,538 cf x 40.0% Voids
#2A	930.50'	6,051 cf	CMP Round 72 x 10 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L Row Length Adjustment= +7.00' x 28.27 sf x 2 rows
		9,066 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 4	930.50'	0.890 cfs Constant Flow/Skimmer
#2	Primary	929.86'	21.0" Round Culvert L= 56.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 929.86' / 929.50' S= 0.0064 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.41 sf
#3	Device 4	934.70'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	929.86'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=22.81 cfs @ 12.21 hrs HW=937.05' (Free Discharge)



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Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)

Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf

Overall Size= 72.0"W x 72.0"H x 20.00'L

Row Length Adjustment= +7.00' x 28.27 sf x 2 rows

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

5 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 107.00' Row Length +12.0" End Stone x 2 = 109.00' Base Length

2 Rows x 72.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 17.00' Base Width

72.0" Chamber Height + 16.0" Stone Cover = 7.33' Field Height

10 Chambers x 565.5 cf +7.00' Row Adjustment x 28.27 sf x 2 Rows = 6,050.7 cf Chamber Storage

13,588.7 cf Field - 6,050.7 cf Chambers = 7,538.0 cf Stone x 40.0% Voids = 3,015.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,065.9 cf = 0.208 af

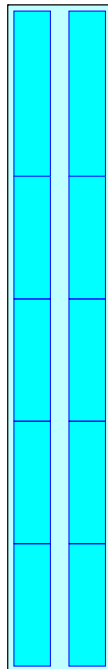
Overall Storage Efficiency = 66.7%

Overall System Size = 109.00' x 17.00' x 7.33'

10 Chambers

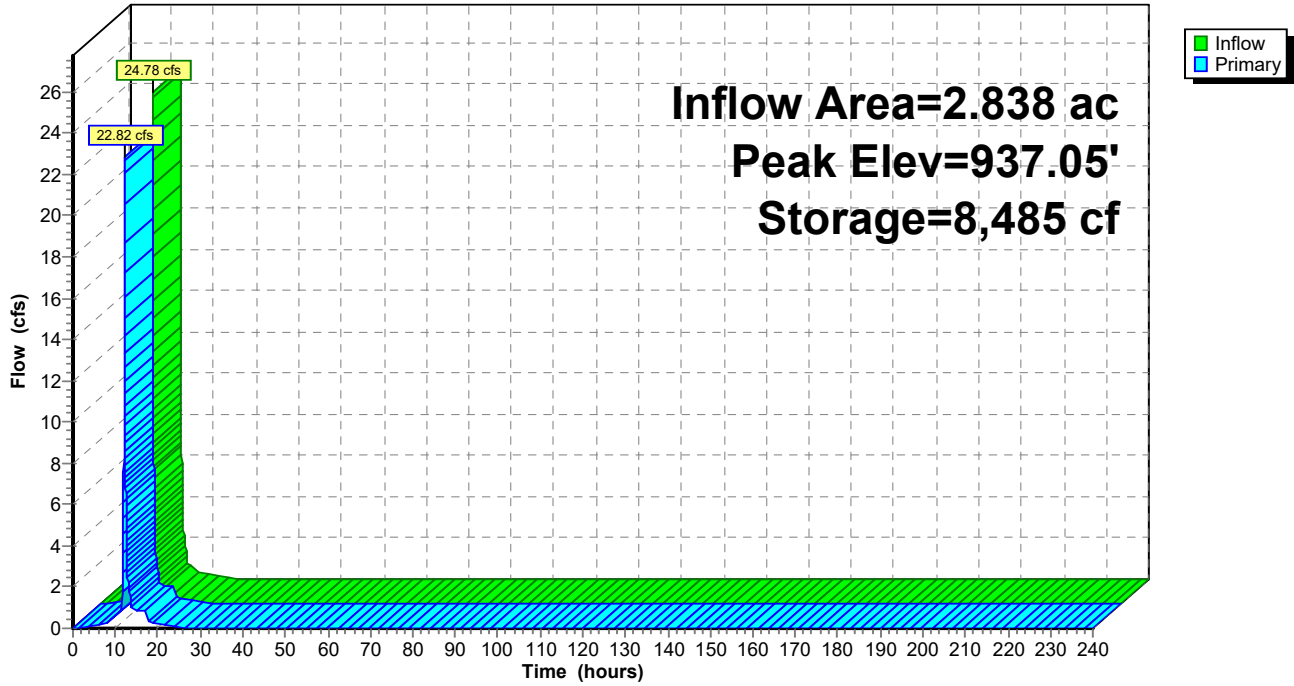
503.3 cy Field

279.2 cy Stone



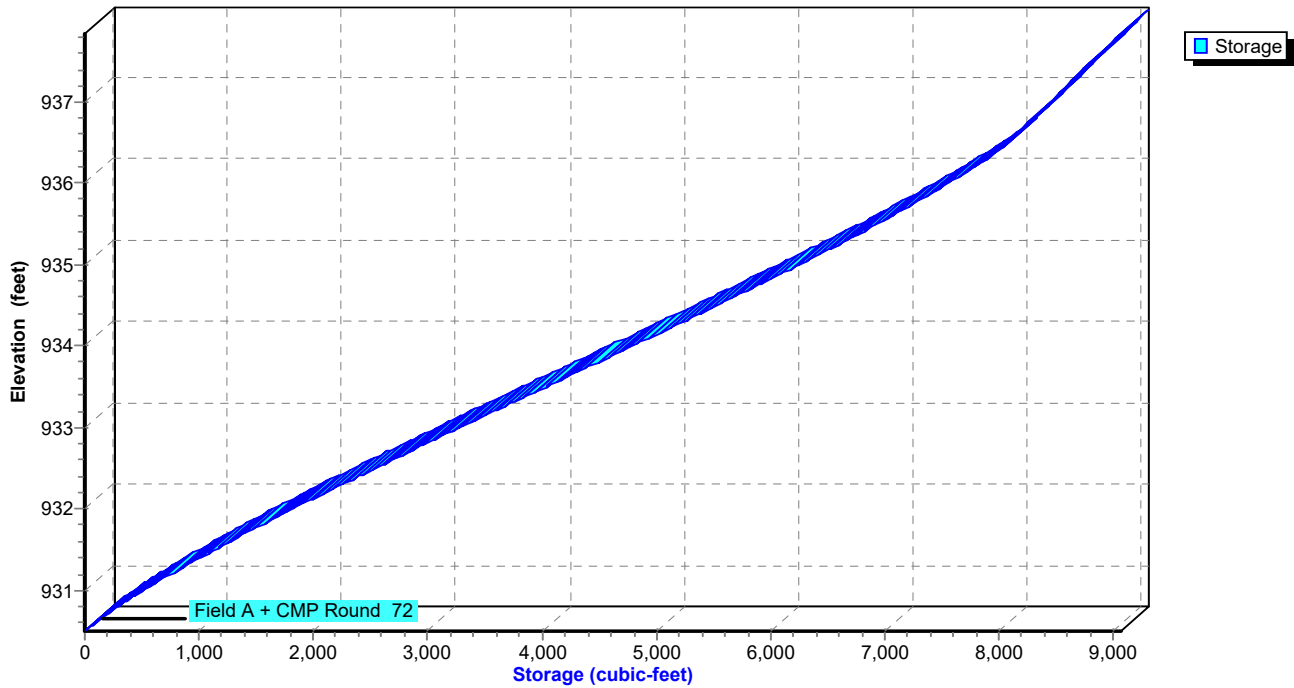
Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Hydrograph



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Stage-Area-Storage



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Stage-Discharge for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
930.50	0.00	933.10	0.89	935.70	10.05
930.55	0.89	933.15	0.89	935.75	10.71
930.60	0.89	933.20	0.89	935.80	11.38
930.65	0.89	933.25	0.89	935.85	12.06
930.70	0.89	933.30	0.89	935.90	12.75
930.75	0.89	933.35	0.89	935.95	13.46
930.80	0.89	933.40	0.89	936.00	14.17
930.85	0.89	933.45	0.89	936.05	14.89
930.90	0.89	933.50	0.89	936.10	15.62
930.95	0.89	933.55	0.89	936.15	16.36
931.00	0.89	933.60	0.89	936.20	17.11
931.05	0.89	933.65	0.89	936.25	17.86
931.10	0.89	933.70	0.89	936.30	18.63
931.15	0.89	933.75	0.89	936.35	19.39
931.20	0.89	933.80	0.89	936.40	20.17
931.25	0.89	933.85	0.89	936.45	20.95
931.30	0.89	933.90	0.89	936.50	21.74
931.35	0.89	933.95	0.89	936.55	22.01
931.40	0.89	934.00	0.89	936.60	22.09
931.45	0.89	934.05	0.89	936.65	22.17
931.50	0.89	934.10	0.89	936.70	22.25
931.55	0.89	934.15	0.89	936.75	22.33
931.60	0.89	934.20	0.89	936.80	22.42
931.65	0.89	934.25	0.89	936.85	22.50
931.70	0.89	934.30	0.89	936.90	22.58
931.75	0.89	934.35	0.89	936.95	22.66
931.80	0.89	934.40	0.89	937.00	22.74
931.85	0.89	934.45	0.89	937.05	22.82
931.90	0.89	934.50	0.89	937.10	22.89
931.95	0.89	934.55	0.89	937.15	22.97
932.00	0.89	934.60	0.89	937.20	23.05
932.05	0.89	934.65	0.89	937.25	23.13
932.10	0.89	934.70	0.89	937.30	23.21
932.15	0.89	934.75	1.00	937.35	23.29
932.20	0.89	934.80	1.20	937.40	23.36
932.25	0.89	934.85	1.45	937.45	23.44
932.30	0.89	934.90	1.76	937.50	23.52
932.35	0.89	934.95	2.10	937.55	23.60
932.40	0.89	935.00	2.47	937.60	23.67
932.45	0.89	935.05	2.87	937.65	23.75
932.50	0.89	935.10	3.31	937.70	23.82
932.55	0.89	935.15	3.76	937.75	23.90
932.60	0.89	935.20	4.24	937.80	23.98
932.65	0.89	935.25	4.74		
932.70	0.89	935.30	5.27		
932.75	0.89	935.35	5.81		
932.80	0.89	935.40	6.37		
932.85	0.89	935.45	6.94		
932.90	0.89	935.50	7.54		
932.95	0.89	935.55	8.14		
933.00	0.89	935.60	8.76		
933.05	0.89	935.65	9.40		

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Stage-Area-Storage for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
930.50	0	933.10	3,435	935.70	7,197
930.55	40	933.15	3,510	935.75	7,260
930.60	87	933.20	3,586	935.80	7,322
930.65	135	933.25	3,661	935.85	7,383
930.70	185	933.30	3,737	935.90	7,444
930.75	237	933.35	3,812	935.95	7,504
930.80	290	933.40	3,888	936.00	7,563
930.85	345	933.45	3,963	936.05	7,620
930.90	400	933.50	4,039	936.10	7,677
930.95	457	933.55	4,114	936.15	7,733
931.00	515	933.60	4,190	936.20	7,787
931.05	574	933.65	4,266	936.25	7,841
931.10	634	933.70	4,341	936.30	7,892
931.15	694	933.75	4,416	936.35	7,942
931.20	756	933.80	4,492	936.40	7,990
931.25	818	933.85	4,567	936.45	8,036
931.30	881	933.90	4,643	936.50	8,078
931.35	944	933.95	4,718	936.55	8,115
931.40	1,009	934.00	4,793	936.60	8,152
931.45	1,073	934.05	4,868	936.65	8,189
931.50	1,139	934.10	4,943	936.70	8,226
931.55	1,205	934.15	5,017	936.75	8,263
931.60	1,272	934.20	5,092	936.80	8,300
931.65	1,339	934.25	5,166	936.85	8,337
931.70	1,406	934.30	5,241	936.90	8,374
931.75	1,474	934.35	5,315	936.95	8,411
931.80	1,543	934.40	5,389	937.00	8,448
931.85	1,612	934.45	5,462	937.05	8,485
931.90	1,681	934.50	5,536	937.10	8,522
931.95	1,751	934.55	5,609	937.15	8,559
932.00	1,822	934.60	5,682	937.20	8,596
932.05	1,892	934.65	5,755	937.25	8,634
932.10	1,963	934.70	5,827	937.30	8,671
932.15	2,034	934.75	5,900	937.35	8,708
932.20	2,106	934.80	5,972	937.40	8,745
932.25	2,178	934.85	6,043	937.45	8,782
932.30	2,250	934.90	6,115	937.50	8,819
932.35	2,323	934.95	6,185	937.55	8,856
932.40	2,395	935.00	6,256	937.60	8,893
932.45	2,468	935.05	6,326	937.65	8,930
932.50	2,542	935.10	6,396	937.70	8,967
932.55	2,615	935.15	6,466	937.75	9,004
932.60	2,689	935.20	6,535	937.80	9,041
932.65	2,763	935.25	6,603		
932.70	2,837	935.30	6,671		
932.75	2,911	935.35	6,739		
932.80	2,986	935.40	6,806		
932.85	3,060	935.45	6,873		
932.90	3,135	935.50	6,939		
932.95	3,210	935.55	7,004		
933.00	3,285	935.60	7,069		
933.05	3,360	935.65	7,133		

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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentPR1: PR1 - DRAINS EAST Runoff Area=33,310 sf 0.87% Impervious Runoff Depth=0.36"
Tc=10.0 min CN=WQ Runoff=0.35 cfs 0.023 af

SubcatchmentPR2: PR2 - DRAINS TO 1P Runoff Area=26,190 sf 80.48% Impervious Runoff Depth=1.50"
Tc=10.0 min CN=WQ Runoff=1.25 cfs 0.075 af

SubcatchmentPR3: PR3 - DRAINS TO Runoff Area=44,375 sf 96.17% Impervious Runoff Depth=1.72"
Tc=10.0 min CN=WQ Runoff=2.45 cfs 0.146 af

SubcatchmentPR4: PR4 - DRAINS TO Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=1.18"
Tc=10.0 min CN=WQ Runoff=1.99 cfs 0.120 af

Reach 1R: TOTAL TO COOKS BAY Inflow=1.24 cfs 0.364 af
Outflow=1.24 cfs 0.364 af

Pond 1P: 1P - UNDERGROUNDRATE Peak Elev=934.05' Storage=4,870 cf Inflow=5.69 cfs 0.341 af
Outflow=0.89 cfs 0.341 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.364 af Average Runoff Depth = 1.21"
39.38% Pervious = 1.419 ac 60.62% Impervious = 2.184 ac

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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Summary for Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Runoff = 0.35 cfs @ 12.19 hrs, Volume= 0.023 af, Depth= 0.36"
 Routed to Reach 1R : TOTAL TO COOKS BAY

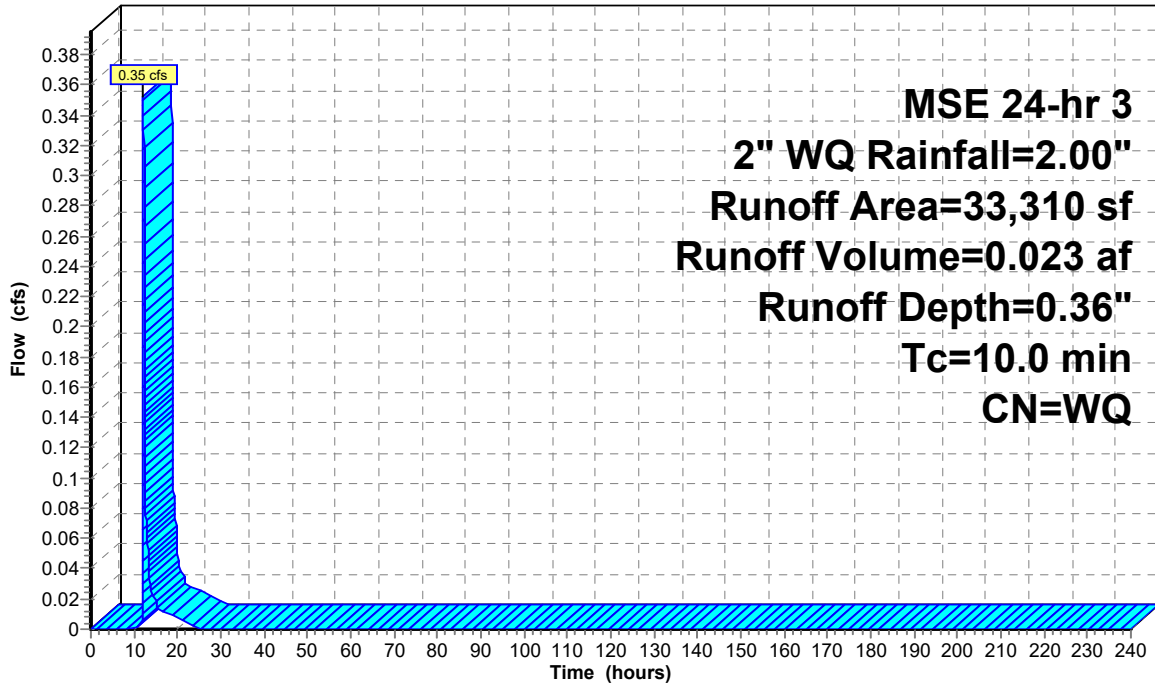
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2" WQ Rainfall=2.00"

