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Final Drainage Report

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

El Paso County, Colorado

CDOT PROJECT NO. C040-042 (21233)

Wilson Project Number: 15-100-08-00

Prepared for:
El Paso County

Prepared by:
Wilson & Company, Inc.

Date Prepared: August 16, 2024
Revised: November 8, 2024

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ENGINEERS STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE: Vancel Fossinger, P.E.
Engineer of Record

Seal:

EL PASO COUNTY STATEMENT:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

_____ _____

County Engineer/ECM Administrator Date

Conditions:

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I. PROJECT INTRODUCTION

A. Purpose

This drainage report is intended to document the design of a storm sewer system along Struthers Road and North Gate Boulevard and a proposed Regional Permanent Water Quality (PWQ)/Full Spectrum Detention Pond to be located south of North Gate Boulevard, between I-25 Northbound and Southbound highways. This report will detail the hydrologic conditions in the area and demonstrate the proposed improvements conform with the requirements set forth in the City of Colorado Springs Drainage Criteria Manual (V1 & V2), and the Mile High Flood District (MHFD), previously the Urban Drainage and Flood Control District (UDFCD), Urban Storm Drainage Criteria Manual (V1, V2, &V3).

B. Project Description

The North Gate/ Struthers PWQ Pond project will construct a storm sewer system and a regional full spectrum detention basin. The storm sewer system will collect and convey surface runoff from approximately 53 acres in a network of pipes and inlets that will outfall into the proposed 6.8 acre-ft pond intended to provide water quality treatment and peak flow rate mitigation for the included watershed. The project will include nearly 3000 lineal feet of concrete pipe and will provide storm sewer connections for the larger existing subdivisions in the area. The watershed area is expected to undergo significant development in the near future and thus the project was designed to accommodate the known planned development to the extent practical.

C. Previous Investigations

The drainage memo titled "Struthers Road Roundabout – Hydrology & Hydraulic Documentation" dated June 26, 2018 was prepared for the now-complete Struthers Road Roundabout project located at the intersection of Struthers Road and Gleneagle Drive. This memo was drafted with the understanding that a full report would follow with the design and development of the future storm network and regional pond.

II. GENERAL LOCATION AND DESCRIPTION

A. Location

The project area is located within and nearby to the Interstate 25 (I-25)/North Gate Boulevard Interchange as shown on the Vicinity Map included in Appendix A.1. More specifically, the project area is spread between: the northeast ¼ quarter of the northeast ¼ of Section 12, Township 12 South, Range 67 West of the 6th Principle Meridian; the southwest ¼ of the southwest ¼ of Section 6, Township 12 South, Range 66 West of the 6th Principle Meridian; and the northwest ¼ of the

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northwest ¼ of Section 7, Township 12 South, Range 66 West of the 6th Principle Meridian, in El Paso County, Colorado.

B. Description of Site

The Project is located along Struthers Road and North Gate Boulevard. Portions of the project, including the proposed pond, are within a Colorado Department of Transportation (CDOT) easement for I-25 on land owned by the United States Air Force Academy (USAFA). North Gate Boulevard, east of the northbound I-25 ramps, has been recently annexed by the City of Colorado Springs. Struthers Road is located in unincorporated El Paso County.

The proposed pond will be located on the south side of North Gate Boulevard between I-25 Northbound and I-25 Southbound highways. The downstream toe of the small dam associated with the proposed pond will be located about 200 feet north of the north bank of adjacent Smith Creek. The proposed pond site is generally an open field with sparse native vegetation that thickens near Smith Creek. There is an existing drainage swale along the southern roadway edge of North Gate Boulevard on the north side of the pond site that conveys runoff to a water quality system located west of I-25 southbound. South of this swale, the terrain rises a few feet then slopes toward Smith Creek.

Wetlands and Prebles Meadow Jumping Mouse habitat have been identified along Smith Creek and have been addressed in an environmental assessment carried out for the project. The environmental assessment resulted in a finding of no significant impact for the project.

An existing 42" RCP storm sewer owned and maintained by CDOT originates in a manhole located along the north shoulder of North Gate Boulevard and extends through the western portion of the pond project area to outfall through an existing concrete headwall to Smith Creek. This storm sewer serves as an outfall for: 2 existing inlets located along the north shoulder of North Gate Boulevard; 1 inlet in the southbound I-25 east ditch just north of the North Gate Boulevard bridge; 2 inlets in the I-25 median north of North Gate Boulevard; and 2 inlets in the North Gate Boulevard raised median that have very marginal drainage areas. The watershed of the existing 42" RCP and associated design flow rates have been reduced through diversions to new facilities over time. The proposed pond is proposed to outfall to this existing storm sewer to utilize its available capacity and reduce project impacts to the sensitive areas along Smith Creek. The crown of the existing 42" pipe is well below the 100-year water surface elevation of Smith Creek at its outlet which results in the 100-year HGL for the pipe being above the ground surface for a short distance upstream of the creek. HGL calculations included in Appendix C.2 demonstrate that the pipe has adequate capacity to convey its existing flow plus the discharge from the pond without negative impacts to existing upstream inlets or the new pond outlet.

The storm sewer to be constructed with the project will be constructed in and adjacent to existing paved streets which contain numerous underground utilities. The project has been designed to

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minimize impacts to the existing facilities to the extent practical, but considerable removals, replacements and relocations of existing facilities will be needed prior to and during construction.

Soil data for the project area obtained from the National Resource Conservation Service (NCRS) indicates that that the soils throughout the watershed are classified as Hydrologic Soil Group "B" – Sandy Loams. The NRCS soil data is included in Appendix A.3.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

The City of Colorado Springs has annexed portions of the project site, including the pond area, and will maintain the pond and storm sewer in North Gate Boulevard following project completion. Thus, the applicable development criteria at this site will be criteria set forth by the City of Colorado Springs in the City of Colorado Springs Drainage Criteria Manual (V1 & V2). Additionally, the Urban Storm Drainage Criteria Manual (V1, V2, &V3) by Mile High Flood District (MHFD) was used as supplemental information. These manuals were used in the design of this project, with the City of Colorado Springs Manuals taking precedence in the event of any conflict.

B. Hydrological Criteria and Analysis

The City of Colorado Springs Drainage Criteria Manual (DCM) establishes that the 5-Year Storm Event serve as the minor storm event and the 100-Year storm event serve as the major storm event.

The Rational Method was used to calculate peak runoff rates for the design of the proposed project facilities. The MHFD UD-Rational 2.00 spreadsheet was used to calculate peak runoff rates from individual sub-basin and an Excel spreadsheet was used to combine and route peak flows from multiple sub-basins. One hour rainfall depths for storm frequencies of interest were obtained from the NOAA Atlas 14 precipitation server for the project area and were utilized in the calculations. The precipitation data, drainage basin map, and rational method calculations are included in Appendix B.

C. Hydraulic Criteria and Analysis

The proposed storm runoff collection and conveyance system was sized according to the City of Colorado Springs DCM. The 5-Year storm event was used for the minor storm design and the 100-Year storm event was used for the major storm design.

Drainage inlets were evaluated using the UD-Inlet_v4.05 spreadsheet from MHFD. A summary of the inlet analysis can be found in Appendix C.1. The velocity, hydraulic grade line and other design factors associated with the storm sewers associated with this project were analyzed using the AutoCAD Storm Sewers program. A summary of the storm sewer piping analysis can be found in Appendix C.2.

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D. Water Quality and Detention Pond Criteria and Analysis

The PWQ/ full spectrum detention basin was sized according to the City of Colorado Springs DCM.

The MHFD Detention Basin Design Workbook v4.04 was used in the design and analysis of the detention basin and outlet structure. Appendix C.4 includes worksheets associated with the analysis of the pond.

E. Waivers from Criteria

No waivers are requested at this time.

IV. DRAINAGE BASINS

A. Major Basin Description

This project area lies within the Smith Creek Drainage Basin. Smith Creek drains to Monument Creek approximately 0.5 miles west of the western portion of the project area.

Upstream of the USAFA, Smith Creek is mapped with a 100-year regulatory floodplain by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Map (FIRM) panel 08041C0290G, effective date December 7, 2018 includes the project area. As shown on the FIRM the detailed study and floodplain boundary concludes at the USAFA property boundary. A copy of the FEMA FIRM is included in Appendix A.2.