Area (sf)	CN	Description
289	98	Paved parking, HSG C
33,021	74	>75% Grass cover, Good, HSG C
33,310		Weighted Average
33,021		99.13% Pervious Area
289		0.87% Impervious Area

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

Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Summary for Subcatchment PR2: PR2 - DRAINS TO 1P

Runoff = 1.25 cfs @ 12.17 hrs, Volume= 0.075 af, Depth= 1.50"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

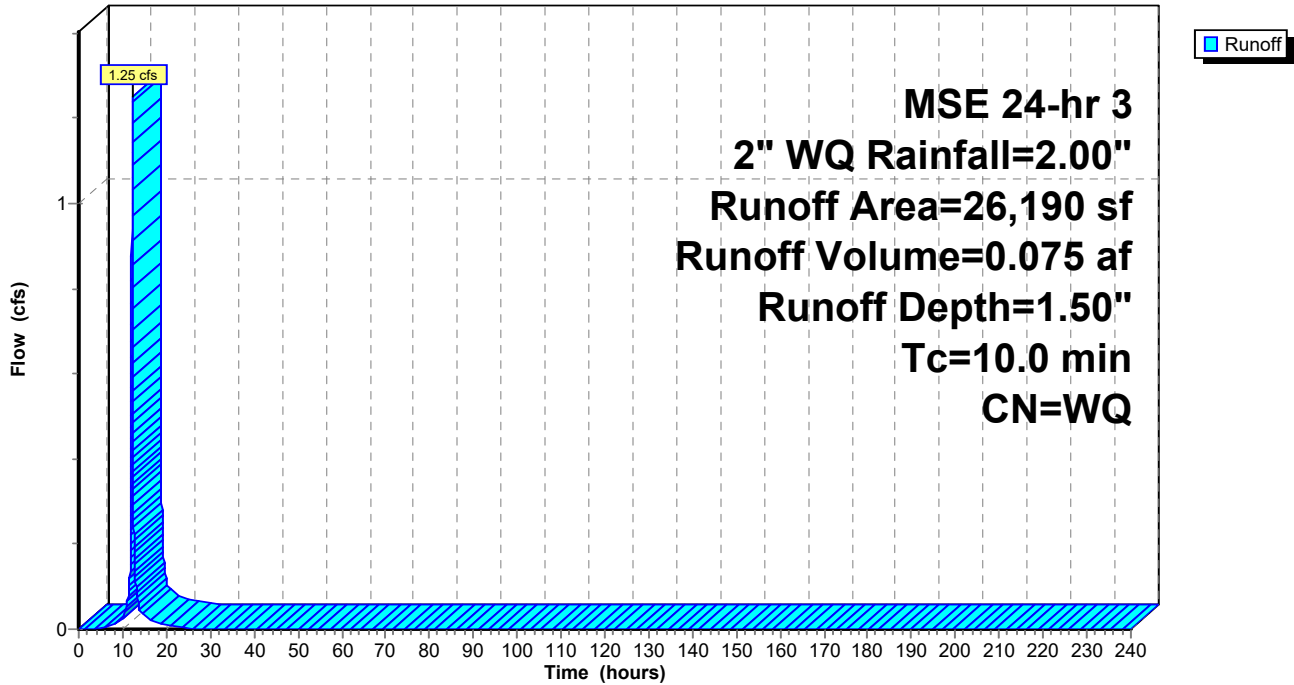
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2" WQ Rainfall=2.00"

Area (sf)	CN	Description
21,079	98	Paved parking, HSG C
5,111	74	>75% Grass cover, Good, HSG C
26,190		Weighted Average
5,111		19.52% Pervious Area
21,079		80.48% Impervious Area

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

Subcatchment PR2: PR2 - DRAINS TO 1P

Hydrograph



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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Summary for Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Runoff = 2.45 cfs @ 12.17 hrs, Volume= 0.146 af, Depth= 1.72"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

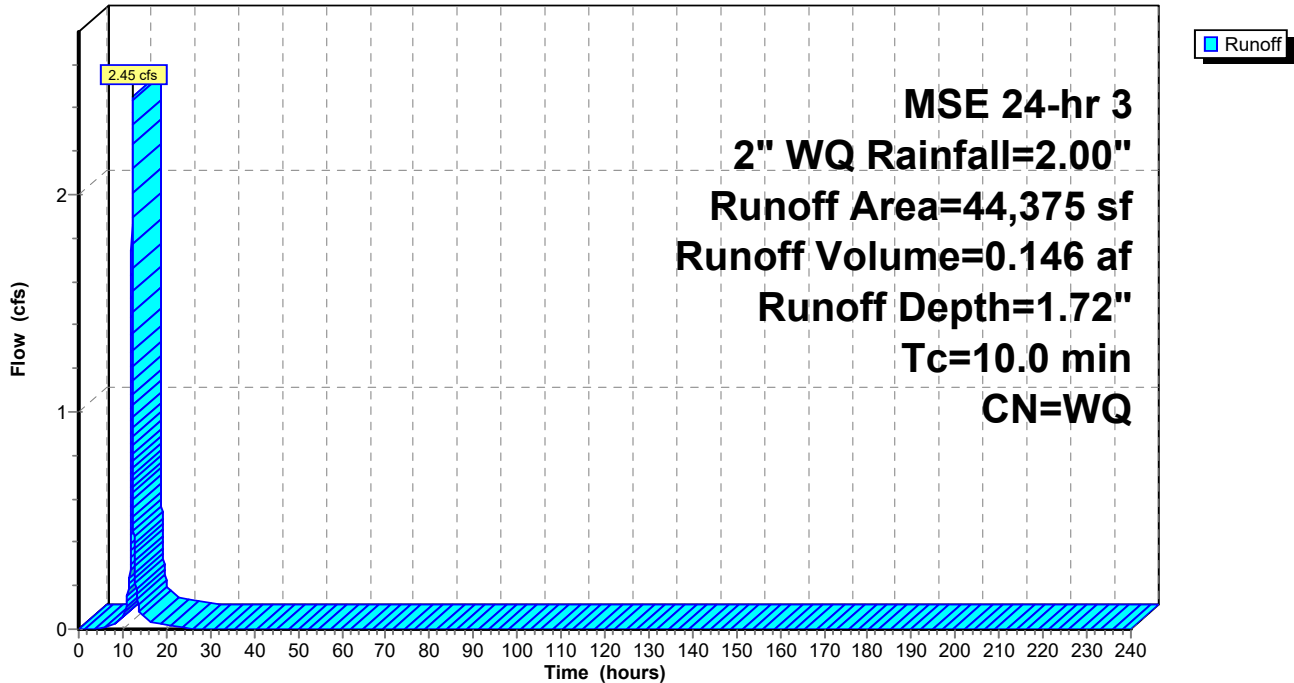
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2" WQ Rainfall=2.00"

Area (sf)	CN	Description
42,677	98	Paved parking, HSG C
1,698	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
1,698		3.83% Pervious Area
42,677		96.17% Impervious Area

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

Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Summary for Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Runoff = 1.99 cfs @ 12.17 hrs, Volume= 0.120 af, Depth= 1.18"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

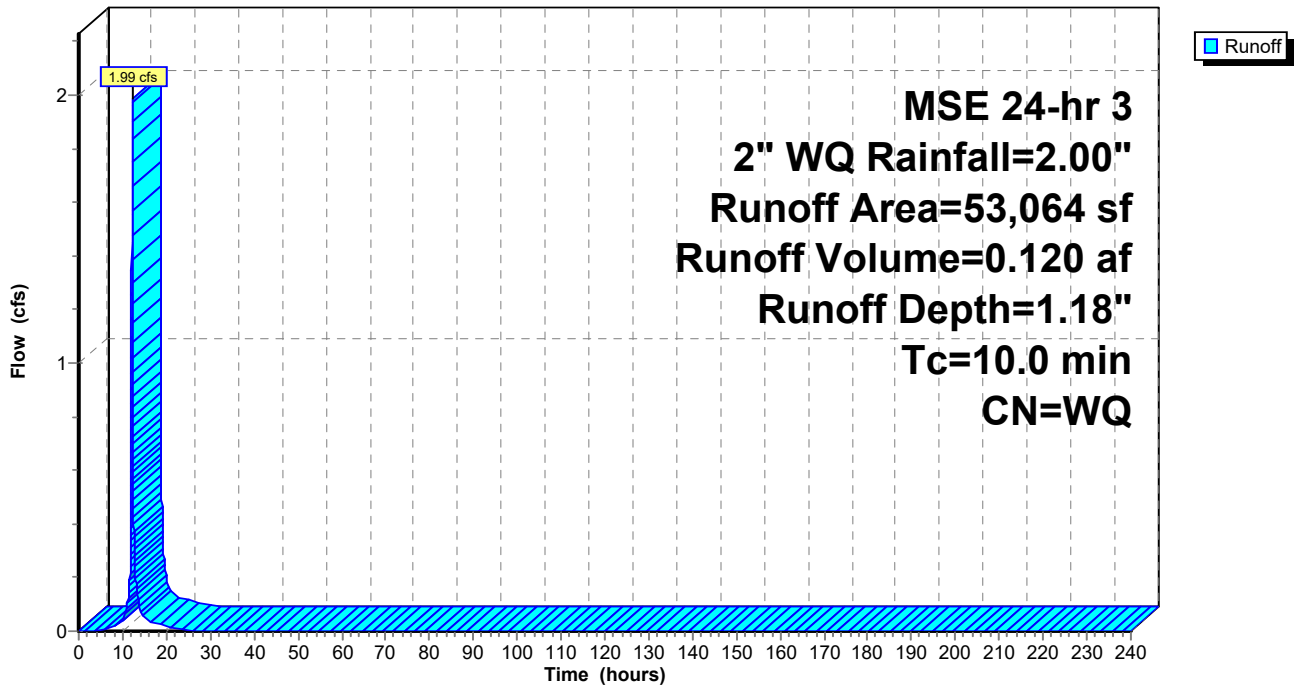
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 2" WQ Rainfall=2.00"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Hydrograph



Summary for Reach 1R: TOTAL TO COOKS BAY

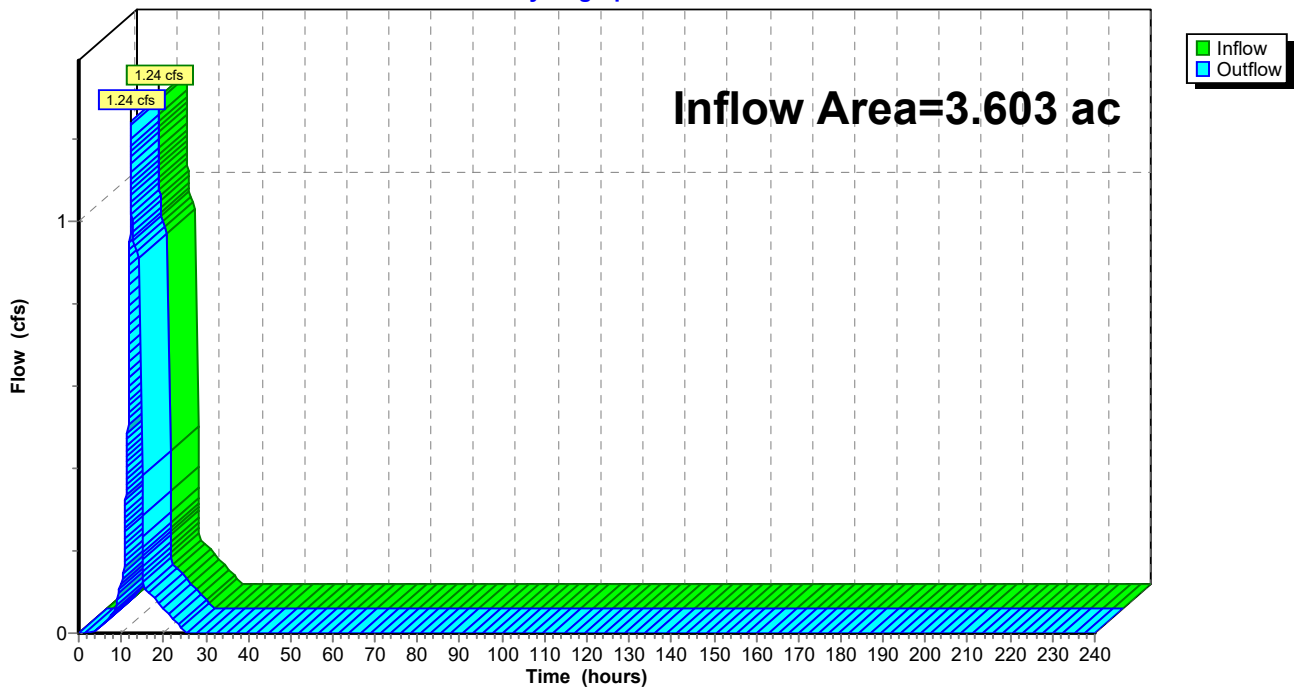
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 60.62% Impervious, Inflow Depth = 1.21" for 2" WQ event
Inflow = 1.24 cfs @ 12.19 hrs, Volume= 0.364 af
Outflow = 1.24 cfs @ 12.19 hrs, Volume= 0.364 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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MSE 24-hr 3 2" WQ Rainfall=2.00"

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Summary for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Inflow Area = 2.838 ac, 76.72% Impervious, Inflow Depth = 1.44" for 2" WQ event
 Inflow = 5.69 cfs @ 12.17 hrs, Volume= 0.341 af
 Outflow = 0.89 cfs @ 11.78 hrs, Volume= 0.341 af, Atten= 84%, Lag= 0.0 min
 Primary = 0.89 cfs @ 11.78 hrs, Volume= 0.341 af
 Routed to Reach 1R : TOTAL TO COOKS BAY

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Peak Elev= 934.05' @ 12.60 hrs Surf.Area= 1,853 sf Storage= 4,870 cf

Plug-Flow detention time= 35.1 min calculated for 0.341 af (100% of inflow)
 Center-of-Mass det. time= 35.1 min (804.6 - 769.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	930.50'	3,015 cf	17.00'W x 109.00'L x 7.33'H Field A 13,589 cf Overall - 6,051 cf Embedded = 7,538 cf x 40.0% Voids
#2A	930.50'	6,051 cf	CMP Round 72 x 10 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L Row Length Adjustment= +7.00' x 28.27 sf x 2 rows
		9,066 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 4	930.50'	0.890 cfs Constant Flow/Skimmer
#2	Primary	929.86'	21.0" Round Culvert L= 56.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 929.86' / 929.50' S= 0.0064 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.41 sf
#3	Device 4	934.70'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	929.86'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 11.78 hrs HW=930.56' (Free Discharge)

- ↑ **2=Culvert** (Passes 0.89 cfs of 2.10 cfs potential flow)
- ↑ **4=Orifice/Grate** (Passes 0.89 cfs of 7.12 cfs potential flow)
- ↑ **1=Constant Flow/Skimmer** (Constant Controls 0.89 cfs)
- ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)

Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf

Overall Size= 72.0"W x 72.0"H x 20.00'L

Row Length Adjustment= +7.00' x 28.27 sf x 2 rows

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

5 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 107.00' Row Length +12.0" End Stone x 2 = 109.00' Base Length

2 Rows x 72.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 17.00' Base Width

72.0" Chamber Height + 16.0" Stone Cover = 7.33' Field Height

10 Chambers x 565.5 cf +7.00' Row Adjustment x 28.27 sf x 2 Rows = 6,050.7 cf Chamber Storage

13,588.7 cf Field - 6,050.7 cf Chambers = 7,538.0 cf Stone x 40.0% Voids = 3,015.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,065.9 cf = 0.208 af

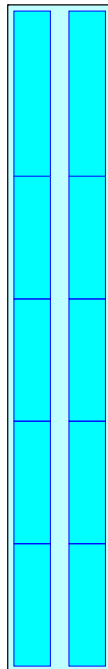
Overall Storage Efficiency = 66.7%

Overall System Size = 109.00' x 17.00' x 7.33'

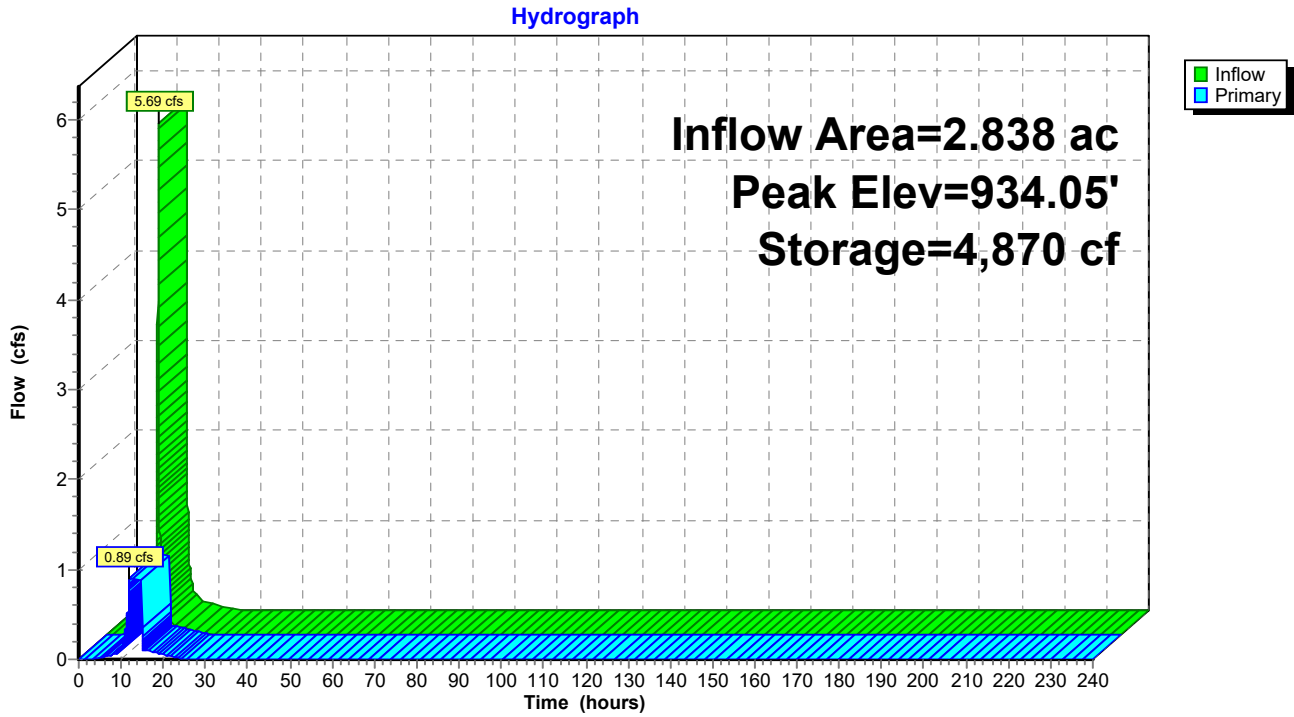
10 Chambers

503.3 cy Field

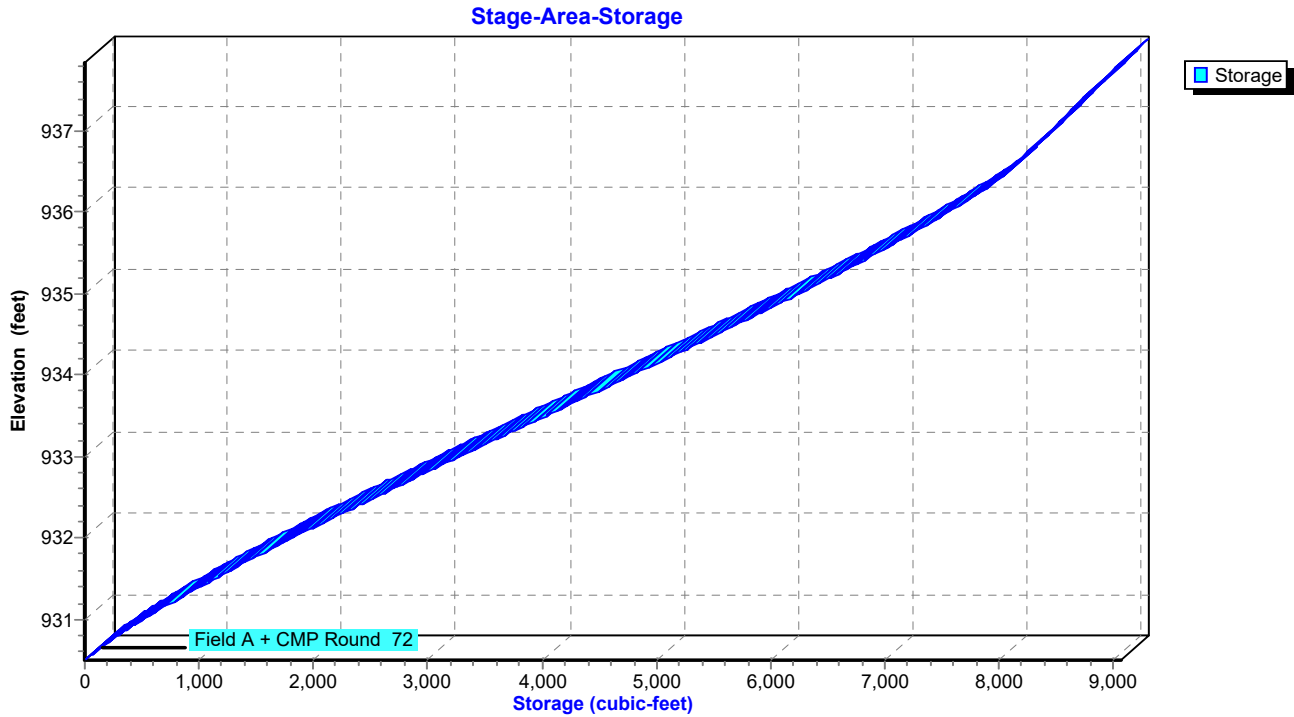
279.2 cy Stone



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN



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Stage-Discharge for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
930.50	0.00	933.10	0.89	935.70	10.05
930.55	0.89	933.15	0.89	935.75	10.71
930.60	0.89	933.20	0.89	935.80	11.38
930.65	0.89	933.25	0.89	935.85	12.06
930.70	0.89	933.30	0.89	935.90	12.75
930.75	0.89	933.35	0.89	935.95	13.46
930.80	0.89	933.40	0.89	936.00	14.17
930.85	0.89	933.45	0.89	936.05	14.89
930.90	0.89	933.50	0.89	936.10	15.62
930.95	0.89	933.55	0.89	936.15	16.36
931.00	0.89	933.60	0.89	936.20	17.11
931.05	0.89	933.65	0.89	936.25	17.86
931.10	0.89	933.70	0.89	936.30	18.63
931.15	0.89	933.75	0.89	936.35	19.39
931.20	0.89	933.80	0.89	936.40	20.17
931.25	0.89	933.85	0.89	936.45	20.95
931.30	0.89	933.90	0.89	936.50	21.74
931.35	0.89	933.95	0.89	936.55	22.01
931.40	0.89	934.00	0.89	936.60	22.09
931.45	0.89	934.05	0.89	936.65	22.17
931.50	0.89	934.10	0.89	936.70	22.25
931.55	0.89	934.15	0.89	936.75	22.33
931.60	0.89	934.20	0.89	936.80	22.42
931.65	0.89	934.25	0.89	936.85	22.50
931.70	0.89	934.30	0.89	936.90	22.58
931.75	0.89	934.35	0.89	936.95	22.66
931.80	0.89	934.40	0.89	937.00	22.74
931.85	0.89	934.45	0.89	937.05	22.82
931.90	0.89	934.50	0.89	937.10	22.89
931.95	0.89	934.55	0.89	937.15	22.97
932.00	0.89	934.60	0.89	937.20	23.05
932.05	0.89	934.65	0.89	937.25	23.13
932.10	0.89	934.70	0.89	937.30	23.21
932.15	0.89	934.75	1.00	937.35	23.29
932.20	0.89	934.80	1.20	937.40	23.36
932.25	0.89	934.85	1.45	937.45	23.44
932.30	0.89	934.90	1.76	937.50	23.52
932.35	0.89	934.95	2.10	937.55	23.60
932.40	0.89	935.00	2.47	937.60	23.67
932.45	0.89	935.05	2.87	937.65	23.75
932.50	0.89	935.10	3.31	937.70	23.82
932.55	0.89	935.15	3.76	937.75	23.90
932.60	0.89	935.20	4.24	937.80	23.98
932.65	0.89	935.25	4.74		
932.70	0.89	935.30	5.27		
932.75	0.89	935.35	5.81		
932.80	0.89	935.40	6.37		
932.85	0.89	935.45	6.94		
932.90	0.89	935.50	7.54		
932.95	0.89	935.55	8.14		
933.00	0.89	935.60	8.76		
933.05	0.89	935.65	9.40		

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Stage-Area-Storage for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
930.50	0	933.10	3,435	935.70	7,197
930.55	40	933.15	3,510	935.75	7,260
930.60	87	933.20	3,586	935.80	7,322
930.65	135	933.25	3,661	935.85	7,383
930.70	185	933.30	3,737	935.90	7,444
930.75	237	933.35	3,812	935.95	7,504
930.80	290	933.40	3,888	936.00	7,563
930.85	345	933.45	3,963	936.05	7,620
930.90	400	933.50	4,039	936.10	7,677
930.95	457	933.55	4,114	936.15	7,733
931.00	515	933.60	4,190	936.20	7,787
931.05	574	933.65	4,266	936.25	7,841
931.10	634	933.70	4,341	936.30	7,892
931.15	694	933.75	4,416	936.35	7,942
931.20	756	933.80	4,492	936.40	7,990
931.25	818	933.85	4,567	936.45	8,036
931.30	881	933.90	4,643	936.50	8,078
931.35	944	933.95	4,718	936.55	8,115
931.40	1,009	934.00	4,793	936.60	8,152
931.45	1,073	934.05	4,868	936.65	8,189
931.50	1,139	934.10	4,943	936.70	8,226
931.55	1,205	934.15	5,017	936.75	8,263
931.60	1,272	934.20	5,092	936.80	8,300
931.65	1,339	934.25	5,166	936.85	8,337
931.70	1,406	934.30	5,241	936.90	8,374
931.75	1,474	934.35	5,315	936.95	8,411
931.80	1,543	934.40	5,389	937.00	8,448
931.85	1,612	934.45	5,462	937.05	8,485
931.90	1,681	934.50	5,536	937.10	8,522
931.95	1,751	934.55	5,609	937.15	8,559
932.00	1,822	934.60	5,682	937.20	8,596
932.05	1,892	934.65	5,755	937.25	8,634
932.10	1,963	934.70	5,827	937.30	8,671
932.15	2,034	934.75	5,900	937.35	8,708
932.20	2,106	934.80	5,972	937.40	8,745
932.25	2,178	934.85	6,043	937.45	8,782
932.30	2,250	934.90	6,115	937.50	8,819
932.35	2,323	934.95	6,185	937.55	8,856
932.40	2,395	935.00	6,256	937.60	8,893
932.45	2,468	935.05	6,326	937.65	8,930
932.50	2,542	935.10	6,396	937.70	8,967
932.55	2,615	935.15	6,466	937.75	9,004
932.60	2,689	935.20	6,535	937.80	9,041
932.65	2,763	935.25	6,603		
932.70	2,837	935.30	6,671		
932.75	2,911	935.35	6,739		
932.80	2,986	935.40	6,806		
932.85	3,060	935.45	6,873		
932.90	3,135	935.50	6,939		
932.95	3,210	935.55	7,004		
933.00	3,285	935.60	7,069		
933.05	3,360	935.65	7,133		

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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Time span=0.00-240.00 hrs, dt=0.01 hrs, 24001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

SubcatchmentPR1: PR1 - DRAINS EAST Runoff Area=33,310 sf 0.87% Impervious Runoff Depth=0.03"
Tc=10.0 min CN=WQ Runoff=0.01 cfs 0.002 af

SubcatchmentPR2: PR2 - DRAINS TO 1P Runoff Area=26,190 sf 80.48% Impervious Runoff Depth=0.64"
Tc=10.0 min CN=WQ Runoff=0.56 cfs 0.032 af

SubcatchmentPR3: PR3 - DRAINS TO Runoff Area=44,375 sf 96.17% Impervious Runoff Depth=0.76"
Tc=10.0 min CN=WQ Runoff=1.14 cfs 0.065 af

SubcatchmentPR4: PR4 - DRAINS TO Runoff Area=53,064 sf 58.58% Impervious Runoff Depth=0.47"
Tc=10.0 min CN=WQ Runoff=0.83 cfs 0.048 af

Reach 1R: TOTAL TO COOKS BAY Inflow=0.90 cfs 0.147 af
Outflow=0.90 cfs 0.147 af

Pond 1P: 1P - UNDERGROUNDRATE Peak Elev=931.52' Storage=1,161 cf Inflow=2.53 cfs 0.145 af
Outflow=0.89 cfs 0.145 af

Total Runoff Area = 3.603 ac Runoff Volume = 0.147 af Average Runoff Depth = 0.49"
39.38% Pervious = 1.419 ac 60.62% Impervious = 2.184 ac

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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Summary for Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Runoff = 0.01 cfs @ 12.17 hrs, Volume= 0.002 af, Depth= 0.03"
 Routed to Reach 1R : TOTAL TO COOKS BAY

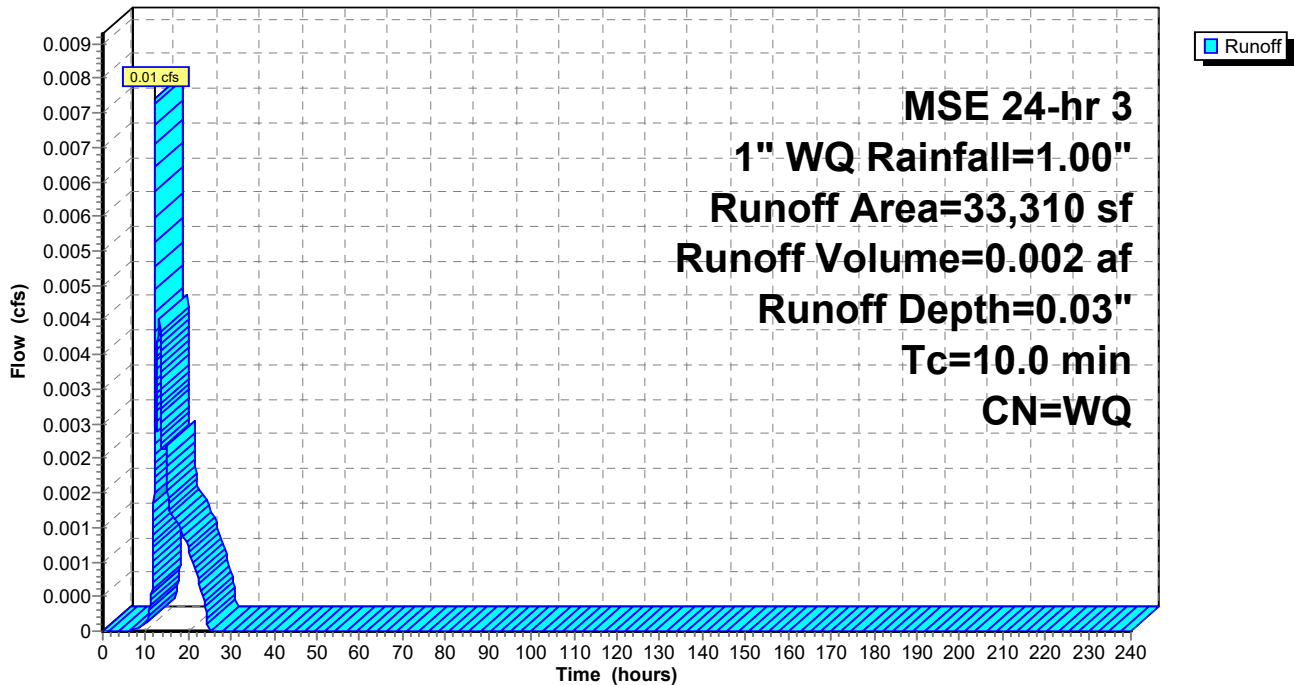
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 1" WQ Rainfall=1.00"

Area (sf)	CN	Description
289	98	Paved parking, HSG C
33,021	74	>75% Grass cover, Good, HSG C
33,310		Weighted Average
33,021		99.13% Pervious Area
289		0.87% Impervious Area

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

Subcatchment PR1: PR1 - DRAINS EAST TO COOKS BAY

Hydrograph



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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Summary for Subcatchment PR2: PR2 - DRAINS TO 1P

Runoff = 0.56 cfs @ 12.17 hrs, Volume= 0.032 af, Depth= 0.64"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

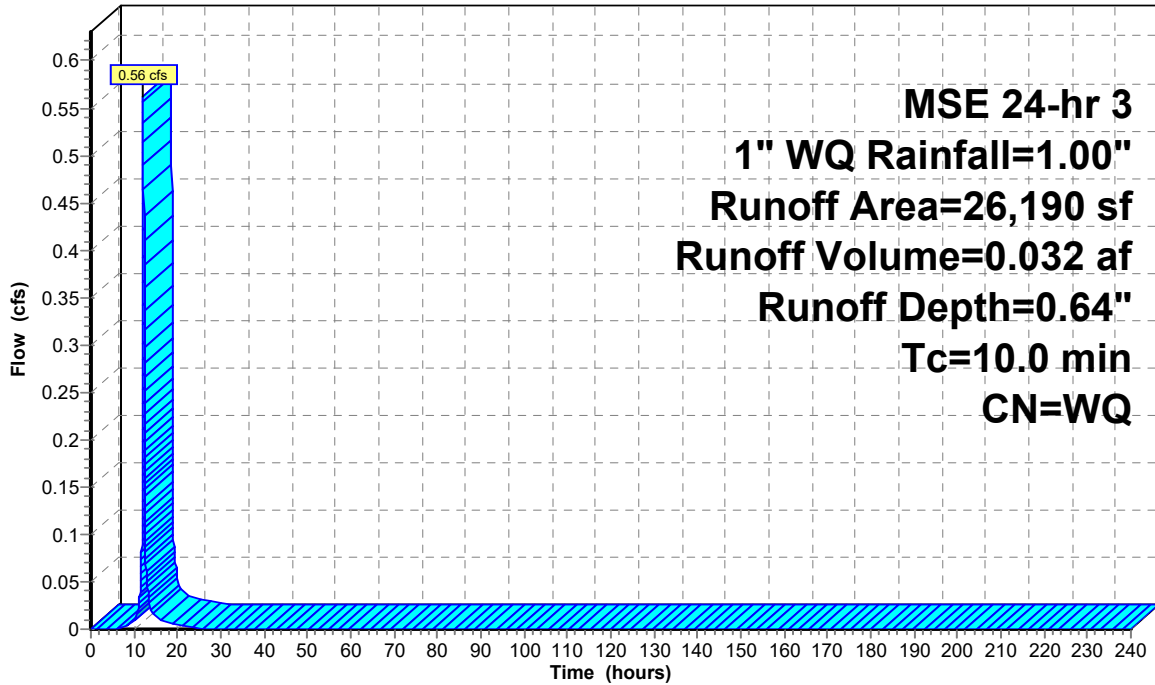
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 1" WQ Rainfall=1.00"