The Smith Creek Drainage Basin Planning Study (DBPS), JR Engineering, August 2002, analyzed the 100-year flood depths along Smith Creek including the reach adjacent to the project within USAFA property. Based on the FEMA mapping and DBPS analysis, the project area is outside of the 100-year floodplain associated with Smith Creek.

B. Sub-Basin Description

The watershed analyzed for the current project is shown on the basin map included in Appendix B.2. It covers 95.4 acres that were sub-divided into 18 logical sub-basins to provide peak flow rates at points of interest for the design of the project. 56.5 acres including Sub-Basins 1 through 14 and 16 are tributary to the proposed pond. Sub-Basin 15 includes 37.1 acres of I-25 corridor property that is tributary to the existing 42" storm sewer that traverses the median of I-25 that the pond will be located in and is proposed to serve as the outfall for the pond. Sub-Basin 17 includes 1.75 acres of land located west of the proposed pond that will be filled with the project to minimize soil export during construction. It was analyzed to quantify peak flow rates for design of erosion protection over a short, steepened area at the south end of the proposed fill.

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Overall, approximately 40 percent of the analyzed watershed is developed or is expected to be developed as commercial or residential property in the near future. The remaining 60 percent is associated with the I-25 and North Gate Boulevard roadway corridors and have mostly pervious, undeveloped surface cover.

Fully developed property was assigned impervious percentages reflecting the existing development. Properties under development were assigned impervious values based on the planned development for the property. More detailed descriptions of the analyzed sub-basins and proposed facilities are included in the following sections.

C. 4-Step Process and Erosion Control

The purpose of this project is to collect, convey and treat stormwater from existing developed areas. Treatment will occur in a new full spectrum detention pond in the median of I-25. The new collection and conveyance system will reduce erosion/sedimentation and shallow flooding in and adjacent to the developed area, and the pond will mitigate peak flow rates and provide water quality treatment through extended detention.

The project is discussed relative to the 4-Step Process below:

Step 1. Employ Runoff Reduction Practices: The amount of new impervious surfaces added by the project was limited to the amount needed to provide maintenance access, and line the forebay, low flow channel and outlet structure of the new pond. Though not formally accounted for, some stormwater will be infiltrated into soils below the pond bottom during events large enough to store water in the pond.

Step 2. Stabilize Drainageways: The project will reduce the amount of uncontrolled runoff entering Smith Creek upstream of I-25 and will mitigate peak flow rates released to Smith Creek downstream of I-25. These functions will have a positive effect on the stability of Smith Creek.

Step 3. Provide Water Quality Capture Volume: The project will provide extended detention of the water quality capture volume collected by the new storm sewer and runoff from the pond site in the new full spectrum detention pond.

Step 4. Consider Need for Industrial and Commercial BMPs: No new commercial or industrial sites are being developed with the project.

V. DRAINAGE FACILITY DESIGN

A. General Concept

The primary purpose of the project is to collect and convey surface runoff from the developed areas around Gleneagle Drive, Struthers Road, and North Gate Boulevard to the proposed regional PWQ

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pond which will provide water quality treatment and peak flow rate mitigation for the runoff. The proposed pond will be located along the south side of Northgate Boulevard between the I-25 northbound and I-25 southbound highways. The proposed detention facility is designed as a full spectrum facility. The pond will outfall to an existing 42" diameter CDOT storm sewer that outfalls to Smith Creek.

B. Specific Details

The current analysis for the storm sewer system began at existing inlets constructed for the recent Struthers Road Roundabout project. The inlets collect surface runoff from the upstream extents of the greater tributary basin. The following sections provides specific information on the analyzed sub-basins and existing and proposed drainage facilities as shown on the basin map included in Appendix B.2.

Basin 01: (Q_5 = 3.2 cfs, Q_{100} = 7.5 cfs) This basin consists of the southbound half of Gleneagle Drive beginning at Westchester Drive and terminating at curb inlet EX-02 on the northwest corner of the Gleneagle Drive and Struthers Road intersection. This basin is primarily impervious roadway but also includes some adjacent landscape that drains toward the roadway. This basin has an area of 1.23 acres. Flow is conveyed from Inlet EX-02 to inlet EX-03 via an 18" RCP.

Basin 02: (Q_5 = 0.8 cfs, Q_{100} = 1.8 cfs) Basin 02 consists of a small, landscaped area south of The Peoples Bank and north of the roundabout. This flow is collected at area inlet EX-01. This basin has an area of 0.25 acres. Flow is conveyed from Inlet EX-01 to inlet EX-03 via a 12" RCP.

Basin 03: (Q_5 = 1.1 cfs, Q_{100} = 2.6 cfs) Basin 03 consists of the northern corner of the intersection between Struthers Road and Gleneagle Drive. Along Gleneagle Drive, this basin extends to a point justdownstream of EX-02, and to a highpoint along the northbound side of Struthers Road. This basin drains to curb inlet EX-03. This basin has an area of 0.36 acres. Flow is conveyed from Inlet EX-03 (DP 1) to inlet EX-04 via a 24" RCP.

Basin 04*:* (Q_5 = 4.0 cfs, Q_{100} = 9.3 cfs) Basin 04 was determined by analyzing topographic information as well as the drainage map and report for Sun Mesa Townhomes. The basin includes the northbound side of Gleneagle Drive from approximately 130 ft north of the Sun Mesa Townhomes entrance drivecut to curb inlet EX-04 on the southeast corner of the Gleneagle Drive and Struthers Road intersection. Additionally, the basin includes a portion of the Sun Mesa Townhomes entry driveway. The surface of this basin is mostly impervious pavement with some landscape. This basin has an area of 1.78 acres. Flow is conveyed from Inlet EX-04 (DP 2) to inlet EX-05 via a 24" RCP.

Basin 05: (Q_5 = 20.4 cfs, Q_{100} = 55.6 cfs) This basin consists entirely of the Ridgepoint Apartments development. Runoff from this basin drains to the existing detention basin at the southern point of the property. The "Final Drainage Study and Erosion Control Plan for Ridge Point Apartment" as

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revised July 27, 1999, indicates the 100-year peak discharge from the pond to be 13.3 cfs. The current project will connect to the pond outlet pipe at a new manhole, MH-16. The new manhole will replace an existing manhole (EX MH-01). The current analysis assumes the peak 100-year discharge from the pond is 14 cfs. The existing pipe that currently conveys the pond discharge to an adjacent storm sewer system in North Gate Boulevard will be filled with flow fill and abandoned in place.

The total area for this basin is 11.94 acres. Runoff in manhole MH-16 (DP 5) will be conveyed to inlet IN-03 via a proposed 24" RCP.

Basin 06: (Q_5 = 2.6 cfs, Q_{100} = 6.0 cfs) This basin extends from downstream of inlet EX-04 to curb inlet EX-05. The basin includes the northbound side of Struthers Road and part of the roof runoff from the adjacent buildings. This basin has an area of 0.84 acres. Flow from Inlet EX-05 (DP 3) will be conveyed to EX MH-02 via an existing 24" RCP.

Basin 07: (Q_5 = 0.8 cfs, Q_{100} = 4.2 cfs) Basin 07 extends from downstream of curb inlet EX-05 to the proposed 10' Type R Inlet IN-01. The basin includes the northbound side of Struthers Road and a portion of the southbound side of Struthers Road near the intersection with the existing commercial driveway. Runoff from the northbound side of the roadway crosses to the southbound side at this intersection. This basin has an area of 0.43 acres. Flow collected in IN-01 will be conveyed to MH-14 (DP 4) and onto MH-11 via proposed 24" RCP.

Basin 07a: (Q_5 = 0.8 cfs, Q_{100} = 2.3 cfs) Basin 07a includes the area behind the sidewalk along northbound side of Struthers Road and a portion of the roof runoff from adjacent buildings. This basin has an area of 0.43 acres. Runoff flows along a swale behind the sidewalk and will be collected by a proposed Inlet Type D (IN-01A at DP 3.1).