Area (sf)	CN	Description
21,079	98	Paved parking, HSG C
5,111	74	>75% Grass cover, Good, HSG C
26,190		Weighted Average
5,111		19.52% Pervious Area
21,079		80.48% Impervious Area

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

Subcatchment PR2: PR2 - DRAINS TO 1P

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Summary for Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Runoff = 1.14 cfs @ 12.17 hrs, Volume= 0.065 af, Depth= 0.76"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

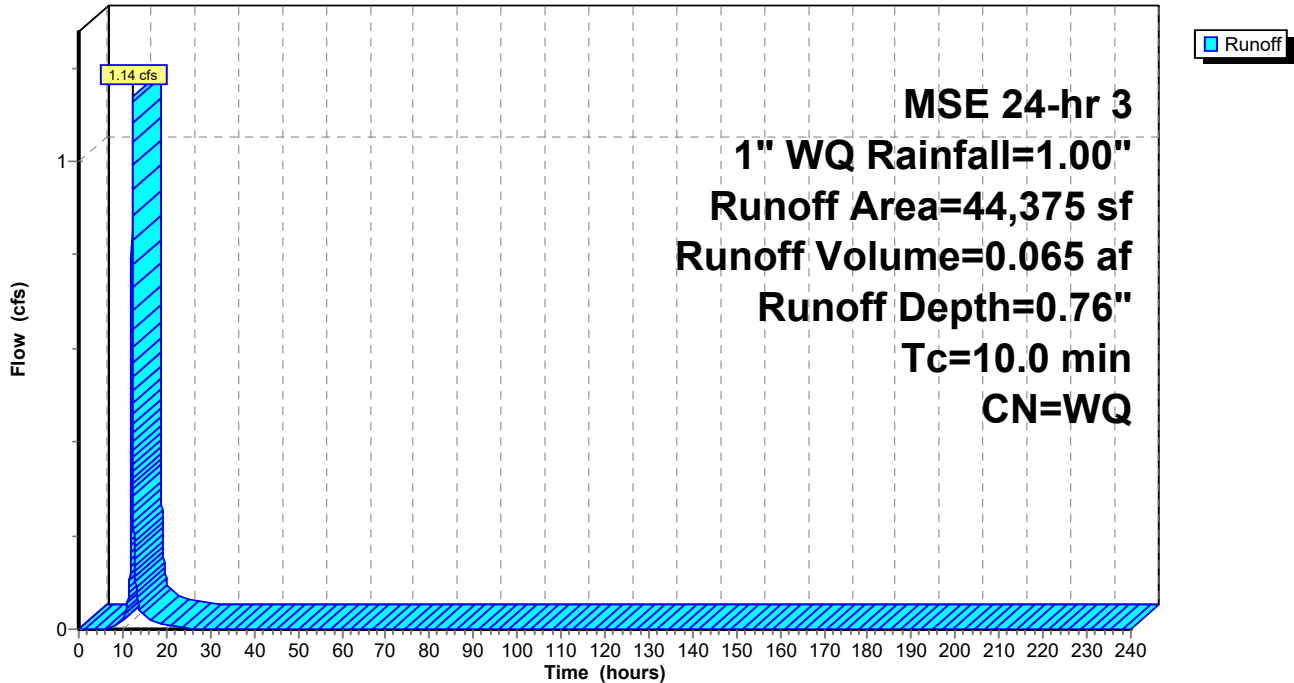
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 1" WQ Rainfall=1.00"

Area (sf)	CN	Description
42,677	98	Paved parking, HSG C
1,698	74	>75% Grass cover, Good, HSG C
44,375		Weighted Average
1,698		3.83% Pervious Area
42,677		96.17% Impervious Area

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

Subcatchment PR3: PR3 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Summary for Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Runoff = 0.83 cfs @ 12.17 hrs, Volume= 0.048 af, Depth= 0.47"

Routed to Pond 1P : 1P - UNDERGROUND RATE CONTROL BASIN

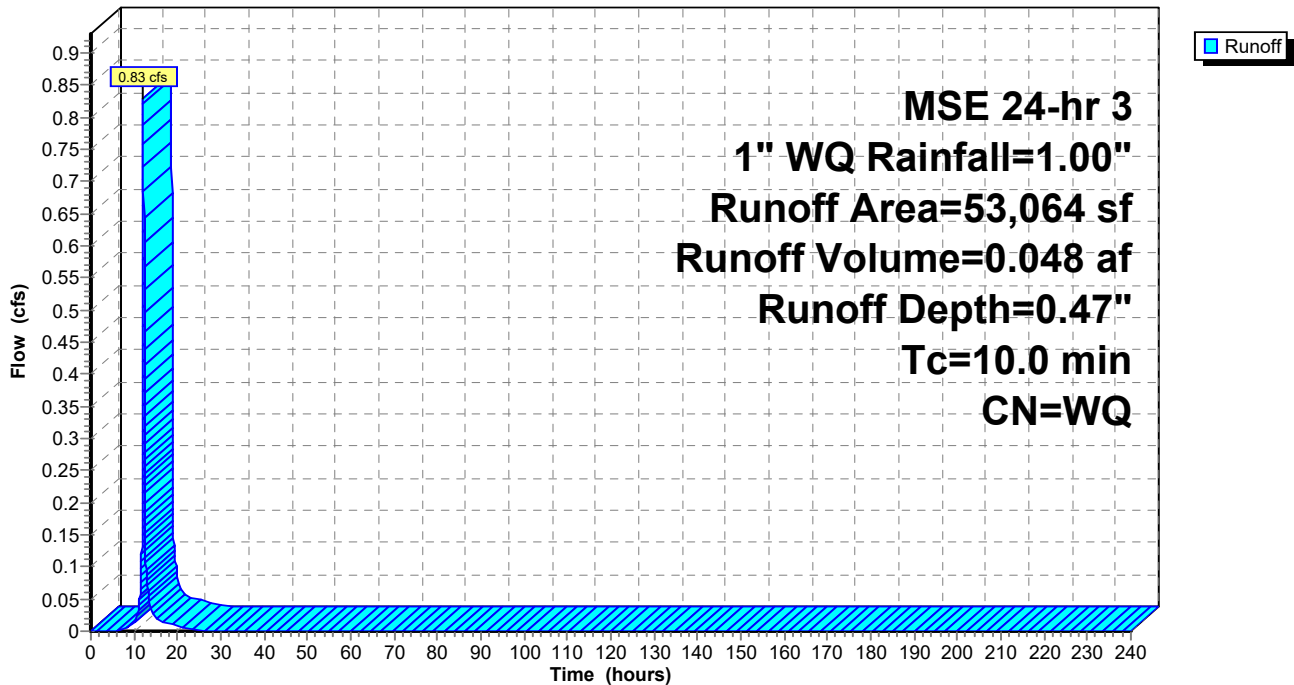
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 1" WQ Rainfall=1.00"

Area (sf)	CN	Description
31,086	98	Paved parking, HSG C
21,978	74	>75% Grass cover, Good, HSG C
53,064		Weighted Average
21,978		41.42% Pervious Area
31,086		58.58% Impervious Area

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

Subcatchment PR4: PR4 - DRAINS TO COMMERCE BLVD

Hydrograph



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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Summary for Reach 1R: TOTAL TO COOKS BAY

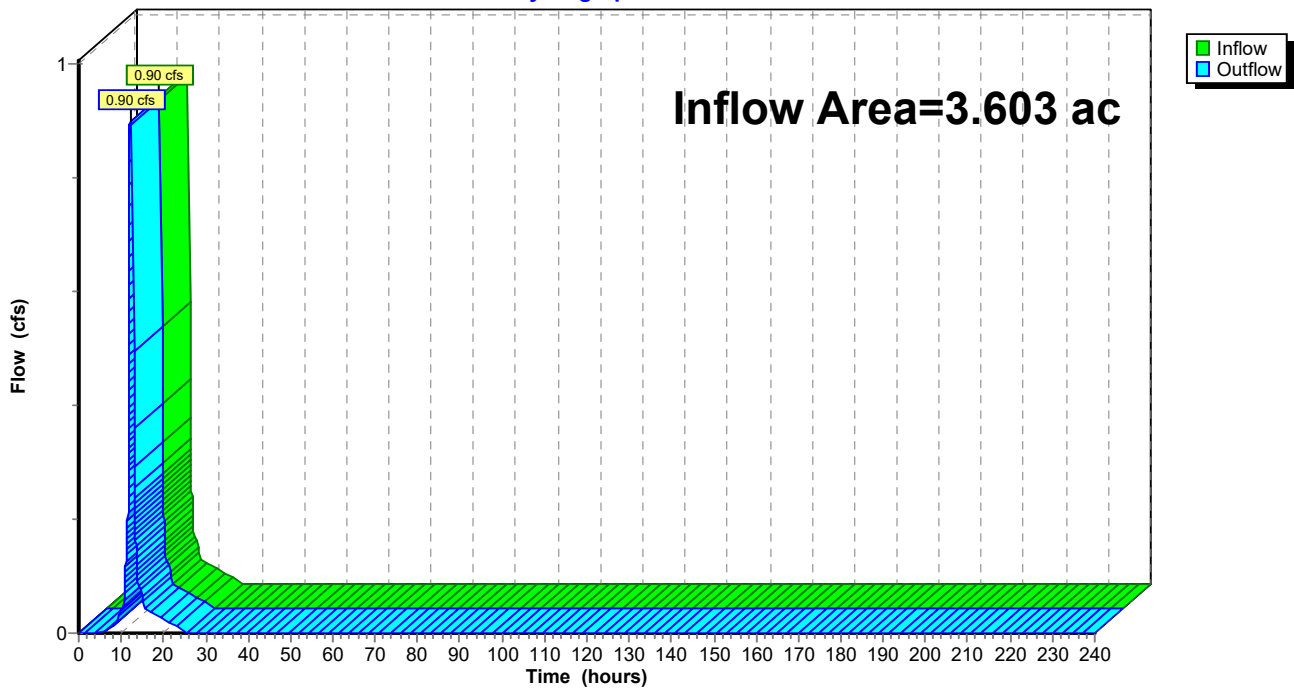
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.603 ac, 60.62% Impervious, Inflow Depth = 0.49" for 1" WQ event
Inflow = 0.90 cfs @ 12.17 hrs, Volume= 0.147 af
Outflow = 0.90 cfs @ 12.17 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Reach 1R: TOTAL TO COOKS BAY

Hydrograph



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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Summary for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Inflow Area = 2.838 ac, 76.72% Impervious, Inflow Depth = 0.61" for 1" WQ event
 Inflow = 2.53 cfs @ 12.17 hrs, Volume= 0.145 af
 Outflow = 0.89 cfs @ 12.00 hrs, Volume= 0.145 af, Atten= 65%, Lag= 0.0 min
 Primary = 0.89 cfs @ 12.00 hrs, Volume= 0.145 af
 Routed to Reach 1R : TOTAL TO COOKS BAY

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
 Peak Elev= 931.52' @ 12.38 hrs Surf.Area= 1,853 sf Storage= 1,161 cf

Plug-Flow detention time= 7.0 min calculated for 0.145 af (100% of inflow)
 Center-of-Mass det. time= 7.0 min (788.0 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	930.50'	3,015 cf	17.00'W x 109.00'L x 7.33'H Field A 13,589 cf Overall - 6,051 cf Embedded = 7,538 cf x 40.0% Voids
#2A	930.50'	6,051 cf	CMP Round 72 x 10 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L Row Length Adjustment= +7.00' x 28.27 sf x 2 rows
		9,066 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 4	930.50'	0.890 cfs Constant Flow/Skimmer
#2	Primary	929.86'	21.0" Round Culvert L= 56.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 929.86' / 929.50' S= 0.0064 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 2.41 sf
#3	Device 4	934.70'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 2	929.86'	18.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 12.00 hrs HW=930.56' (Free Discharge)

- ↑ **2=Culvert** (Passes 0.89 cfs of 2.11 cfs potential flow)
- ↑ **4=Orifice/Grate** (Passes 0.89 cfs of 7.13 cfs potential flow)
- ↑ **1=Constant Flow/Skimmer** (Constant Controls 0.89 cfs)
- ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)

Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf

Overall Size= 72.0"W x 72.0"H x 20.00'L

Row Length Adjustment= +7.00' x 28.27 sf x 2 rows

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

5 Chambers/Row x 20.00' Long +7.00' Row Adjustment = 107.00' Row Length +12.0" End Stone x 2 = 109.00' Base Length

2 Rows x 72.0" Wide + 36.0" Spacing x 1 + 12.0" Side Stone x 2 = 17.00' Base Width

72.0" Chamber Height + 16.0" Stone Cover = 7.33' Field Height

10 Chambers x 565.5 cf +7.00' Row Adjustment x 28.27 sf x 2 Rows = 6,050.7 cf Chamber Storage

13,588.7 cf Field - 6,050.7 cf Chambers = 7,538.0 cf Stone x 40.0% Voids = 3,015.2 cf Stone Storage

Chamber Storage + Stone Storage = 9,065.9 cf = 0.208 af

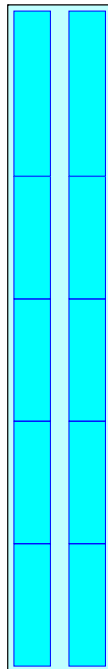
Overall Storage Efficiency = 66.7%

Overall System Size = 109.00' x 17.00' x 7.33'

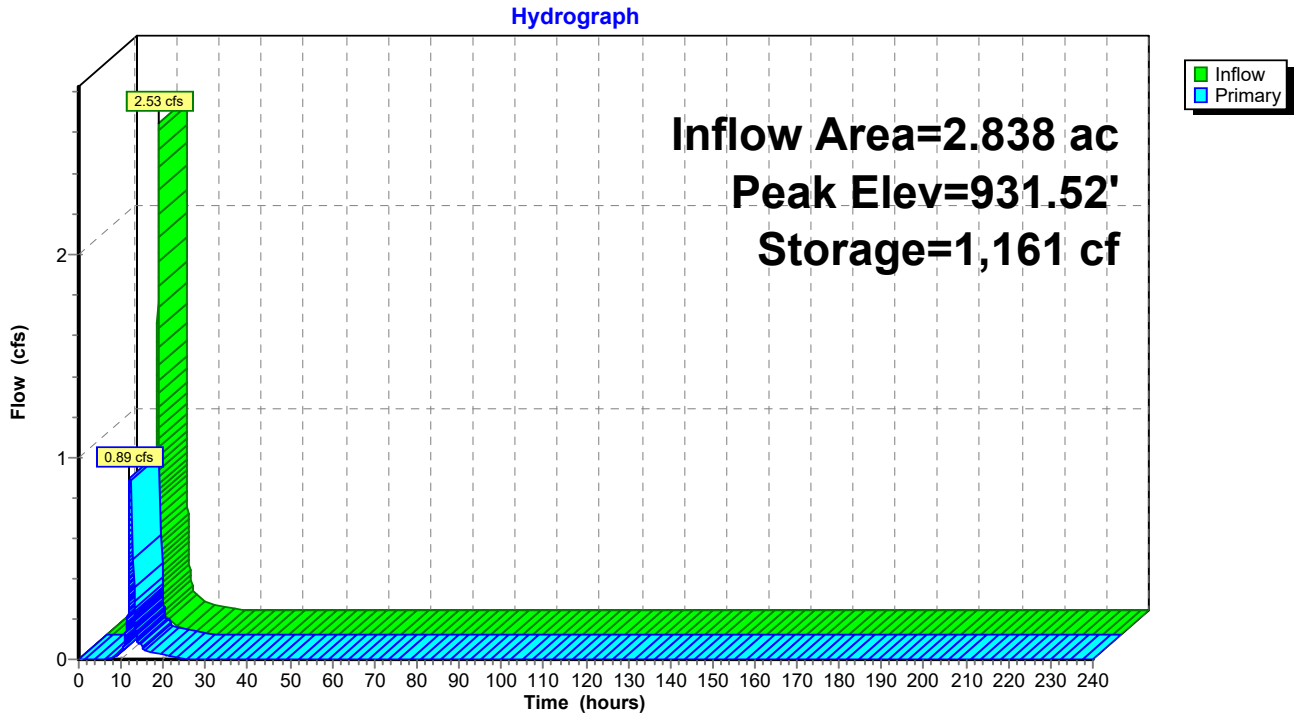
10 Chambers

503.3 cy Field

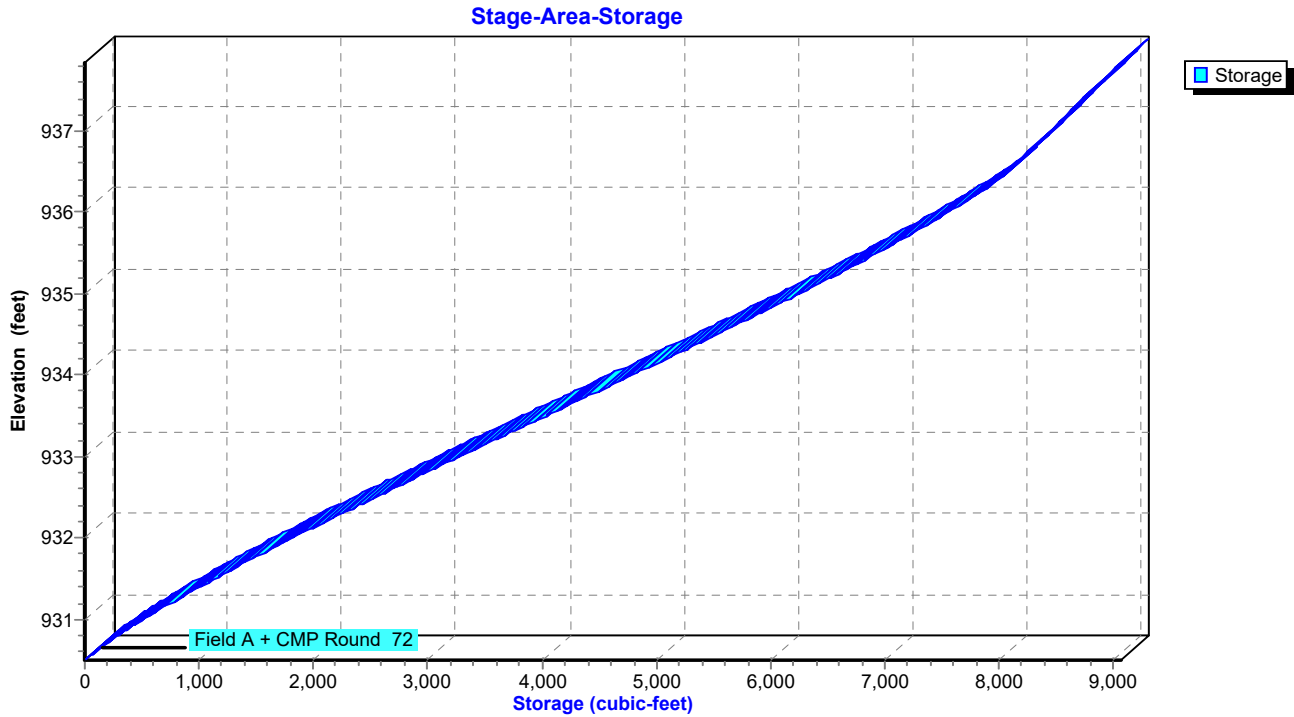
279.2 cy Stone



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN



Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN



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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Stage-Discharge for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
930.50	0.00	933.10	0.89	935.70	10.05
930.55	0.89	933.15	0.89	935.75	10.71
930.60	0.89	933.20	0.89	935.80	11.38
930.65	0.89	933.25	0.89	935.85	12.06
930.70	0.89	933.30	0.89	935.90	12.75
930.75	0.89	933.35	0.89	935.95	13.46
930.80	0.89	933.40	0.89	936.00	14.17
930.85	0.89	933.45	0.89	936.05	14.89
930.90	0.89	933.50	0.89	936.10	15.62
930.95	0.89	933.55	0.89	936.15	16.36
931.00	0.89	933.60	0.89	936.20	17.11
931.05	0.89	933.65	0.89	936.25	17.86
931.10	0.89	933.70	0.89	936.30	18.63
931.15	0.89	933.75	0.89	936.35	19.39
931.20	0.89	933.80	0.89	936.40	20.17
931.25	0.89	933.85	0.89	936.45	20.95
931.30	0.89	933.90	0.89	936.50	21.74
931.35	0.89	933.95	0.89	936.55	22.01
931.40	0.89	934.00	0.89	936.60	22.09
931.45	0.89	934.05	0.89	936.65	22.17
931.50	0.89	934.10	0.89	936.70	22.25
931.55	0.89	934.15	0.89	936.75	22.33
931.60	0.89	934.20	0.89	936.80	22.42
931.65	0.89	934.25	0.89	936.85	22.50
931.70	0.89	934.30	0.89	936.90	22.58
931.75	0.89	934.35	0.89	936.95	22.66
931.80	0.89	934.40	0.89	937.00	22.74
931.85	0.89	934.45	0.89	937.05	22.82
931.90	0.89	934.50	0.89	937.10	22.89
931.95	0.89	934.55	0.89	937.15	22.97
932.00	0.89	934.60	0.89	937.20	23.05
932.05	0.89	934.65	0.89	937.25	23.13
932.10	0.89	934.70	0.89	937.30	23.21
932.15	0.89	934.75	1.00	937.35	23.29
932.20	0.89	934.80	1.20	937.40	23.36
932.25	0.89	934.85	1.45	937.45	23.44
932.30	0.89	934.90	1.76	937.50	23.52
932.35	0.89	934.95	2.10	937.55	23.60
932.40	0.89	935.00	2.47	937.60	23.67
932.45	0.89	935.05	2.87	937.65	23.75
932.50	0.89	935.10	3.31	937.70	23.82
932.55	0.89	935.15	3.76	937.75	23.90
932.60	0.89	935.20	4.24	937.80	23.98
932.65	0.89	935.25	4.74		
932.70	0.89	935.30	5.27		
932.75	0.89	935.35	5.81		
932.80	0.89	935.40	6.37		
932.85	0.89	935.45	6.94		
932.90	0.89	935.50	7.54		
932.95	0.89	935.55	8.14		
933.00	0.89	935.60	8.76		
933.05	0.89	935.65	9.40		

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MSE 24-hr 3 1" WQ Rainfall=1.00"

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Stage-Area-Storage for Pond 1P: 1P - UNDERGROUND RATE CONTROL BASIN

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
930.50	0	933.10	3,435	935.70	7,197
930.55	40	933.15	3,510	935.75	7,260
930.60	87	933.20	3,586	935.80	7,322
930.65	135	933.25	3,661	935.85	7,383
930.70	185	933.30	3,737	935.90	7,444
930.75	237	933.35	3,812	935.95	7,504
930.80	290	933.40	3,888	936.00	7,563
930.85	345	933.45	3,963	936.05	7,620
930.90	400	933.50	4,039	936.10	7,677
930.95	457	933.55	4,114	936.15	7,733
931.00	515	933.60	4,190	936.20	7,787
931.05	574	933.65	4,266	936.25	7,841
931.10	634	933.70	4,341	936.30	7,892
931.15	694	933.75	4,416	936.35	7,942
931.20	756	933.80	4,492	936.40	7,990
931.25	818	933.85	4,567	936.45	8,036
931.30	881	933.90	4,643	936.50	8,078
931.35	944	933.95	4,718	936.55	8,115
931.40	1,009	934.00	4,793	936.60	8,152
931.45	1,073	934.05	4,868	936.65	8,189
931.50	1,139	934.10	4,943	936.70	8,226
931.55	1,205	934.15	5,017	936.75	8,263
931.60	1,272	934.20	5,092	936.80	8,300
931.65	1,339	934.25	5,166	936.85	8,337
931.70	1,406	934.30	5,241	936.90	8,374
931.75	1,474	934.35	5,315	936.95	8,411
931.80	1,543	934.40	5,389	937.00	8,448
931.85	1,612	934.45	5,462	937.05	8,485
931.90	1,681	934.50	5,536	937.10	8,522
931.95	1,751	934.55	5,609	937.15	8,559
932.00	1,822	934.60	5,682	937.20	8,596
932.05	1,892	934.65	5,755	937.25	8,634
932.10	1,963	934.70	5,827	937.30	8,671
932.15	2,034	934.75	5,900	937.35	8,708
932.20	2,106	934.80	5,972	937.40	8,745
932.25	2,178	934.85	6,043	937.45	8,782
932.30	2,250	934.90	6,115	937.50	8,819
932.35	2,323	934.95	6,185	937.55	8,856
932.40	2,395	935.00	6,256	937.60	8,893
932.45	2,468	935.05	6,326	937.65	8,930
932.50	2,542	935.10	6,396	937.70	8,967
932.55	2,615	935.15	6,466	937.75	9,004
932.60	2,689	935.20	6,535	937.80	9,041
932.65	2,763	935.25	6,603		
932.70	2,837	935.30	6,671		
932.75	2,911	935.35	6,739		
932.80	2,986	935.40	6,806		
932.85	3,060	935.45	6,873		
932.90	3,135	935.50	6,939		
932.95	3,210	935.55	7,004		
933.00	3,285	935.60	7,069		
933.05	3,360	935.65	7,133		

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Project Information

Calculator Version: Version 4: July 2020
Project Name: Lake Minnetonka Flats - Existing Conditions Site
User Name / Company Name: Madison Darling - Civil Site Group
Date: 09/06/2024
Project Description:
Construction Permit?: Yes

Site Information

Retention Requirement (inches): 2
Site's Zip Code: 55364
Annual Rainfall (inches): 29.4
Phosphorus EMC (mg/l): 0.3
TSS EMC (mg/l): 54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land			1.3		1.3
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
				Impervious Area (acres)	0.07
				Total Area (acres)	1.37

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
				Impervious Area (acres)	
				Total Area (acres)	0

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	508	ft ³
Volume removed by BMPs towards performance goal:		ft ³
Percent volume removed towards performance goal		%

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	0.2613	acre-ft
Annual runoff volume removed by BMPs:		acre-ft
Percent annual runoff volume removed:		%

Post development annual particulate P load:	0.1173	lbs
Annual particulate P removed by BMPs:		lbs
Post development annual dissolved P load:	0.096	lbs
Annual dissolved P removed by BMPs:	0	lbs
Total P removed by BMPs	0	lbs
Percent annual total phosphorus removed:		%

Post development annual TSS load:	38.7	lbs
Annual TSS removed by BMPs:		lbs
Percent annual TSS removed:		%

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft ³)	Volume Recieved (ft ³)	Volume Retained (ft ³)	Volume Outflow (ft ³)	Percent Retained (%)

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
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Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
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TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
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BMP Schematic

Project Information

Calculator Version: Version 4: July 2020
Project Name: Lake Minnetonka Flats - Existing Conditions Street
User Name / Company Name: Madison Darling - Civil Site Group
Date: 09/06/2024
Project Description:
Construction Permit?: Yes

Site Information

Retention Requirement (inches): 0.5
Site's Zip Code: 55364
Annual Rainfall (inches): 29.4
Phosphorus EMC (mg/l): 0.3
TSS EMC (mg/l): 54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			0.05		0.05
			Impervious Area (acres)		0.97
			Total Area (acres)		1.02

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed					0
			Impervious Area (acres)		
			Total Area (acres)		0

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	1761	ft ³
Volume removed by BMPs towards performance goal:		ft ³
Percent volume removed towards performance goal		%

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	2.0562	acre-ft
Annual runoff volume removed by BMPs:		acre-ft
Percent annual runoff volume removed:		%

Post development annual particulate P load:	0.9228	lbs
Annual particulate P removed by BMPs:		lbs
Post development annual dissolved P load:	0.755	lbs
Annual dissolved P removed by BMPs:	0	lbs
Total P removed by BMPs	0	lbs
Percent annual total phosphorus removed:		%

Post development annual TSS load:	304.8	lbs
Annual TSS removed by BMPs:		lbs
Percent annual TSS removed:		%

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft ³)	Volume Recieved (ft ³)	Volume Retained (ft ³)	Volume Outflow (ft ³)	Percent Retained (%)

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
----------	----------------------------------	-------------------------------	---------------------	--------------------	----------------------

Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
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TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
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BMP Schematic

Project Information

Calculator Version: Version 4: July 2020
Project Name: Lake Minnetonka Flats - Proposed Conditions Site
User Name / Company Name: Madison Darling - Civil Site Group
Date: 09/06/2024
Project Description:
Construction Permit?: Yes

Site Information

Retention Requirement (inches): 2
Site's Zip Code: 55364
Annual Rainfall (inches): 29.4
Phosphorus EMC (mg/l): 0.3
TSS EMC (mg/l): 54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land			0.53		0.53
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			0.35		0.35
			Impervious Area (acres)		0.49
			Total Area (acres)		1.37

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			0.12		0.12
			Impervious Area (acres)		0.48
			Total Area (acres)		0.6

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	3557	ft ³
Volume removed by BMPs towards performance goal:		ft ³
Percent volume removed towards performance goal		%

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	1.243	acre-ft
Annual runoff volume removed by BMPs:	0	acre-ft
Percent annual runoff volume removed:	0	%

Post development annual particulate P load:	0.5578	lbs
Annual particulate P removed by BMPs:	0.239	lbs
Post development annual dissolved P load:	0.456	lbs
Annual dissolved P removed by BMPs:	0.195	lbs
Total P removed by BMPs	0.434	lbs
Percent annual total phosphorus removed:	43	%

Post development annual TSS load:	184.3	lbs
Annual TSS removed by BMPs:	126.1	lbs
Percent annual TSS removed:	68	%

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft ³)	Volume Recieved (ft ³)	Volume Retained (ft ³)	Volume Outflow (ft ³)	Percent Retained (%)
Jellyfish Filter	0	3485	0	3485	0

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
Jellyfish Filter	1.0637	0	0	1.0637	0

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	0.4774	0	0.2387	0.2387	50

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	0.3906	0	0.1953	0.1953	50

Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	0.868	0	0.434	0.434	50

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	157.68	0	126.14	31.54	80

BMP Schematic

Project Information

Calculator Version: Version 4: July 2020
Project Name: Lake Minnetonka Flats - Proposed Conditions Street
User Name / Company Name: Madison Darling - Civil Site Group
Date: 09/06/2024
Project Description:
Construction Permit?: Yes

Site Information

Retention Requirement (inches): 0.5
Site's Zip Code: 55364
Annual Rainfall (inches): 29.4
Phosphorus EMC (mg/l): 0.3
TSS EMC (mg/l): 54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			.05		0.05
				Impervious Area (acres)	.97
				Total Area (acres)	1.02

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed			0.05		0.05
				Impervious Area (acres)	0.97
				Total Area (acres)	1.02

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	1761	ft ³
Volume removed by BMPs towards performance goal:		ft ³
Percent volume removed towards performance goal		%

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	2.0562	acre-ft
Annual runoff volume removed by BMPs:	0	acre-ft
Percent annual runoff volume removed:	0	%

Post development annual particulate P load:	0.9228	lbs
Annual particulate P removed by BMPs:	0.461	lbs
Post development annual dissolved P load:	0.755	lbs
Annual dissolved P removed by BMPs:	0.378	lbs
Total P removed by BMPs	0.839	lbs
Percent annual total phosphorus removed:	50	%

Post development annual TSS load:	304.8	lbs
Annual TSS removed by BMPs:	243.8	lbs
Percent annual TSS removed:	80	%

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft ³)	Volume Recieved (ft ³)	Volume Retained (ft ³)	Volume Outflow (ft ³)	Percent Retained (%)
Jellyfish Filter	0	1761	0	1761	0

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
Jellyfish Filter	2.0562	0	0	2.0562	0

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	0.9228	0	0.4614	0.4614	50

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	0.755	0	0.3775	0.3775	50

Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	1.6778	0	0.8389	0.8389	50

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
Jellyfish Filter	304.81	0	243.85	60.96	80

BMP Schematic

Other
Jellyfish Filter

May 15, 2024

HGTS Project Number: 24-0274

Mr. Dan Schaefer
Schaeferco Builders LLC
305 Minnetonka Ave S, Suite 100
Wayzata MN 55391

Re: Geotechnical Exploration Report, Proposed Lost Lake Townhomes, Commerce Boulevard, Mound, Minnesota

Dear Mr. Schaefer:

We have completed the geotechnical exploration report for the proposed Lost Lake Townhomes in Mound, Minnesota. A brief summary of our results and recommendations is presented below. Specific details regarding our procedures, results and recommendations follow in the attached geotechnical exploration report.

Six (6) soil borings were completed for this project that encountered about 2 to 7 feet of topsoil and/or Fill underlain by native clayey glacial till soils that extended to the termination depths of the borings. Groundwater was encountered in the soil borings at depths ranging from about 2 ½ to 20 feet below the ground surface.

The vegetation, topsoil/Fill are not suitable for foundation support and will need to be removed from within the proposed building and oversize areas and replaced, as needed, with suitable compacted engineered fill. Portions of the underlying clayey glacial till soils had a soft consistency and are likewise not suitable for foundation support so that some soil corrections will also be needed to remove any soft clayey soils. It is our opinion that the stiffer underlying native glacial till soils are suitable for foundation support.