In the pre-project condition, EX MH-02 outfalls to the surface through an existing 24" RCP (w/ FES) on the northwest side of Shepard Heights, the Ridgepoint Apartments entry driveway. The runoff flows under the driveway via the existing 24" RCP culvert (w/ FES) and discharges to an existing swale that continues southeast. The existing 100-yr headwater condition for entrance culvert overtops the adjacent curb and sidewalk.

To convey this runoff to the proposed PWQ pond, the existing storm sewer system that discharges from EX MH-02 will be connected to the upstream end of the existing 24" RCP Shepard Heights entrance culvert via a proposed Inlet Type D (IN-01A). The downstream end of the entrance culvert will be connected to the upstream end of the proposed storm sewer system using a manhole (MH-13). The existing entrance culvert has shallow ground cover and requires short lengths of proposed 24" RCP at the inlet and outlet of IN-01A to achieve connection to the existing storm sewer. Additionally, a proposed containment wall will be constructed adjacent to IN-01A to contain the 100-yr HGL at IN-01A, and allow for the flow from Basin 7a to be collected without overtopping the adjacent curb and sidewalk. See the storm sewer plan and profile sheets for the connection and containment wall details.

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While somewhat unconventional, this treatment was favored by El Paso County over reconstruction of the storm sewer through the intersection as it will reduce project costs, impacts to utilities, and impacts to the traveling public during construction.

***Basin 08**:* (Q_5 = 4.4 cfs, Q_{100} = 10.3 cfs) Basin 08 includes the northbound side of Struthers Road south of Basin 07. Runoff from the basin will be split between two collection points. The majority of the runoff (80%, Q_5 = 3.5 cfs, Q_{100} = 8.2 cfs) will be collected at proposed inlet IN-03 a 10′ Type R inlet on the end of the Struthers Road raised median along the north side of North Gate Boulevard. The remaining portion Q_5 = 0.9 cfs, Q_{100} = 2.1 cfs will be collected at an existing inlet in the small ditch along the eastern edge of Struthers Road near MH-16. The basin consists of mostly roadway surface runoff with some runoff contributed by the rooftops of adjacent buildings. This basin has an area of 1.47 acres. Runoff collected in the existing inlet will be conveyed to MH-16 in an existing storm sewer then conveyed to proposed IN-03 in a proposed 24″ RCP. Flow from proposed IN-03 (DP 6) will be conveyed to proposed MH-10 via a proposed 24″ RCP.

***Basin 09**:* (Q_5 = 1.9 cfs, Q_{100} = 4.3 cfs) Basin 09 is generally parallel to Basin 08 and includes the southbound side of Struthers Road. It extends from the downstream side of IN-01 south of Basin 07 to the proposed 10′ Type R inlet IN-02. This basin has an area of 0.60 acres. Runoff from the basin will be collected in IN-02 and will then be conveyed to MH-10 via a 18″ RCP.

The combined runoff in MH-10 (DP 7) will be conveyed south then west to proposed MH-08 through proposed MH-9 (DP 8) via a proposed 36″ RCP.

***Basin 10**:* (Q_5 = 42.7 cfs, Q_{100} = 96.4 cfs) Basin 10 has an area of 18 acres and encompasses the entire Academy Gateway and Academy Village area bounded to the north by a professional offices building, to the west by the I-25 Corridor, to the east by Struthers Road and to the south by North Gate Boulevard. This area is in varying degrees of development with some tracts having been fully developed while others remain fully undeveloped. The expectation however is that this area will be fully developed in time and so an impervious value of 95% was used to determine peak discharges. Currently this basin drains to an existing water quality and detention basin on the property that then outfalls to the North Gate Boulevard roadway surface.

The proposed storm sewer will connect to the existing pond outfall with proposed MH-15. Runoff will be conveyed from MH-15 to proposed MH-08 on the mainline of the new system via a proposed 36″ RCP. The combined runoff at MH-08 (DP 8) will then be conveyed west and southwest to proposed MH-04 through proposed MHs- 05, 06, and 07 via a proposed 48″ RCP including precast bends.

The connection stub for Basin 10, as well as the downstream system, is designed to accept unattenuated flow from the basin in the future (up to the rates calculated by the current study) as it is assumed that the existing pond may be removed, and its site re-developed.

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Basin 11: (Q_5 = 4.8 cfs, Q_{100} = 26.4 cfs) Basin 11 includes a portion of the Northgate Boulevard roadway, the southern perimeter of Academy Gateway, and a portion of the I-25 corridor located north of North Gate Boulevard. This basin drains to an existing culvert located under the I-25 on-ramp north of the North Gate roundabout. Runoff conveyed by the culvert discharges to the small gore area between on-ramps and is then collected by a type C inlet in the gore area (DP 10) along with runoff from Basin 13. Runoff collected in the type C inlet is conveyed through an existing 30" concrete pipe beneath the western leg of the on-ramp to existing type D area inlet (DP 11) located at the NW corner of the North Gate roundabout and western I-25 on-ramp. This basin has an area of 9.54 acres.

Basin 12: (Q_5 = 1.2 cfs, Q_{100} = 11.8 cfs) Basin 12 contains a portion of the I-25 corridor located north of North Gate Boulevard. Runoff generally flows overland to the southeast in broad grassed swales to the existing type D inlet (DP 11) located at the northwest corner of existing North Gate roundabout. Runoff from Basin 12 and routed runoff from Basins 11 and 13 is conveyed from the existing inlet though an existing 29" x 45" elliptical RCP culvert that discharges to a surface swale to Smith Creek at the SW corner of the roundabout in the pre-project condition. The current project will connect the existing culvert to the new storm sewer system at proposed MH-03 (DP 12). This basin has an area of 5.46 acres.

Basin 13: (Q_5 = 1.0 cfs, Q_{100} = 2.6 cfs) Basin 13 consists of drainage from a portion of North Gate Boulevard roundabout and adjacent gore area between on-ramps. This area drains to an existing type C inlet (DP 10) in the small gore area. Runoff collected in the inlet is conveyed west as discussed above under Basin 11. This basin has an area of 0.43 acres.

Basin 14: (Q_5 = 1.3 cfs, Q_{100} = 3.4 cfs) Basin 14 encompasses the rest of Northgate Boulevard east of the existing roundabout and surface flows southeast of the roundabout. Runoff flows to the southern roundabout gore and into proposed area inlet IN-04 that will replace the previous inlet in that location. Proposed inlet IN-04 will connect to the proposed storm sewer via an 18" RCP at proposed MH-04 (DP 9). Then combined flow at MH-04 will then be conveyed to MH-03 (DP 12) via a proposed 48" RCP. This basin has an area of 0.50 acres. After all flows reach MH-03, they will then be conveyed by approximately 950 linear feet of 48" RCP to the forebay of the proposed pond (DP13).

Basin 15: (Q_5 = 4.5 cfs, Q_{100} = 63.9 cfs) Basin 15 represents the existing watershed of the existing 42" RCP CDOT storm sewer that runs through the project pond site to Smith Creek just west of the proposed pond. This 42" storm sewer is proposed as the outfall for the proposed pond. The basin was defined through topographic information, site investigation, and review of CDOT plans. The basin is nearly all grass covered and un-paved. Runoff from the small amount of paved area discharges via grass lined swales containing riprap check structures to the inlets on the existing storm sewer system. Runoff collected in existing storm sewer system will be conveyed south through the 42" RCP to proposed manhole MH-17 (DP 14) to be constructed on the existing pipe to provide a junction for the

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proposed pond discharge. The combined flow will then be conveyed to Smith Creek via the existing 42" RCP. This basin has an area of 37.09 acres.

Basin 16: (Q_5 = 0.7 cfs, Q_{100} = 10.0 cfs) Basin 16 represents the local basin of the proposed pond. Runoff from the basin will combine with routed runoff from Basins 1 through 14 to represent the total inflow to the pond at DP-13 (Q_5 = 50.0 cfs, Q_{100} = 145.3 cfs). This basin has an area of 3.15 acres.