Thank you for the opportunity to assist you on this project. If you have any questions or need additional information, please contact Paul Gionfriddo at 612-729-2959.

Sincerely,

Haugo GeoTechnical Services



Nic Alfonso, G.I.T.
Project Geologist



Paul Gionfriddo, P.E.
Senior Engineer

GEOTECHNICAL EXPLORATION REPORT

PROJECT:

Proposed Lost Lake Townhomes
2400 Block of Commerce Boulevard
Mound, Minnesota

PREPARED FOR:

Schaefco Builders LLC
305 Minnetonka Ave S, Suite 100
Wayzata MN 55391

PREPARED BY:

Haugo GeoTechnical Services
2825 Cedar Avenue South
Minneapolis, Minnesota 55407

Haugo GeoTechnical Services Project: 24-0274

May 15, 2024

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.



Paul Gionfriddo, P.E.
Senior Engineer
License Number: 23093



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APPENDIX

Boring Location Sketch, Figure 1
Soil Boring Logs, SB-1 thru SB-6
Descriptive Terminology

1.0 INTRODUCTION

1.1 Project Description

Schaefer Builders, LLC (Schaefer) is preparing for construction of the Lost Lake Townhomes on the approximate 2400 block of Commerce Boulevard in Mound, Minnesota. Schaefer retained Haugo GeoTechnical Services (HGTS) to perform a geotechnical exploration to evaluate the suitability of site soil conditions to support the proposed townhome development.

1.2 Purpose

The purpose of this geotechnical exploration was to characterize subsurface soil and groundwater conditions and provide recommendations for foundation design and construction.

1.3 Site Description

The project site is located on the east side of Commerce Boulevard between the addresses of 2388 and 2426 Commerce Boulevard in Mound, Minnesota. At the time of this assessment, the project site was composed of multiple parcels that totaled about 8 ¼ acres. The overall project site mostly consisted of lowlands/wetland lands associated with Lost Lake. The “buildable” area of the project site was generally located along Commerce Boulevard.

Based on a brief review of historical aerial photographs available on Google Earth it appears that structures existed on the property that were removed sometime between May, 2006 and May, 2008. These structures appeared to be homes/residential in nature and were located on the approximate north and south ends of the site (near borings SB-1, SB-2 and SB-6).

The site topography varied with the ground surface ranging from about elevation 942 feet along Commerce Boulevard to about elevation 930 along Lost Lake. Ground surface elevations at the boring locations ranging from about 935 to 938 ½ feet above mean sea level (MSL).

1.4 Scope of Services

Our services were performed as requested and authorized by Schaefer and under the terms of our General Conditions. Our services were limited to the following tasks:

- Completing six (6) standard penetration test soil borings each extending to nominal depths of 20 feet.
- Sealing the boring in accordance with Minnesota Department of Health requirements.
- Obtaining GPS coordinates and ground surface elevations at the soil boring location.
- Visually/manually classifying samples recovered from the soil boring.
- Performing laboratory tests on selected samples.
- Preparing soil boring logs describing the materials encountered and the results of groundwater level measurements.
- Preparing an engineering report describing soil and groundwater conditions and providing recommendations for foundation design and construction.

1.5 Documents Provided

We were provided with the following documents, in no particular order;

- Plan Sheet V1.0, ALTA/NSPS Land Title Survey prepared by Civil Site Group and dated November 12, 2023.
- Plan Sheet "EX1-Schematic Site Plan" that was prepared by Civil site Group and dated March 5, 2024. The Schematic Site Plan appeared to consist of a layout of the town homes onto the ALTA/NSPS Land Title Survey.
- A 5-page Power Point Presentation which included but was not limited to; an outline of the project site, aerial photographs edited to identify nearby features, and a Development Vision.
- 3-plan sheets prepared by Whitten Associated Inc, that were dated April 16, 2024 which showed the proposed townhomes overlain onto a survey of the site and floor plans of the proposed townhomes.
- A1-page sheet showing a plan of the Main Floor of the townhomes. The plan was not dated and did not identify the preparer.

Except as described above, specific architectural, structural and civil engineering plans were not provided.

1.6 Locations and Elevations

The soil boring locations were selected by Schaefco and/or their civil engineering consultants. The approximate locations of the soil borings are shown on Figure 1, "Soil Boring Location Sketch," in the Appendix. The sketch was prepared by HGTS using an aerial image from Google Earth as a base.

HGTS obtained the GPS coordinates and ground surface elevations at the soil boring locations using GPS technology based on the US State Plane Coordinate System. GPS coordinates and ground surface elevations are shown on Figure 2 in the Appendix.

2.0 FIELD PROCEDURES

The standard penetration test borings were advanced on April 30, 2024 by HGTS with a rotary drilling rig, using continuous flight augers to advance the boreholes. Representative samples were obtained from the borings, using the split-barrel sampling procedures in general accordance with ASTM Specification D-1586. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel spoon is driven into the ground with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampling spoon the last 12 inches of an 18-inch penetration is recorded as the standard penetration resistance value, or "N" value. The results of the standard penetration tests are indicated on the boring logs. The samples were sealed in containers and provided to HGTS for testing and soil classification.

A field log of each boring was prepared by HGTS. The logs contain visual classifications of the soil materials encountered during drilling, as well as the driller's interpretation of the subsurface conditions between samples and water observation notes. The final boring logs

included with this report represent an interpretation of the field logs and include modifications based on visual/manual method observation of the samples.

The soil boring logs, general terminology for soil description and identification, and classification of soils for engineering purposes are also included in the appendix. The soil boring logs identify and describe the materials encountered, the relative density or consistency based on the Standard Penetration resistance (N-value, "blows per foot") and groundwater observations.

The strata changes were inferred from the changes in the samples and auger cuttings. The depths shown as changes between strata are only approximate. The changes are likely transitions, variations can occur beyond the location of the borings.

3.0 RESULTS

3.1 Soil Conditions

At the surface, the soil borings encountered about 2 to 7 feet of topsoil or Fill consisting of clayey sand or sandy lean clay that was black in color and contained some grass and roots. The topsoil was judged to be slightly organic to organic.

Below the topsoil soil borings SB-3 encountered about 2 ½ feet of Possible Fill that was composed of silty clayey sand that was dark grey to grey in color. Due to its darker coloration, it was difficult to determine its origin and therefore was identified a Possible Fill.

Below the topsoil or Possible Fill, the soil borings encountered native glacial till soils that extended to the termination depths of the borings. The glacial till soils consisted of; sandy lean clay, sandy clayey silt, silty sand, silty clayey sand, silty clay and poorly graded sand with silt. These soils were brown and grey in color but were mostly grey.

Penetration resistance values (N-Values), shown as blows per foot (bpf) on the boring logs, within the clayey glacial till (sandy lean clay, silty clay, clayey sand and sandy clayey silt) ranged from 3 to 28 bpf indicating a soft to very stiff consistency.

N-Values within the sandy or sandier soil (silty sand, silty clayey sand and poorly graded sand with silt) ranged from 4 to 25 bpf indicating a loose to medium dense relative density.

3.2 Groundwater

Groundwater was encountered in 5 of the 6 soil borings while drilling and sampling at depths ranging from about 2 ½ to 20 feet below the ground surface. The observed water levels are summarized in Table 1.

Table 1. Summary of Groundwater Levels Tests

Boring Number	Surface Elevation (feet)	Approximate Depths to Groundwater (feet)*	Approximate Groundwater Elevation (feet)*
SB-1	936.1	5	931
SB-2	934.8	2 ½	932 ½
SB-3	936.1	14 ½	921 ½
SB-4	938.7	20	918 ½
SB-5	937.0	10	927
SB-6	938.4	NE	-

* = Depths and elevations were rounded to the nearest ½ foot.

Water levels were measured on the date as noted on the boring logs and the period of water level observations was relatively short. Due to the cohesive nature of the soil encountered in the borings, it is possible that insufficient time was available for groundwater to seep into the boring(s) and rise to its hydrostatic level. Seasonal and annual fluctuations in the groundwater levels should be expected. Groundwater monitoring wells or piezometers in conjunction with deeper soil boring(s) would be required to more accurately determine water levels.

Information included on the ALTA/NSPS Land Title Survey indicates that the Ordinary High-Water Level of Lost Lake is 929.4 (NCVD 1929). The highest and lowest recorded levels were reported to be 931.1 and 921.78, respectively. Further the flood elevation was reported to be 931 feet.

3.3 Laboratory Testing

Laboratory moisture content tests were performed on selected samples recovered from the soil borings. Laboratory soil moisture contents ranged from about 16 to 32 ½ percent indicating that the soils were likely above their assumed optimum moisture content based on the standard Proctor test. Laboratory tests results are summarized in Table 2 and are shown on the boring logs adjacent to the samples tested.

Table 2. Summary of Laboratory Tests

Boring Number	Sample Number	Depth (feet)	Moisture Content (%) *
SB-1	SS-3	5	23
SB-2	SS-5	10	20 ½
SB-2	SS-11	5	27
SB-2	SS-13	10	25
SB-3	SS-43	5	16
SB-3	SS-44	7 ½	31
SB-4	SS-20	7 ½	32 ½
SB-5	SS-23	15	24
SB-5	SS-27	5	28
SB-6	SS-34	2 ½	20
SB-6	SS-36	7 ½	18 ½

*Moisture content values rounded to the nearest ½ percent.

3.4 OSHA Soil Classification

The soils encountered in the borings consisted of; clayey sand, silty clayey sand, sandy lean clay, silty clay, sandy clayey silt, silty sand, and poorly graded sand with silt. The sandy lean clay, silty clay and sandy clayey silt correspond to the ASTM Classification of CL and are typically a Type B soil Department of Labor Occupational Safety and Health Administration (OSHA) guidelines. The clayey sand, silty clayey sand, silty sand and poorly graded sand with silt correspond to the ASTM classifications; SC, SC-SM, SM and SP-SM and will generally be Type C soils under OSHA guidelines.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Proposed Construction

We understand the project will consist of constructing 4-townhome buildings with each building containing 3 or 4 townhome units for a total of up to 14 townhome units. Based on the provided documents each building will have a basement level with 2 stories above grade. The basement floor slabs will be set at elevation 933.5 feet, or higher, and the main floor or sidewalk/street level will be set at elevation 943, or higher.

We anticipate below grade construction consisting of cast-in-place concrete foundation walls supported on concrete spread footings. The above grade construction is assumed to consist of wood framing, a pitched roof and asphalt shingles.

Based on the assumed construction we estimate wall loadings will range from about 2 to 3 kips (2,000 to 3,000 pounds) per lineal foot and column loads, if any, will be on the order of 75 kips (75,000 pounds).

We have attempted to describe our understanding of the project. If the proposed loads exceed these values, the proposed grades differ by more than 2 feet from the assumed values or if the design or location of the proposed building changes, we should be informed. Additional analyses and revised recommendations may be necessary.

4.2 Discussion

Structure(s) existed on the project site at the time of our exploration and structures formerly existed on the site which were removed sometime between May, 2006 and May 2008. Former structures appeared to have been located near borings SB-1, SB-2 and SB-6. Although our borings did not appear to encounter remnants of any former structures there is that potential. We recommend that all remnants of any current and former structures including footings, floor slabs, foundation walls, exterior flatwork and underground utilities, if encountered, be removed from within the proposed building, utility and oversize areas and be properly disposed of off-site.

The vegetation and topsoil/ Fill and possible Fill are not suitable for foundation support and will need to be removed from within the proposed building, pavement, utility and oversize areas and replaced with suitable compacted engineered fill to attain site grades.

It is our opinion that the underlying native glacial till soils are generally suitable for foundation support however portions of the clayey soil had a soft consistency and some corrections to remove the soft clay will be required. Since the homes will have a basement level removal of some or all the topsoil and any soft clay could be incidental to construction.

Groundwater was encountered in 5 of the 6 soil borings while drilling and sampling at depths ranging from about 2 ½ to 20 feet below the ground surface corresponding to elevations ranging from about 918 ½ to 932 ½ feet. With excavations for soil corrections and/or foundation construction anticipated to extend about 7 feet below the ground surface groundwater will likely be encountered and dewatering could be required.

The following sections provide recommendations for foundation design and construction.

4.3 Site Grading Recommendations

Excavation We recommend that all vegetation, topsoil, Fill and any soft or otherwise unsuitable soils, if encountered, be removed from below the proposed building and oversize areas. Likewise, we recommend that all remnants of any existing and former structure(s) including footings, floor slabs, foundation walls, exterior flatwork and underground utilities, if encountered, be removed from within the proposed building, utility and oversize areas and be properly disposed of off-site. Table 3 summarizes the anticipated excavation depths at the soil boring locations. Excavation depths may vary and could be deeper.

Table 3. Anticipated Excavation Depths

Boring Number	Measured Surface Elevation (feet)	Anticipated Excavation Depth (feet)*	Anticipated Excavation Elevation (feet)*	Approximate Groundwater Elevation(feet)*
SB-1	936.1	7	929	931
SB-2	934.8	4 ½	930 ½	932 ½
SB-3	936.1	4 ½ - 7	931 ½ - 929	921 ½
SB-4	938.7	7	931 ½	918 ½
SB-5	937.0	7	931	927
SB-6	938.4	2	936 ½	NE

* = Excavation depths and elevations were rounded to nearest ½ foot.

Oversizing In areas where the excavations for soil corrections extend below the proposed footing elevations, the excavations require oversizing. We recommend the perimeter of the excavation be extended a foot outside the proposed footprint for every foot below footing grade (1H:1V oversizing). The purpose of the oversizing is to provide lateral support of the foundation.

Fill Material Additional fill required to attain design grades can consist of any mineral soil provided it is free of debris, organic soil and any soft or otherwise unsuitable materials. Except we recommend that fill or backfill placed in wet excavations or within 2 feet of the groundwater table consist of granular soil (sand) with less than 5 percent passing the number 200 sieve and at least 50 percent retained on the number 40 sieve. Alternately “clear rock” can be used in wet excavations.

The on-site native glacial till soils appear to be suitable for reuse as structural fill or backfill provided it is free of debris, organic soils or other unsuitable materials. Laboratory soil moisture contents ranged from about 16 to 32 ½ percent indicating that the soils were likely above their assumed optimum moisture content based on the standard Proctor test. Soils that will be excavated and reused as fill and backfill will likely require some moisture conditioning (drying) to achieve the recommended compaction levels. Summer months are typically more favorable for drying wet soils.

Topsoil or other soils that are black in color are not suitable for reuse as structural fill or backfill.

Backfilling We recommend that backfill placed to attain site grades be compacted to a minimum of 95 percent of its standard Proctor density (ASTM D 698). Granular fill classified as SP or SP-SM should be placed within 65 percent to 105 percent of its optimum moisture content as determined by the standard Proctor. Other fill soils should be placed within 3 percentage points above and 1 percentage point below its optimum moisture content as determined by the standard Proctor. All fill should be placed in thin lifts and be compacted with a large self-propelled vibratory compactor operating in vibratory mode.

Foundations We recommend the perimeter footings bear a minimum of 42 inches below the exterior grade for frost protection. Interior footings may be placed immediately below the slab provided construction does not occur during below freezing weather conditions. Foundation elements in unheated areas should bear at least 5 feet below exterior grade for frost protection.

We anticipate the foundations and floor slabs will bear on compacted engineered fill or native glacial till soils. With the building pad prepared as recommended, it is our opinion the footings can be designed for a net allowable bearing pressure up to 2,000 pounds per square foot (psf).

We anticipate total and differential settlement of the foundations will be less than 1 inch and ½ inch, respectively, across a 30-foot span.

4.4 Dewatering

Groundwater was encountered in 5 of the 6 soil borings while drilling and sampling at depths ranging from about 2 ½ to 20 feet below the ground surface corresponding to elevations ranging from about 918 ½ to 932 ½ feet. With excavations for soil corrections and/or foundation construction anticipated to extend about 7 feet (about elevation 929) below the ground surface groundwater will likely be encountered and dewatering could be required.

In the event dewatering is required, we recommend the groundwater level be temporarily lowered to a minimum of 2 feet below the lowest anticipated excavation elevation to allow for construction. In sand soils, we do not recommend attempting to dewater from within the excavation. Upward seepage will loosen and disturb the excavation, resulting in a “quick condition.” Rather, we recommend groundwater to be drawn down below the anticipated excavation bottom.

If dewatering is required, it may be appropriate for a dewatering contractor to review the soil boring logs, develop a dewatering plan and evaluate the impact of dewatering on adjacent structures.

4.5 Interior Slabs

The anticipated floor subgrade will consist of compacted clayey engineered fill or clayey native glacial till soils. It is our opinion that a modulus of subgrade reaction, k , of 50 pounds per square inch per inch of deflection may be used to design the floor.

If floor coverings or coatings less permeable than the concrete slab will be used, we recommend that a vapor retarder or vapor barrier be placed immediately beneath the slab. Some contractors prefer to bury the vapor barrier or vapor retarder beneath a layer of sand to reduce curling and shrinkage, but this practice often traps water between the slab and vapor retarder or barrier. Regardless of where the vapor retarder or vapor barrier is placed, we recommend consulting the floor covering manufacturer regarding the appropriate type, use and installation of the vapor retarder or vapor barrier to preserve the warranty.

We recommend following all state and local building codes with regards to a radon mitigation plan beneath interior slabs.

4.6 Below Grade Walls

We recommend general waterproofing of the below grade walls. We recommend either placing drainage composite against the backs of the exterior walls or backfilling adjacent to the walls with sand having less than 50 percent of the particles by weight passing the #40 sieve and less than 5 percent of the particles by weight passing the #200 sieve. The sand backfill should be placed within 2 feet horizontally of the wall. We recommend the balance of the backfill for the walls consist of sand however the sand may contain up to 20 percent of the particles by weight passing the #200 sieve.

We recommend installing drain tile behind the below grade walls, adjacent to the wall footing and below the slab elevation. Preferably the drain tile should consist of perforated pipe embedded in gravel. A geotextile filter fabric should encase the pipe and gravel. The drain tile should be routed to a storm sewer, sump pump or other suitable disposal site.

Foundation walls or below grade walls will have lateral loads from the surrounding soil transmitted to them. Active earth pressures can be used to design the below grade walls if the walls are allowed to rotate slightly. If wall rotation cannot be tolerated, then below grade wall design should be based on at-rest earth pressures. It is our opinion that the estimated soil parameters presented in Table 4 can be used for below grade wall design. These estimated

soil parameters are based on the assumptions that the walls are drained, there are no surcharge loads within a horizontal distance equal to the height of the wall and the backfill is level.

Table 4. Estimated Soil Parameters

Soil Type	Estimated Unit Weight (pcf)	Estimated Friction Angle (degrees)	At-Rest Pressure (pcf)	Active Soil Pressure (pcf)	Passive Soil Pressure (pcf)
Sand (SP & SP-SM)	115	32	55	35	375
Other Soils (CL, CL-ML, SC, SC-SM SM)	135	28	70	50	375

Resistance to lateral earth pressures will be provided by passive resistance against the wall footings and by sliding resistance along the bottom of the wall footings. We recommend a sliding coefficient of 0.35. This value does not include a factor of safety.

4.8 Exterior Slabs

Exterior slabs will likely be underlain by clayey soils which are considered to be moderately to highly frost susceptible. If these soils become saturated and freeze, frost heave may occur. This heave can be a nuisance in front of doors and at other critical grade areas. One way to help reduce the potential for heaving is to remove the frost-susceptible soils below the slabs down to bottom of footing grades and replace them with non-frost-susceptible backfill consisting of sand having less than 5 percent of the particles by weight passing the number 200 sieve.

If this approach is used and the excavation bottoms terminate in non-free draining granular soil, we recommend a drain tile be installed along the bottom outer edges of the excavation to collect and remove any water that may accumulate within the sand. The bottom of the excavation should be graded away from the building.

If the banks of the excavations to remove the frost-susceptible soils are not sloped, abrupt transitions between the frost-susceptible and non-frost-susceptible backfill will exist along which unfavorable amounts of differential heaving may occur. Such transitions could exist between exterior slabs and sidewalks, between exterior slabs and pavements and along the slabs themselves if the excavations are confined to only the building entrances. To address this issue, we recommend sloping the excavations to remove frost-susceptible soils at a minimum 3:1 (horizontal:vertical) gradient.

Another alternative for reducing frost heave is to support the slabs on frost depth footings. A void space of at least 4 inches should be provided between the slab and the underlying soil to allow the soil to heave without affecting the slabs.

4.9 Site Grading and Drainage

We recommend the site be graded to provide positive run-off away from the proposed buildings. We recommend landscaped areas be sloped a minimum of 6 inches within 10 feet of the building and slabs be sloped a minimum of 2 inches. In addition, we recommend downspouts with long splash blocks or extensions.

We recommend the lowest floor grades be constructed to meet City of Mound requirement with respect to groundwater separation distances. In the absence of city requirements, we recommend maintaining at least a 2-foot separation between the lowest floor slab and the 100-year flood level of nearby wetlands, storm water ponds or other surface water features.

4.10 Utilities

We anticipate that new utilities will be installed as part of this project. We further anticipate that new utilities will bear at depths ranging from about 7 to 10 feet below the ground surface. At these depths, we anticipate that the pipes will bear on compacted engineered fill or native glacial till soils, which in our opinion are suitable for pipe support. We recommend removing all vegetation, topsoil and any soft or otherwise unsuitable soils, if any, beneath utilities prior to placement.

We recommend bedding material be thoroughly compacted around the pipes. We recommend trench backfill above the pipes be compacted to a minimum of 95 percent beneath slabs and pavements, the exception being within 3 feet of the proposed pavement subgrade, where 100 percent of standard Proctor density is required. In landscaped areas, we recommend a minimum compaction of 90 percent.

We anticipate that groundwater will be encountered during construction and that dewatering will likely be required. See section 4.4 for dewatering considerations.

4.11 Bituminous Pavements

General We were not provided any information regarding traffic volumes or vehicle distribution. We anticipate the parking and drive lanes will be used mostly by automobiles and light trucks with weekly use by heavier vehicles such as garbage trucks. Based on the number of townhome units we estimate the pavements will be subjected to Equivalent Single Axle Loads (ESAL's) significantly less than 50,000 over a 20-year design life. This does not account for any future growth.

Subgrade Preparation We recommend removing all vegetation, topsoil and any soft or otherwise unsuitable soils, if any, be removed from below the pavement and oversize areas. Prior to placing the aggregate base (Class 5) we recommend compacting the subgrade and/or performing a proof-roll of the subgrade to identify soft, weak, loose, or unstable areas that may require additional subcuts. Backfill to attain pavement subgrade elevation can consist of any mineral soil provided it is free of organic material or other deleterious materials.

Granular fill classified as SP or SP-SM should be placed within 65 percent to 105 percent of its optimum moisture content as determined by the standard Proctor. Remaining fill soils should be placed within 3 percentage points above and 1 percentage point below its optimum

moisture content as determined by the standard Proctor. All fill should be placed in thin lifts and be compacted to a minimum of 95 percent of its standard Proctor maximum dry density with a large self-propelled vibratory compactor operating in vibratory mode. The upper 3 feet of fill and backfill should be compacted to a minimum of 100 percent of its standard Proctor maximum dry density.

R-Value R-Value testing was beyond the scope of this project. The soil borings predominantly encountered clayey soils near the surface corresponding to the ASTM Classification CL. We recommend using an R-Value of 10 for pavement design.

Pavement Section We anticipate that both heavy duty and light duty pavements will be constructed. Based on an estimated R-value of 10 and a maximum of 50,000 ESAL's we recommend a light-duty pavement section consisting of a minimum of 3 ½ inches of bituminous underlain by a minimum of 8 inches of aggregate base. If a heavy-duty section is required, we recommend a pavement section consisting of a minimum of 4 inches of bituminous underlain by a minimum of 9 inches of aggregate base.

4.12 Pavement Materials

We recommend aggregate base meeting MN/DOT specification 3138 for Class 5 aggregate base. We recommend the aggregate base be compacted to 100 percent of its maximum standard Proctor dry density.

We recommend that the bituminous wear and base courses meet the requirement of MN/DOT specification 2360. We recommend the bituminous pavements be compacted to at least 92% of the maximum theoretical density.

We recommend specifying concrete that has a minimum 28-day compressive strength of 3,900 psi. We recommend specifying 5 to 8 percent entrained air for exposed concrete to provide resistance to freeze-thaw deterioration. We recommend slump, air content and compressive strength test of Portland cement concrete.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Excavation

The soils encountered in the borings consisted of; clayey sand, silty clayey sand, sandy lean clay, silty clay, sandy clayey silt, silty sand, and poorly graded sand with silt. The sandy lean clay, silty clay and sandy clayey silt correspond to the ASTM Classification of CL and are typically a Type B soil Department of Labor Occupational Safety and Health Administration (OSHA) guidelines. The clayey sand, silty clayey sand, silty sand and poorly graded sand with silt correspond to the ASTM classifications; SC, SC-SM, SM and SP-SM and will generally be Type C soils under OSHA guidelines.

Temporary excavations in Type C soils should be constructed at a minimum of 1 ½ foot horizontal to every 1 foot vertical within excavations. Temporary excavations in Type B soils should be constructed at a minimum of 1 foot horizontal to every 1 foot vertical within excavations. Slopes constructed in this manner may still exhibit surface sloughing. If site

constraints do not allow the construction of slopes with these dimensions, then temporary shoring may be required.

5.2 Observations

A geotechnical engineer or a qualified engineering technician should observe the excavation subgrade to evaluate if the subgrade soils are similar to those encountered in the borings and adequate to support the proposed construction.

5.3 Backfill and Fills

The on-site soils appear to be above their assumed optimum soil moisture content. If these soils will be used or reused as structural fill or backfill, some drying of the soils will likely be required to meet the recommend compaction levels. We recommend moisture conditioning all soils that will be used as fill or backfill in accordance with Section 4.3 above. We recommend that fill and backfill be placed in lifts not exceeding 4 to 12 inches, depending on the size of the compactor and materials used.

5.4 Testing

We recommend density tests of backfill and fills placed for the proposed foundations. Samples of the proposed materials should be submitted to our laboratory prior to placement for evaluation of their suitability and to determine their optimum moisture content and maximum dry density (Standard Proctor).

5.5 Winter Construction

If site grading and construction is anticipated to proceed during cold weather, all snow and ice should be removed from cut and fill areas prior to additional grading and placement of fill. No fill should be placed on frozen soil and no frozen soil should be used as fill or backfill.

Concrete delivered to the site should meet the temperature requirements of ASTM and/or ACI. Concrete should not be placed on frozen soil. Concrete should be protected from freezing until the necessary strength is obtained. Frost should not be permitted to penetrate below the footings.

6.0 PROCEDURES

6.1 Soil Classification

The drill crew chief visually and manually classified the soils encountered in the borings in general accordance with ASTM D 2488, "Description and Identification of Soils (Visual-Manual Procedure)." Soil terminology notes are included in the Appendix. The samples were returned to our laboratory for review of the field classification by a soils engineer. Samples will be retained for a period of 30 days.

6.2 Groundwater Observations

Immediately after taking the final samples in the bottom of the boring, the hole was checked for the presence of groundwater. Immediately after removing the augers from the borehole the hole was once again checked and the depth to water and cave-in depths were noted.

7.0 GENERAL

7.1 Subsurface Variations

The analyses and recommendations presented in this report are based on data obtained from a limited number of soil borings. Variations can occur away from the boring, the nature of which may not become apparent until additional exploration work is completed, or construction is conducted. A reevaluation of the recommendations in this report should be made after performing on-site observations during construction to note the characteristics of any variations. The variations may result in additional foundation costs and it is suggested that a contingency be provided for this purpose.

It is recommended that we be retained to perform the observation and testing program during construction to evaluate whether the design is as expected, if any design changes have affected the validity of our recommendations, and if our recommendations have been correctly interpreted and implemented in the designs, specifications and construction methods. This will allow correlation of the soil conditions encountered during construction to the soil borings and will provide continuity of professional responsibility.

7.2 Review of Design

This report is based on the design of the proposed structures as related to us for preparation of this report. It is recommended that we be retained to review the geotechnical aspects of the design and specifications. With the review, we will evaluate whether any changes have affected the validity of the recommendations and whether our recommendations have been correctly interpreted and implemented in the design and specifications.

7.3 Groundwater Fluctuations

We made water level measurements in the borings at the times and under the conditions stated on the boring log. The data was interpreted in the text of this report. The period of observation was relatively short and fluctuations in the groundwater level may occur due to rainfall, flooding, irrigation, spring thaw, drainage, and other seasonal and annual factors not evident at the time the observations were made. Design drawings and specifications and construction planning should recognize the possibility of fluctuations.

7.4 Use of Report

This report is for the exclusive use of Schaefco Builders LLC and their design team to use to design the proposed structures and prepare construction documents. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. The data, analysis and recommendations may not be appropriate for

other structures or purposes. We recommend that parties contemplating other structures or purposes contact us.

7.5 Level of Care

Haugo GeoTechnical Services has used the degree of skill and care ordinarily exercised under similar circumstance by members of the profession currently practicing in this locality. No warranty expressed or implied is made.

APPENDIX



Legend

 Approximate Soil Boring Location



Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed.
This is not a legal document and should not be substituted for a title search, appraisal, survey, or for zoning verification.

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Services, LLC
2825 Cedar Avenue S.
Minneapolis, MN 55407

Soil Boring Location Sketch
Lost Lake Townhomes
Mound, Minnesota

Figure #: 1
Drawn By: NA
Date: 5/14/2024
Scale: None
Project #: 24-0274

Figure 2: GPS Boring Locations

Boring Number	Elevation (US Feet)	Northing Coordinate	Easting Coordinate
SB-1	936.1	1033587.63932281	2711142.33217227
SB-2	934.8	1033534.55676074	2711076.88327216
SB-3	936.1	1033489.78792384	2711039.08736328
SB-4	938.7	1033458.19691256	2711004.4629201
SB-5	937.0	1033416.96176939	2710981.85506609
SB-6	938.4	1033364.38942191	2710929.30791112

Referencing US State Plane Coordinate System



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 Minneapolis, MN, 55407
 Telephone: 612-729-2959
 Fax: 763-445-2238

BORING NUMBER SB-1

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 936.1 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
 ▽ **AT TIME OF DRILLING** 5.00 ft / Elev 931.10 ft
AT END OF DRILLING ---
AFTER DRILLING ---

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 5/15/24 11:52 - C:\USERS\ALICE HAUGO\HGTS DROPBOX\LAB HAUGO\HAUGO GEOTECHNICAL SERVICES\GINT PROJECT BACKUP\PROJECTS\24-0274 BORING LOG DRAFT.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Moisture Content (%)	▲ SPT N VALUE ▲		
							20	40	60
0		Clayey Sand with Grass and Roots, black, slightly organic to organic, moist (Topsoil)	AU 1						
			SS 2		2-2-1 (3)				
5		▽ (SC-SM) Silty Clayey Sand, grey with trace black, wet to waterbearing, very loose (Glacial Till)	SS 3		2-2-2 (4)	23			
		(CL-ML) Sandy Clayey Silt, brown to greyish brown, wet, loose (Glacial Till)	SS 4		4-5-5 (10)				
10		(CL) Sandy Lean Clay, trace Gravel, brown, wet, rather stiff to stiff (Glacial Till) Sand Seam at about 10 Feet	SS 5		3-4-6 (10)	20.5			
			SS 6		4-7-9 (16)				
15		(CL) Sandy Lean Clay, trace Gravel, grey, wet, stiff to very stiff (Glacial Till)	SS 7		4-5-9 (14)				
20			SS 8		4-6-11 (17)				

Bottom of borehole at 21.0 feet.



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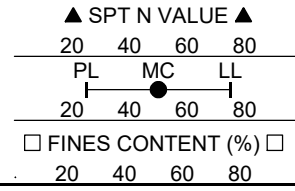
BORING NUMBER SB-2

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 934.8 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
 ▽ **AT TIME OF DRILLING** 2.50 ft / Elev 932.30 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Moisture Content (%)	▲ SPT N VALUE ▲		
							20	40	60
0		Sandy Lean Clay with Grass and Roots, black, moist to wet (Topsoil)	AU 9						
3	▽		SS 10		3-2-3 (5)				
5		(SM) Silty Sand, fine grained, greyish brown, moist to waterbearing, loose to medium dense (Glacial Till)	SS 11		1-3-3 (6)	27			
7			SS 12		3-5-7 (12)				
10		(CL) Silty Clay with Sand, grey, wet, rather stiff (Glacial Till)	SS 13		5-4-5 (9)	25			
13			SS 14		7-7-10 (17)				
15		(CL) Sandy Lean Clay, trace Gravel, grey, wet, stiff to very stiff (Glacial Till)	SS 15		4-6-8 (14)				
20			SS 16		8-10-16 (26)				



Bottom of borehole at 21.0 feet.