Basin 17: (Q_5 = 0.1 cfs, Q_{100} = 3.6 cfs) Basin 17 includes the area between the southbound I-25 highway pavement and the proposed pond that will discharge to a proposed riprap lined rundown to mitigate erosion of the transition slope between the proposed fill area west of the pond and the existing grade downstream. The proposed 40' long rundown will be a trapezoidal section 1' deep, with a bottom width of 6' and 4:1 side slopes constructed using an 18" thick lining of Type L soil riprap. Runoff from this area will be collected and conveyed to the rundown in a broad swale constructed in the fill area. This basin has an area of 1.75 acres.

Table 5-1 below summarizes the basin hydrologic information.

Table 5-1 Hydrologic Data Summary

Basin ID	Area (ac)	Peak Discharge (cfs)		Description
		Q5-YR	Q100-YR	
1	1.23	3.2	7.5	Gleneagle North
2	0.25	0.8	1.8	People's Bank
3	0.36	1.1	2.6	Gleneagle South
4	1.78	4.0	9.3	Ridgepoint Homes
5	11.94	20.4	55.6	Struthers North
6	0.84	2.6	6.0	Struthers Middle
7	0.56	1.8	4.2	Struthers Southeast
7a	0.43	0.8	2.3	Struthers Southeast
8	1.47	4.4	10.3	Struthers Southwest
9	0.60	1.9	4.3	North Gate East
10	18.00	42.7	96.4	Academy Gateway
11	9.54	4.8	26.4	I-25 NB Onramp
12	5.46	1.2	11.8	I-25 NB Onramp Gore
13	0.43	1.0	2.6	I-25 NB Onramp West
14	0.50	1.3	3.4	I-25 NB Offramp Gore
15	37.09	4.5	63.9	I-25 -42" RCP Storm Sewer Basin
16	3.15	0.7	10.0	Proposed Pond Area
17	1.75	0.1	3.6	Area West of Proposed Pond

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Full Spectrum Detention/PWQ Pond :

The proposed detention pond is designed as a full spectrum, extended detention basin and will store the WQCV, EURV, and 100-Year required volumes and release them at a controlled rates via outlet controls to a proposed 36" RCP that will outfall to the existing 42" RCP that outfalls to Smith Creek. The UD-Detention Spreadsheet was used to analyze and design the pond volume and outlet structure. The spreadsheet calculates pre-development flow rates for the input watershed based on soil type and watershed area and compares them to proposed discharge rates for 2, 5, 10, 25, 50 and 100-year events. The spreadsheet also calculates developed condition inflow hydrographs based on watershed area, soil type, impervious area, average basin slope, and basin length and centroid length parameters. The centroid length was shortened to raise the peak flow rate of the spreadsheet inflow 100-year hydrograph to reasonably compare to the 100-year peak rate of the pond inflow determined through the rational method analysis.

The proposed pond watershed will be 56.54 acres in size and is assumed to have a 65% impervious area when fully developed. Peak inflow rates to the pond (DP 13) were calculated at Q_5 = 50.0 cfs and Q_{100} = 145.3 cfs through the rational analysis. The calculated developed condition discharges from the pond in the 2 though 100-year events will be at ratios of 0.5 through 1 as compared to pre-development rates. Two analyses were done for the pond, one assuming the outlet structure grate is completely unclogged, and the other assuming a 50% clogged condition. Unless otherwise noted, the results presented in the remainder of this report are for the 0% clogged condition. The results are as follows:

Table 5-2 Outlet Structure Clogging Analysis Comparison

100 Year Event	Peak Outflow (cfs)	Max. Ponding Depth (ft)	Max. Volume Stored (ac-ft)
0% Clogged	44.8	9.11	6.795
50% Clogged	45.3	9.30	7.085

The proposed outlet structure for the pond will consist of a 7'x6' square cast in place reinforced concrete box with a top grate sloped at 4:1. The front of the box will include a slot through the concrete fitted with a trash rack on the front wall face and a steel plate on the back wall face. The trash rack and slot will extend to the bottom of the 2.5' deep micro-pool to be constructed in front of the concrete outlet. Rectangular orifices will be cut in the steel plate as described below. The proposed 36" RCP outfall pipe for the structure will have a rectangular steel restrictor plate set 16.5" above the invert. The proposed outfall pipe will drain to a proposed manhole that will connect the pond system to an existing 42" CDOT storm sewer pipe (see description below).

The Water Quality Capture Volume of 1.198 acre-feet is set to drain in 45 hours. The WQCV will drain through 3 -2.64 sq. inch rectangular holes in the orifice plate with 1.25' vertical spacing. The excess

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urban runoff volume (EURV) of 4.017 acre-feet will be stored below the overtopping elevation of the outlet structure. It is set to drain in 61 hours through a single 6.5″ wide by 10″ high rectangular orifice, and the lower, smaller orifices described above.

The facility will adequately treat the runoff from the tributary area and no significant adverse impacts to the creek are anticipated. Runoff planned to be routed through the proposed pond and released Smith Creek is tributary to Smith Creek upstream of the proposed discharge point in the pre-project condition. Runoff routed through the pond will have enhanced water quality and the discharge rates to the creek will be controlled. Utilizing the existing 42″ storm sewer to convey pond discharge to the creek will minimize disturbances to the habitat adjacent to the creek.

Existing 42″ Storm Sewer Outfall:

As noted in previous sections, a 42″ RCP CDOT storm sewer that outfalls to Smith Creek exists adjacent to the west side of the proposed pond and is proposed to serve as an outfall and conveyance for discharge from the proposed pond.

Based on CDOT as-built plans, topographic mapping, and site investigation, the watershed that the CDOT 42″ storm sewer system originally drained has been reduced through the modification made through subsequent projects. The most significant change appears to have occurred with the I-25 widening project completed in 2014. That project removed the tributary area west of southbound I-25, the south side of North Gate Boulevard and likely some area east of the I-25 northbound on-ramps. The analysis done for this study indicates that the existing pipe has adequate capacity to accept the proposed pond discharge without negatively impacting the system's ability to drain the watershed that is currently tributary to it.

The current analysis included: defining the existing tributary area; calculating peak runoff rates from the tributary area (Sub-basin 15); determining combined 100-year peak rates in the 42″ pipe at and downstream of the junction with the proposed pond outfall (DP 14); and calculating a 100-year hydraulic grade line for the existing 42″ pipe and proposed pond outfall at the calculated combined peak 100-year rates.

A graphic was generated to aid in the determination of the peak flow rate in the 42″ pipe at the junction with the pond outfall. The outflow hydrograph for the pond was plotted along with a plot of rational method generated peak flow rates based on intensities for times of concentration corresponding to times of interest in the pond outflow hydrograph. This graphic is shown in Figure 5-1 below.

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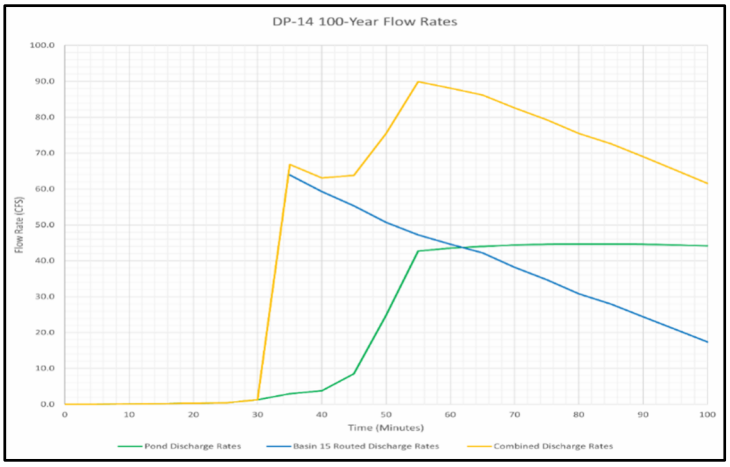

Figure 5-1

As indicated by the Figure 5-1, significant discharge from the pond will occur well after the peak of the local watershed (Sub-Basin 15) contributing to the existing 42" pipe. The combined peak flow in the system will occur once the pond outlet structure is overtopped and significant flow is discharged from the pond. The 100-year peak of the combined flow has been estimated at 90 cfs with 43 cfs coming from the pond and 47 cfs coming from the watershed of the existing system. For comparison, the individual 100-year peak rates are 45 and 64 cfs for the pond outflow and storm sewer watershed, respectively.

HGL calculations were done for the existing 42" pipe and proposed pond outfall structure using the Hydraflow program. The starting HGL at Smith Creek was set at elevation 6662.1 based on the HGL for Smith Creek presented in the Smith Creek DBPS. The analysis indicates that the addition of the discharge from the pond will not hinder the function of the existing 42" pipe to drain its existing watershed. Additionally, calculations indicate that the 100-yr backwater through the proposed 36" RCP will not adversely affect the function of the proposed pond outlet structure. Therefore, these analyses indicate that the 42" pipe can serve as a satisfactory outfall for the pond.

The existing 42" pipe at the discharge point to Smith Creek is covered by a screen (see photo below). The purpose and intent of the screen is unknown, but it appears to have been in place for a long time and has the potential to collect trash and clog the storm sewer and create un-reasonable head losses. El Paso County and CDOT have agreed that the screen should be removed with the project to reduce flow resistance and decrease the potential for sedimentation in the storm sewer.

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Existing 42" RCP Outfall to Smith Creek

Ground water investigations in the pond footprint indicate that, without mitigation, the water table would be above the pond invert in a portion of the pond. A 6" pipe under-drain will be constructed around a portion of the eastern and northern pond banks to lower the water table to below the pond bottom. The under-drain will discharge to the existing 42" RCP CDOT storm sewer on the western side of the pond that will also serve as the outfall for the pond. A groundwater report that documents the investigation into this issue and modeling of potential solutions is attached in Appendix D of this report.

Though the tailwater present at Smith Creek would provide significant energy dissipation and the nature of the existing storm sewer tributary area and proposed full spectrum pond discharge are such that significant discharge from the existing 42" outfall pipe will be very infrequent, USAFA and El Paso County have requested the installation of outlet protection at Smith Creek. The proposed 16' long riprap apron will be 7' wide at the headwall and 13' wide at the downstream end and constructed using an 18" thick layer of Type L soil riprap. Transitions to existing ground will be at 3:1 slopes. Disturbed and regraded soil will be planted with willow stakes and a wetland seed mix for stabilization. See the plan set for further information.

VI. SUMMARY

A. Compliance with Standards

This drainage report has been prepared in accordance with the criteria in the City of Colorado Springs Drainage Criteria Manual (V1 & V2). Additionally, the Urban Storm Drainage Criteria Manual (V1, V2, &V3) by MHFD was used as supplemental information. No variances have will be requested at this time.

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B. Drainage Concept

The proposed drainage facilities are designed to comply with the criteria listed above. The design will maintain existing drainage patterns to the extent possible and will effectively and safely convey the stormwater to the receiving structures downstream and ultimately to Smith Creek.

C. Erosion Control Plan

Complete construction drawings will be submitted with this Final Drainage Report. Additionally, the grading and erosion control plan and report will also be submitted.

D. Floodplain Statement

No portion of this site is located within a FEMA regulatory floodplain as shown on FEMA Flood Insurance Rate Map (FIRM) panel 08041C0290G, effective date December 7, 2018.

VII. REFERENCES

1. *Drainage Criteria Manual, Volumes I & II,* City of Colorado Springs, January 2021.

2. *Urban Storm Drainage Criteria Manual, Volumes I, II, III*, Urban Drainage and Flood Control District, Updated August 2108.

3. *FEMA, FIRM Panel Map No. 08041C0290G,* December 7, 2018

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APPENDIX A –
Reference Information

A.1 – Vicinity Map

A.2 – FEMA FIRM

A.3 – NRCS Soil Report Data

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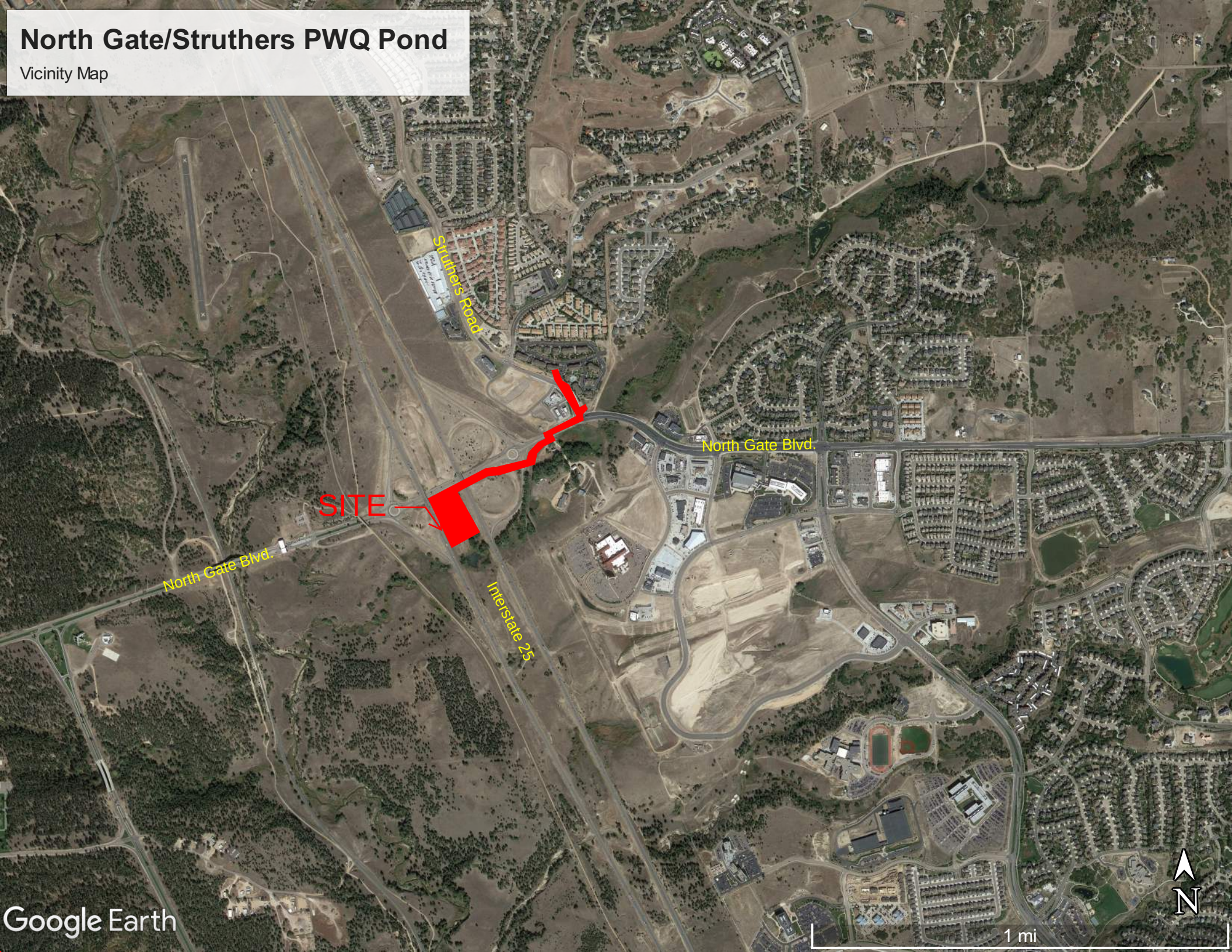
A.1
VICINITY MAP

North Gate/Struthers PWQ Pond

Vicinity Map



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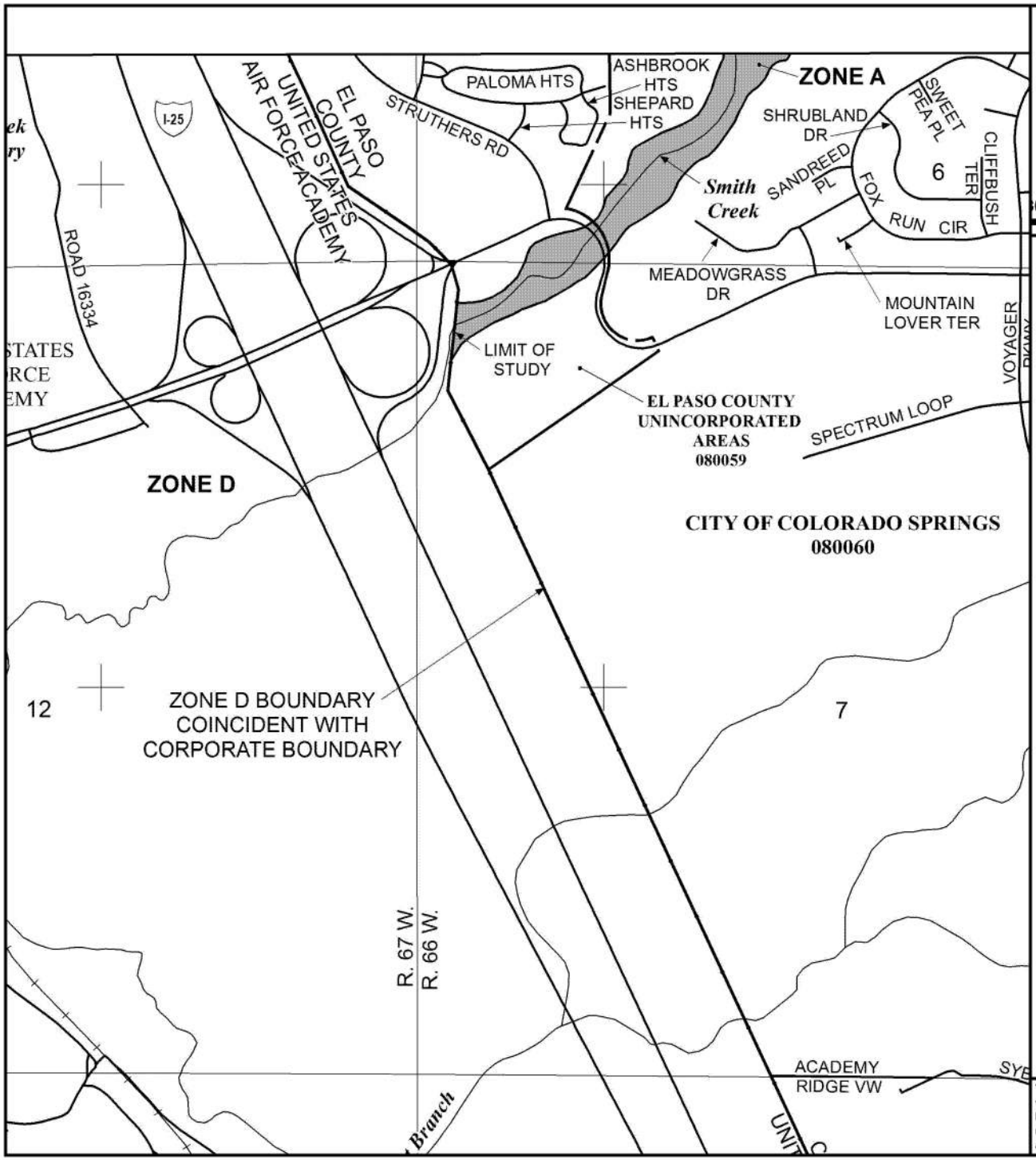
A.2
FEMA FIRM



MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

PANEL 0290G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 290 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0290	G
EL PASO COUNTY	080059	0290	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0290G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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A.3
NRCS SOIL REPORT

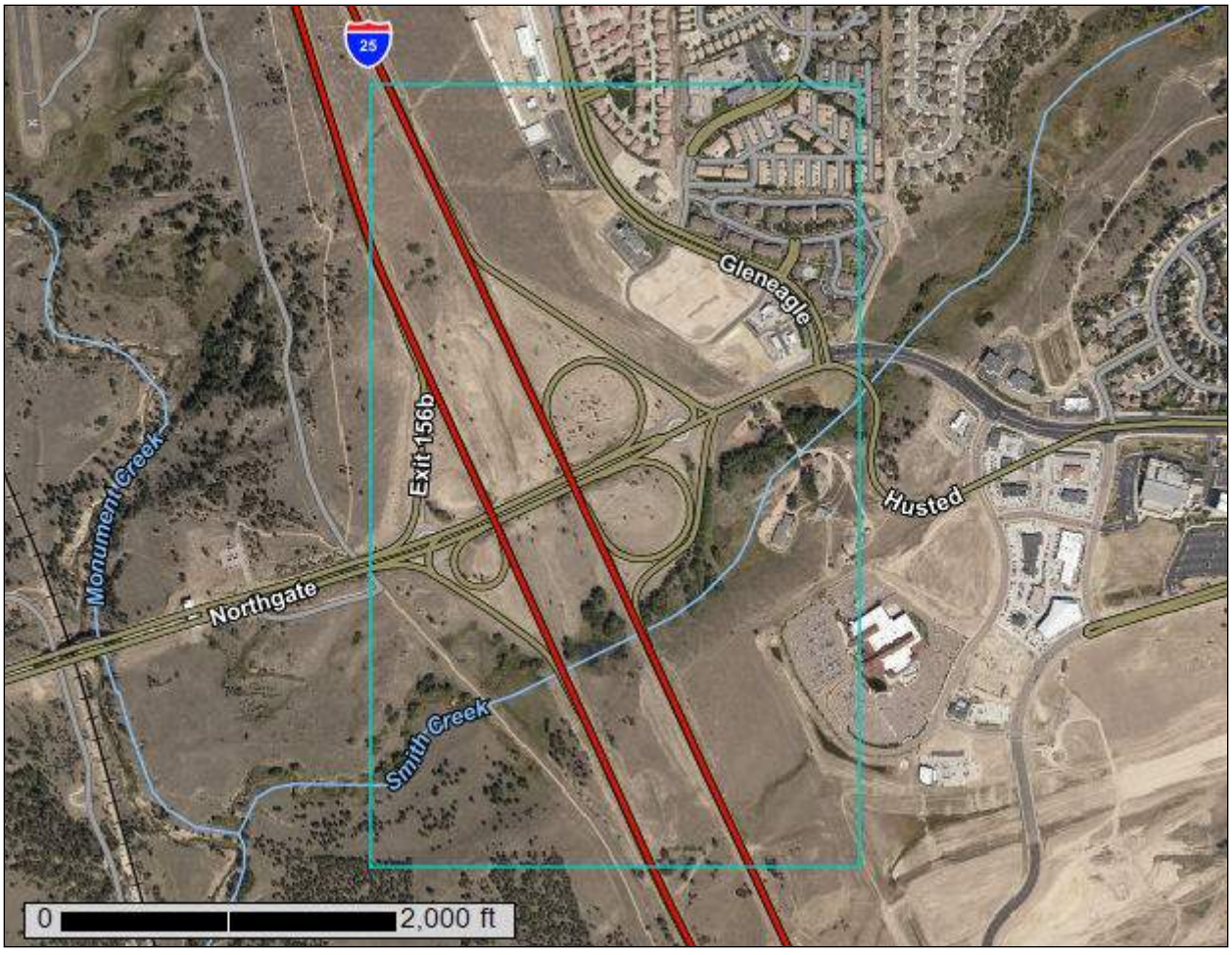
United States Department of Agriculture

NRCS

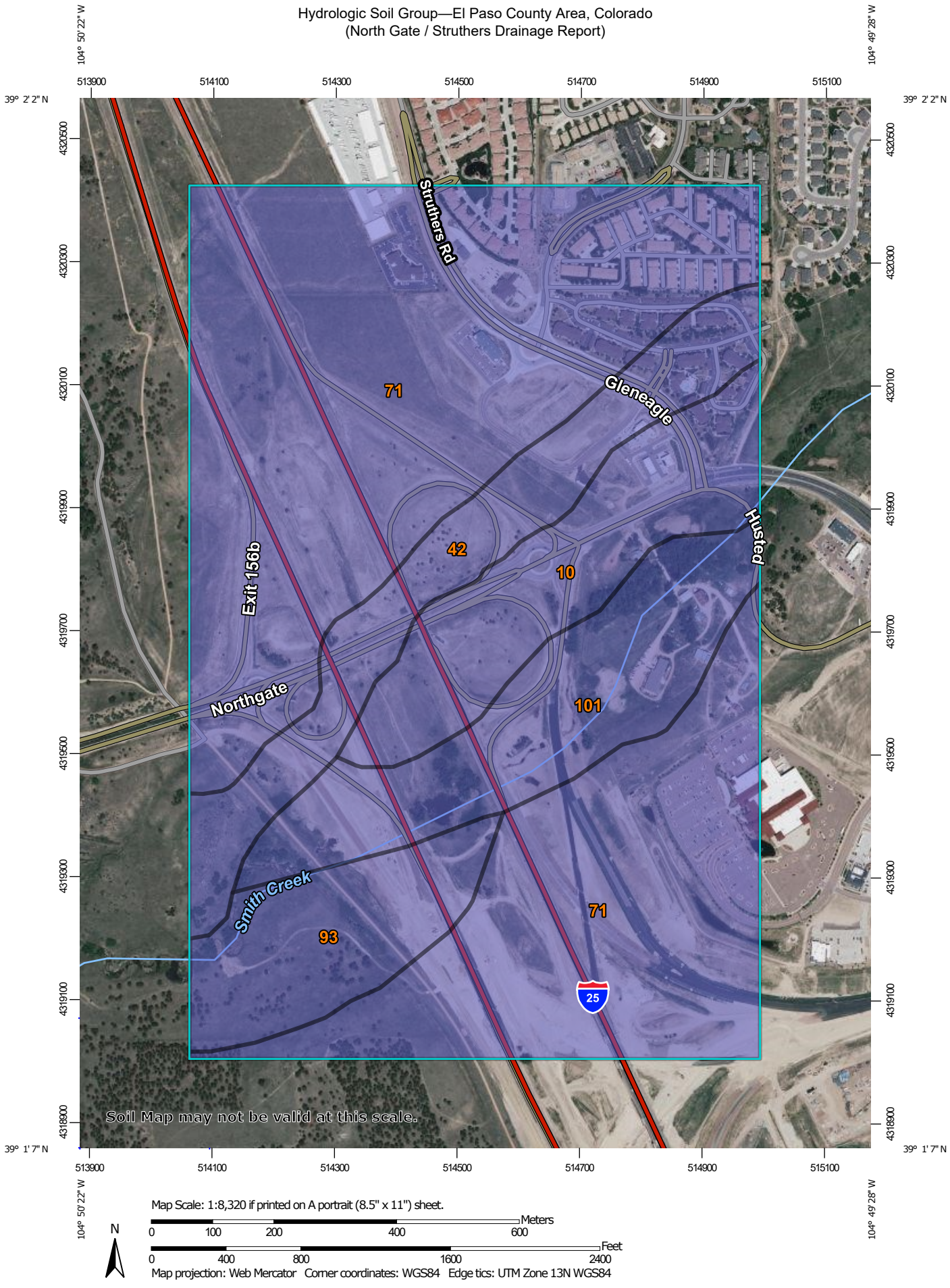
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



Hydrologic Soil Group—El Paso County Area, Colorado
(North Gate / Struthers Drainage Report)



Map Scale: 1:8,320 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	B	34.5	10.5%
42	Kettle-Rock outcrop complex	B	34.5	10.5%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	194.3	59.2%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	25.5	7.8%
101	Ustic Torrifluvents, loamy	B	39.5	12.0%
Totals for Area of Interest			**328.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

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

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

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX B – HYDROLOGIC ANALYSIS

B.1 – NOAA Precipitation Data

B.2 – Drainage Basin Map

B.3 – Rational Method Peak Rate Calculations

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B.1
NOAA PRECIPITATION DATA

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0304°, Longitude: -104.8299°
Elevation: 6778.27 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.229** (0.187-0.279)	**0.288** (0.236-0.352)	**0.388** (0.317-0.475)	**0.475** (0.385-0.584)	**0.599** (0.470-0.765)	**0.698** (0.534-0.901)	**0.801** (0.591-1.06)	**0.909** (0.642-1.23)	**1.06** (0.717-1.47)	**1.17** (0.773-1.65)
10-min	**0.335** (0.275-0.409)	**0.421** (0.345-0.515)	**0.568** (0.464-0.696)	**0.695** (0.564-0.855)	**0.876** (0.688-1.12)	**1.02** (0.782-1.32)	**1.17** (0.866-1.55)	**1.33** (0.940-1.80)	**1.55** (1.05-2.15)	**1.72** (1.13-2.41)
15-min	**0.408** (0.335-0.498)	**0.514** (0.421-0.628)	**0.693** (0.565-0.849)	**0.847** (0.687-1.04)	**1.07** (0.839-1.37)	**1.25** (0.954-1.61)	**1.43** (1.06-1.89)	**1.62** (1.15-2.20)	**1.89** (1.28-2.62)	**2.09** (1.38-2.94)
30-min	**0.570** (0.467-0.696)	**0.717** (0.587-0.876)	**0.966** (0.789-1.18)	**1.18** (0.958-1.45)	**1.49** (1.17-1.90)	**1.74** (1.33-2.24)	**1.99** (1.47-2.63)	**2.26** (1.60-3.06)	**2.63** (1.79-3.66)	**2.92** (1.93-4.10)
60-min	**0.739** (0.606-0.902)	**0.904** (0.740-1.10)	**1.20** (0.975-1.46)	**1.46** (1.18-1.79)	**1.85** (1.46-2.38)	**2.18** (1.67-2.83)	**2.53** (1.87-3.36)	**2.91** (2.06-3.95)	**3.44** (2.34-4.79)	**3.87** (2.55-5.43)
2-hr	**0.909** (0.749-1.10)	**1.09** (0.898-1.32)	**1.42** (1.17-1.73)	**1.74** (1.42-2.12)	**2.21** (1.77-2.84)	**2.62** (2.03-3.39)	**3.06** (2.29-4.06)	**3.55** (2.54-4.81)	**4.24** (2.91-5.89)	**4.81** (3.19-6.71)
3-hr	**1.02** (0.843-1.23)	**1.20** (0.989-1.45)	**1.54** (1.27-1.86)	**1.87** (1.53-2.27)	**2.40** (1.93-3.09)	**2.86** (2.23-3.70)	**3.37** (2.53-4.46)	**3.94** (2.83-5.34)	**4.76** (3.29-6.61)	**5.45** (3.63-7.57)
6-hr	**1.22** (1.02-1.46)	**1.41** (1.17-1.69)	**1.79** (1.48-2.15)	**2.17** (1.78-2.61)	**2.78** (2.26-3.57)	**3.33** (2.62-4.30)	**3.95** (2.99-5.20)	**4.64** (3.36-6.26)	**5.65** (3.93-7.81)	**6.50** (4.36-8.98)
12-hr	**1.45** (1.21-1.72)	**1.68** (1.41-2.00)	**2.14** (1.78-2.55)	**2.58** (2.14-3.09)	**3.29** (2.68-4.18)	**3.92** (3.09-5.00)	**4.61** (3.51-6.01)	**5.38** (3.92-7.19)	**6.50** (4.55-8.90)	**7.43** (5.02-10.2)
24-hr	**1.70** (1.43-2.00)	**2.00** (1.68-2.35)	**2.55** (2.13-3.01)	**3.06** (2.55-3.63)	**3.85** (3.14-4.82)	**4.53** (3.59-5.72)	**5.27** (4.03-6.80)	**6.08** (4.45-8.04)	**7.24** (5.09-9.82)	**8.19** (5.58-11.2)
2-day	**1.97** (1.67-2.31)	**2.33** (1.97-2.72)	**2.96** (2.49-3.47)	**3.53** (2.96-4.16)	**4.39** (3.59-5.42)	**5.11** (4.06-6.37)	**5.88** (4.51-7.50)	**6.71** (4.94-8.79)	**7.89** (5.58-10.6)	**8.85** (6.06-12.0)
3-day	**2.15** (1.83-2.50)	**2.53** (2.15-2.95)	**3.20** (2.70-3.74)	**3.80** (3.20-4.46)	**4.71** (3.86-5.77)	**5.46** (4.36-6.77)	**6.26** (4.82-7.95)	**7.12** (5.26-9.28)	**8.34** (5.92-11.2)	**9.33** (6.42-12.6)
4-day	**2.30** (1.96-2.66)	**2.69** (2.29-3.12)	**3.38** (2.87-3.94)	**4.01** (3.38-4.68)	**4.94** (4.06-6.04)	**5.72** (4.57-7.07)	**6.55** (5.06-8.29)	**7.44** (5.51-9.66)	**8.70** (6.19-11.6)	**9.71** (6.70-13.1)
7-day	**2.68** (2.30-3.09)	**3.10** (2.65-3.57)	**3.83** (3.26-4.43)	**4.50** (3.81-5.22)	**5.49** (4.53-6.67)	**6.32** (5.08-7.76)	**7.20** (5.59-9.06)	**8.15** (6.07-10.5)	**9.50** (6.80-12.6)	**10.6** (7.35-14.2)
10-day	**3.03** (2.60-3.48)	**3.48** (2.98-4.00)	**4.26** (3.64-4.91)	**4.97** (4.22-5.75)	**6.02** (4.98-7.27)	**6.89** (5.56-8.42)	**7.82** (6.09-9.79)	**8.81** (6.58-11.3)	**10.2** (7.33-13.5)	**11.3** (7.90-15.1)
20-day	**4.03** (3.48-4.58)	**4.61** (3.98-5.26)	**5.61** (4.82-6.41)	**6.47** (5.53-7.43)	**7.71** (6.39-9.18)	**8.71** (7.05-10.5)	**9.74** (7.62-12.1)	**10.8** (8.12-13.8)	**12.3** (8.89-16.1)	**13.5** (9.47-17.9)
30-day	**4.84** (4.19-5.48)	**5.55** (4.80-6.30)	**6.73** (5.81-7.66)	**7.73** (6.63-8.83)	**9.12** (7.57-10.8)	**10.2** (8.28-12.2)	**11.3** (8.86-13.9)	**12.4** (9.35-15.7)	**14.0** (10.1-18.1)	**15.1** (10.7-20.0)
45-day	**5.85** (5.09-6.60)	**6.72** (5.84-7.59)	**8.12** (7.03-9.20)	**9.27** (7.98-10.5)	**10.8** (8.99-12.7)	**12.0** (9.75-14.3)	**13.2** (10.3-16.0)	**14.3** (10.8-18.0)	**15.9** (11.5-20.4)	**17.0** (12.0-22.3)
60-day	**6.71** (5.85-7.54)	**7.70** (6.71-8.67)	**9.28** (8.05-10.5)	**10.5** (9.10-11.9)	**12.2** (10.2-14.2)	**13.5** (11.0-15.9)	**14.7** (11.5-17.8)	**15.8** (11.9-19.7)	**17.3** (12.6-22.2)	**18.4** (13.0-24.1)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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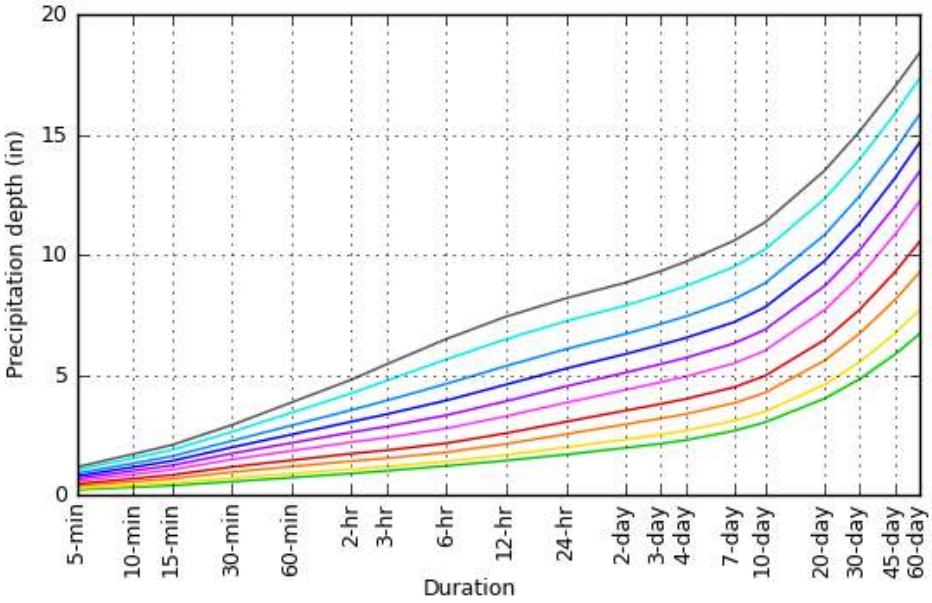
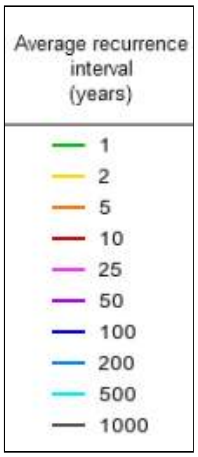
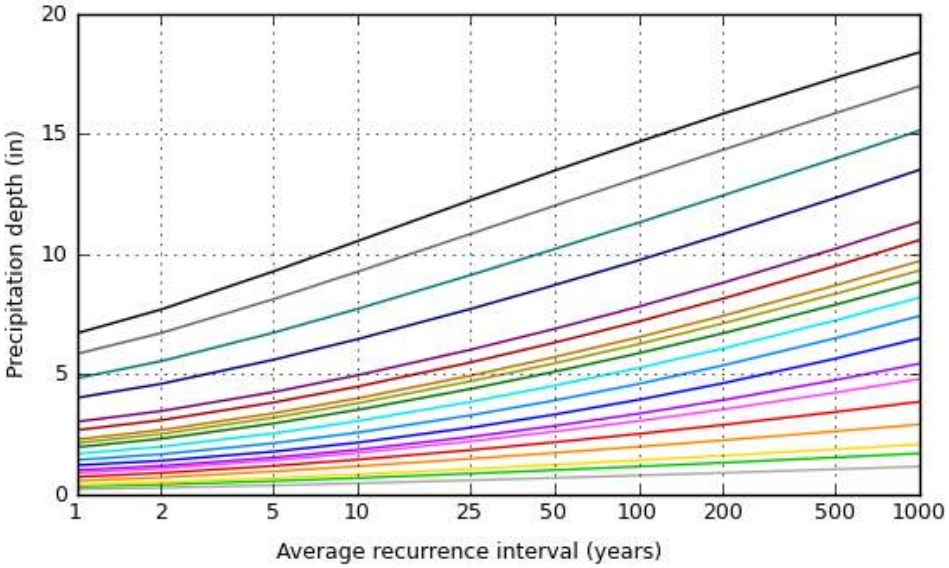
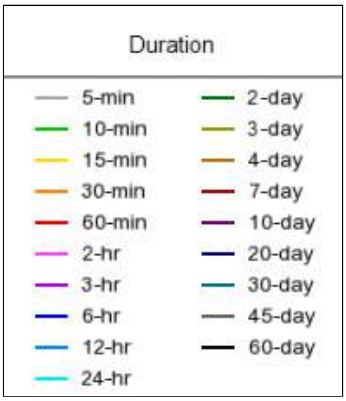
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.0304°, Longitude: -104.8299°









NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Apr 21 16:59:24 2021

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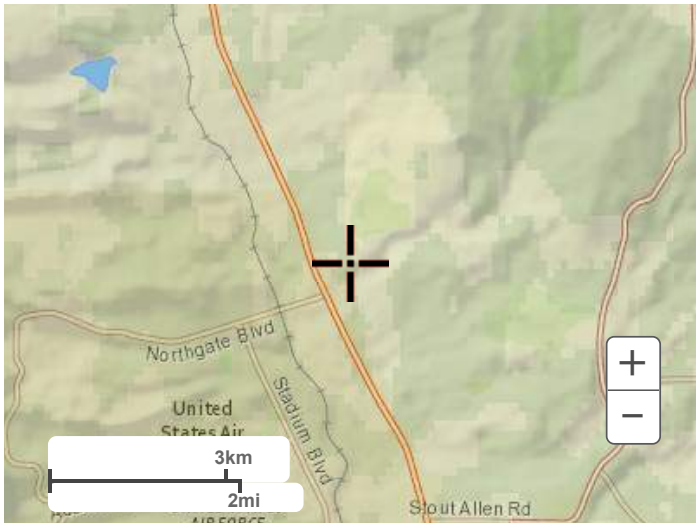