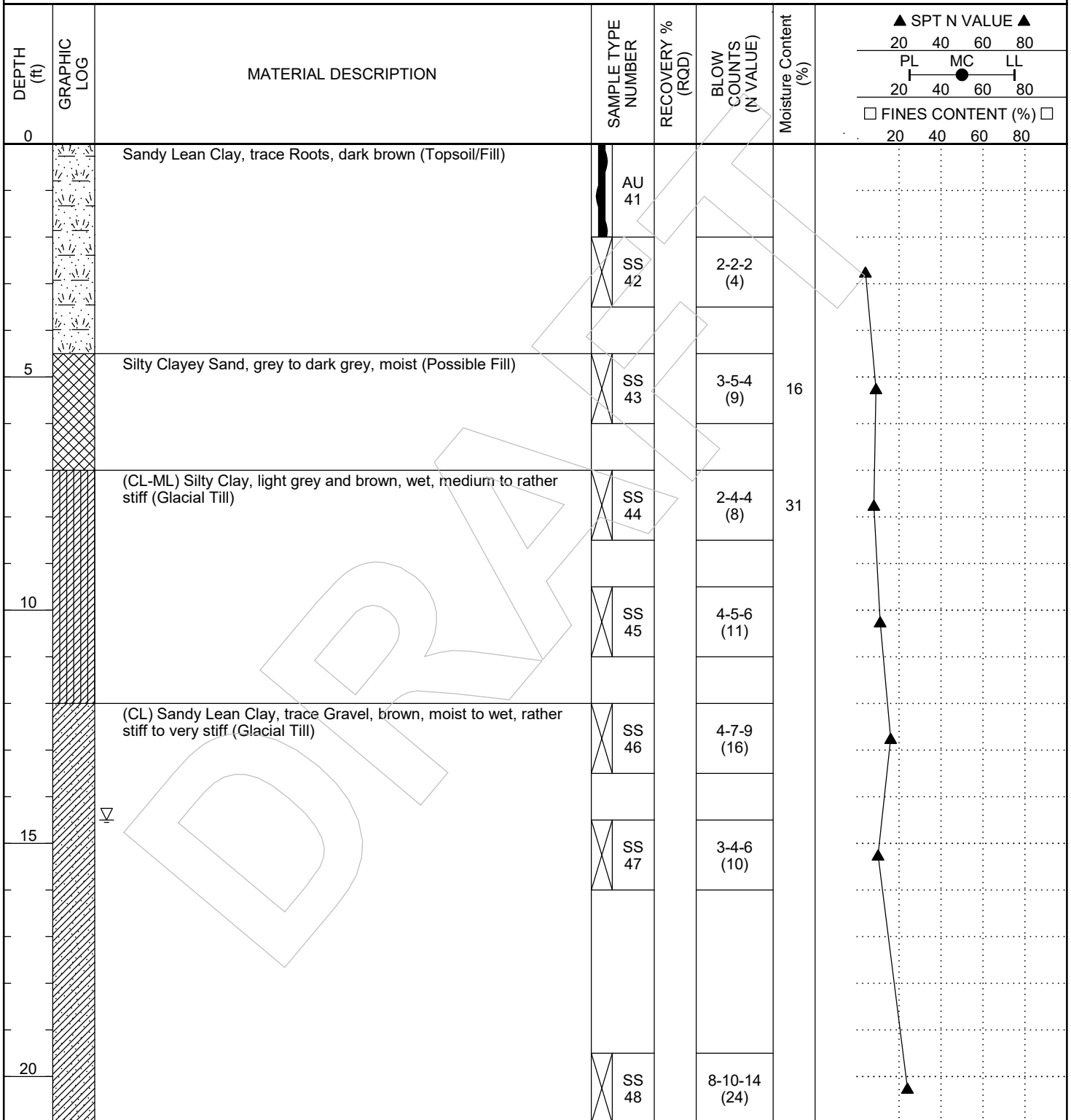
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 Fax: 763-445-2238

BORING NUMBER SB-3

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 936.1 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
 ▽ **AT TIME OF DRILLING** 14.50 ft / Elev 921.60 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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Bottom of borehole at 21.0 feet.



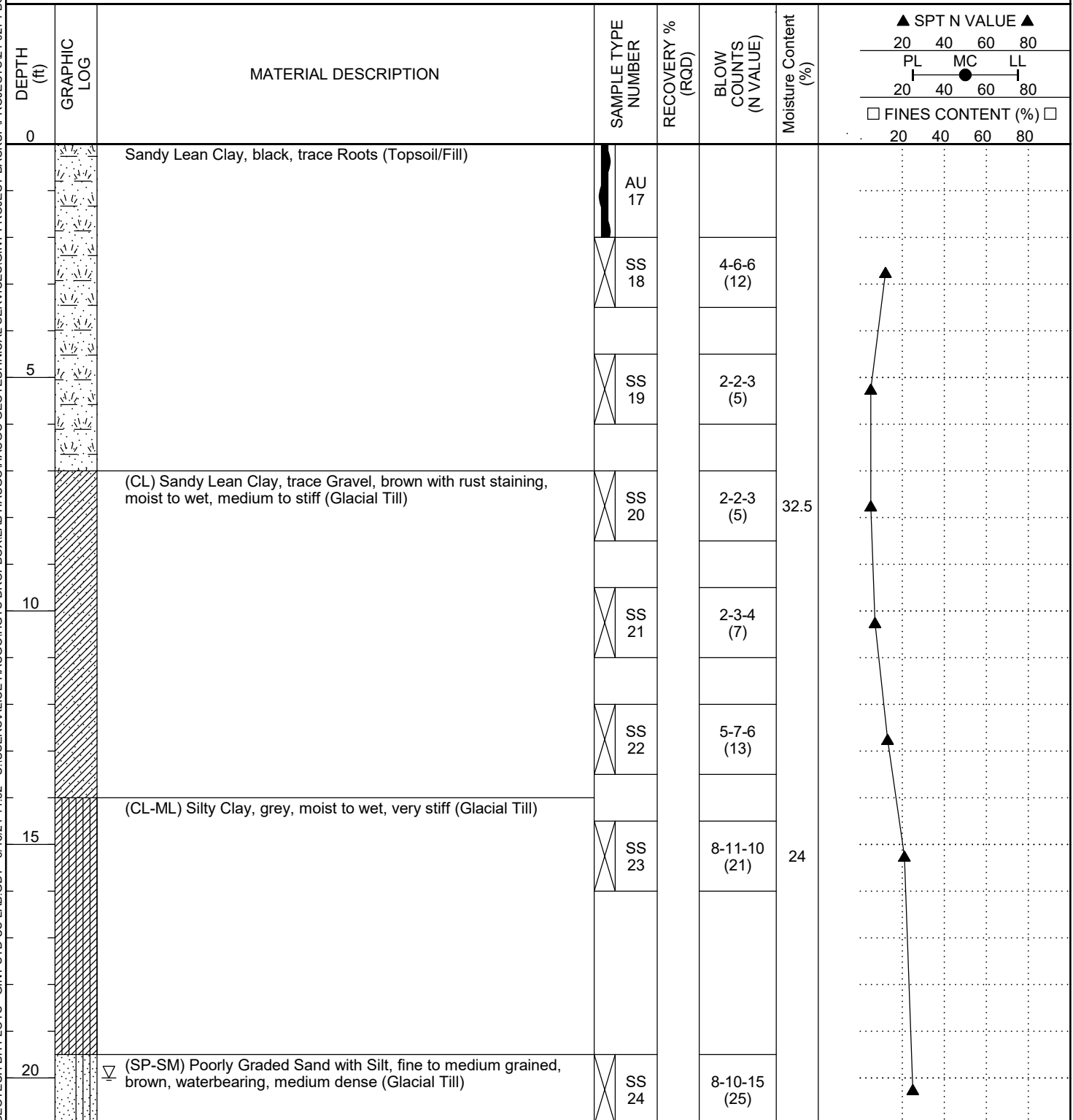
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BORING NUMBER SB-4

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 938.7 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
 ∇ **AT TIME OF DRILLING** 20.00 ft / Elev 918.70 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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Bottom of borehole at 21.0 feet.



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BORING NUMBER SB-5

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 937 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
 ▽ **AT TIME OF DRILLING** 10.00 ft / Elev 927.00 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	Moisture Content (%)	▲ SPT N VALUE ▲				
							PL	MC	LL		
							20	40	60	80	
							20	40	60	80	
							□ FINES CONTENT (%) □				
							20	40	60	80	
0		Sandy Lean Clay with Grass and Roots, black to dark brown, moist (Topsoil/Fill)	AU 25								
			SS 26		1-2-2 (4)						
5		(CL) Sandy Lean Clay, trace Gravel, brown, wet, soft to rather stiff (Glacial Till)	SS 27		1-2-1 (3)	28					
			SS 28		4-5-6 (11)						
		(SM) Silty Sand, fine grained, brown, wet to waterbearing, medium dense (Glacial Till)									
10		(CL) Sandy Lean Clay, trace Gravel, grey, wet, rather stiff (Glacial Till)	SS 29		2-5-10 (15)						
		Sand Seam at about 12 Feet	SS 30		5-5-5 (10)						
			SS 31		3-4-8 (12)						
20		(CL) Sandy Lean Clay, trace Gravel, brown, moist to wet, stiff (Glacial Till)	SS 32		4-6-9 (15)						

Bottom of borehole at 21.0 feet.



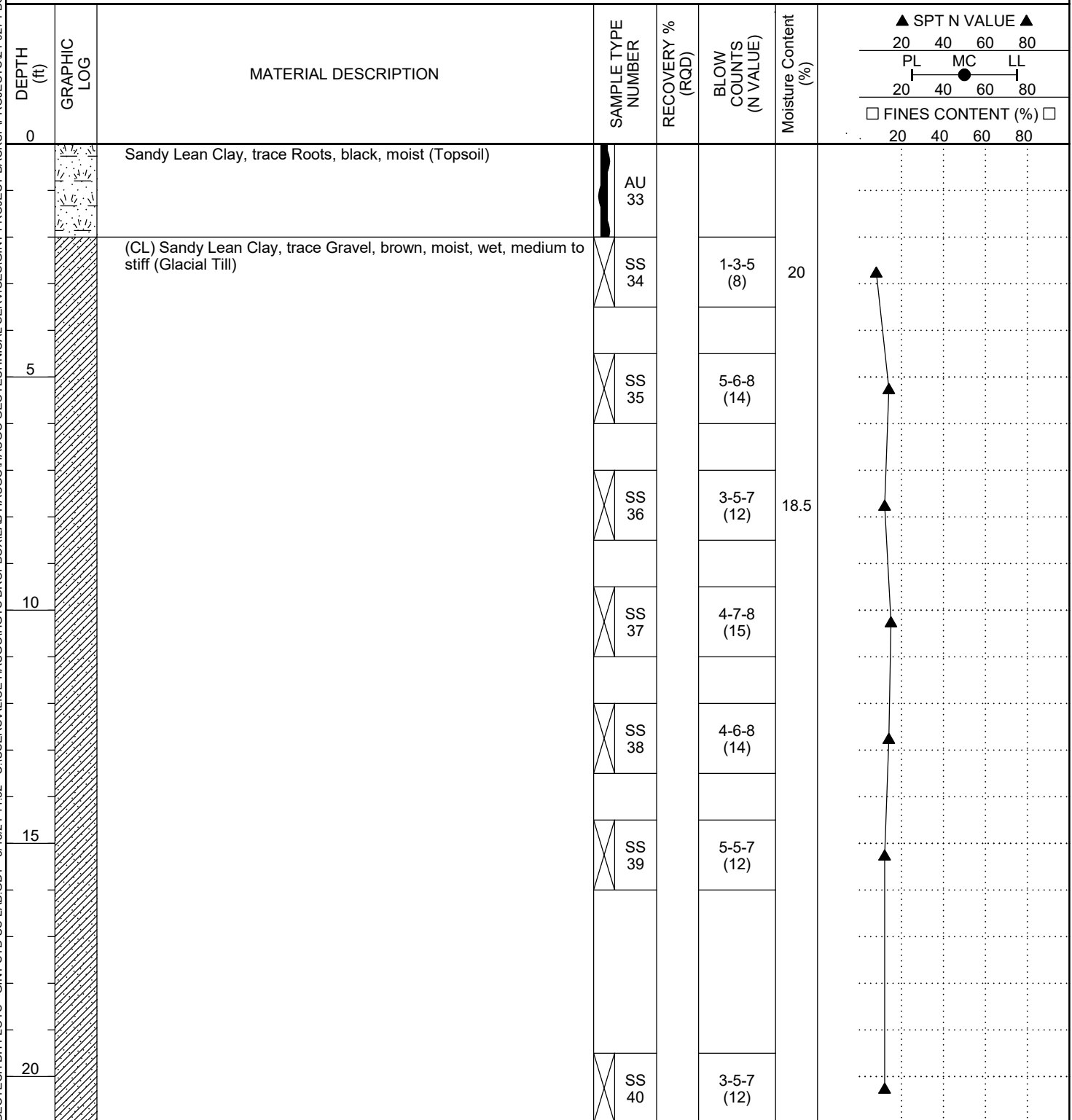
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BORING NUMBER SB-6

CLIENT Schaefer Builders, LLC
PROJECT NUMBER 24-0274
DATE STARTED 4/30/24 **COMPLETED** 4/30/24
DRILLING CONTRACTOR HGTS- 45
DRILLING METHOD Hollow Stem Auger/Split Spoon
LOGGED BY NC/MS **CHECKED BY** PG
NOTES _____

PROJECT NAME Lost Lake Townhomes
PROJECT LOCATION Mound, MN
GROUND ELEVATION 938.4 ft **HOLE SIZE** 3 1/4 inches
GROUND WATER LEVELS:
AT TIME OF DRILLING --- Not Encountered
AT END OF DRILLING --- Not Encountered
AFTER DRILLING --- Not Encountered

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Bottom of borehole at 21.0 feet.



Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^a				Soils Classification	
				Group Symbol	Group Name ^b
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels 5% or less fines ^e	$C_u \geq 4$ and $1 \leq C_c \leq 3$ ^c	GW	Well-graded gravel ^d
		Gravels with Fines More than 12% fines ^e	$C_u < 4$ and/or $1 > C_c > 3$ ^c	GP	Poorly graded gravel ^d
			Fines classify as ML or MH	GM	Silty gravel ^{d f g}
		Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands 5% or less fines ⁱ	$C_u \geq 6$ and $1 \leq C_c \leq 3$ ^c	SW
	Sands with Fines More than 12% ⁱ		$C_u < 6$ and/or $1 > C_c > 3$ ^c	SP	Poorly graded sand ^h
			Fines classify as ML or MH	SM	Silty sand ^{f g h}
	Fines classify as CL or CH		SC	Clayey sand ^{f g h}	
	Fine-grained Soils 50% or more passed the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line ^j	CL
PI < 4 or plots below "A" line ^j				ML	Silt ^{k i m}
Organic		Liquid limit - oven dried < 0.75	OL	Organic clay ^{k i m n}	
		Liquid limit - not dried < 0.75	OL	Organic silt ^{k i m o}	
Silts and clays Liquid limit 50 or more		Inorganic	PI plots on or above "A" line	CH	Fat clay ^{k i m}
			PI plots below "A" line	MH	Elastic silt ^{k i m}
	Organic	Liquid limit - oven dried < 0.75	OH	Organic clay ^{k i m p}	
		Liquid limit - not dried < 0.75	OH	Organic silt ^{k i m q}	
Highly Organic Soils	Primarily organic matter, dark in color and organic odor			PT	Peat

Particle Size Identification

Boulders over 12"
Cobbles 3" to 12"
Gravel
Coarse 3/4" to 3"
Fine No. 4 to 3/4"
Sand
Coarse No. 4 to No. 10
Medium No. 10 to No. 40
Fine No. 40 to No. 200
Silt $< \text{No. 200}$, PI < 4 or below "A" line
Clay $< \text{No. 200}$, PI ≥ 4 and on or above "A" line

Relative Density of Cohesionless Soils

Very loose 0 to 4 BPF
Loose 5 to 10 BPF
Medium dense 11 to 30 BPF
Dense 31 to 50 BPF
Very dense over 50 BPF

Consistency of Cohesive Soils

Very soft 0 to 1 BPF
Soft 2 to 3 BPF
Rather soft 4 to 5 BPF
Medium 6 to 8 BPF
Rather stiff 9 to 12 BPF
Stiff 13 to 16 BPF
Very stiff 17 to 30 BPF
Hard over 30 BPF

- a. Based on the material passing the 3-in (75mm) sieve.
- b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
- c. $C_u = D_{60}/D_{10}$, $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- d. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- e. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
- f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- g. If fines are organic, add "with organic fines" to group name.
- h. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- i. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
- j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
- k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
- l. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- m. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- n. PI ≥ 4 and plots on or above "A" line.
- o. PI < 4 or plots below "A" line.
- p. PI plots on or above "A" line.
- q. PI plots below "A" line.

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers unless noted otherwise. Jetting water was used to clean out auger prior to sampling only where indicated on logs. Standard penetration test borings are designated by the prefix "ST" (Split Tube). All samples were taken with the standard 2" OD split-tube sampler, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous-flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface and are, therefore, somewhat approximate. Power auger borings are designated by the prefix "B."

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn. Hand auger borings are indicated by the prefix "H."

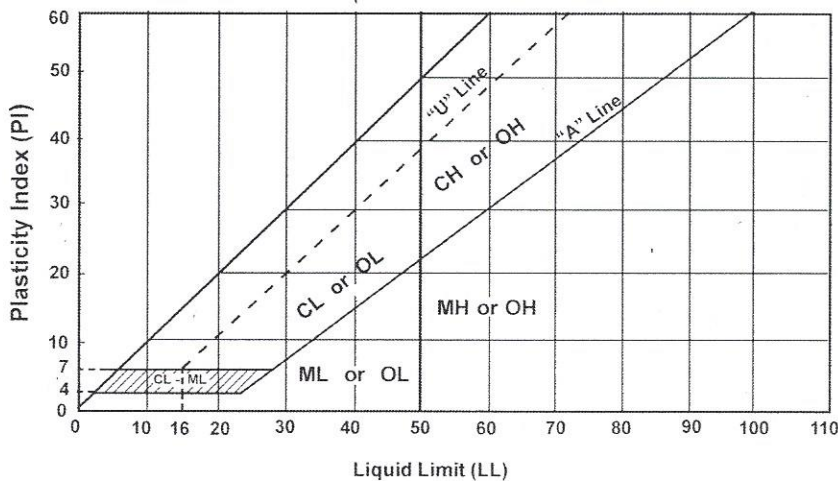
BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcf	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limit, %	ϕ	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf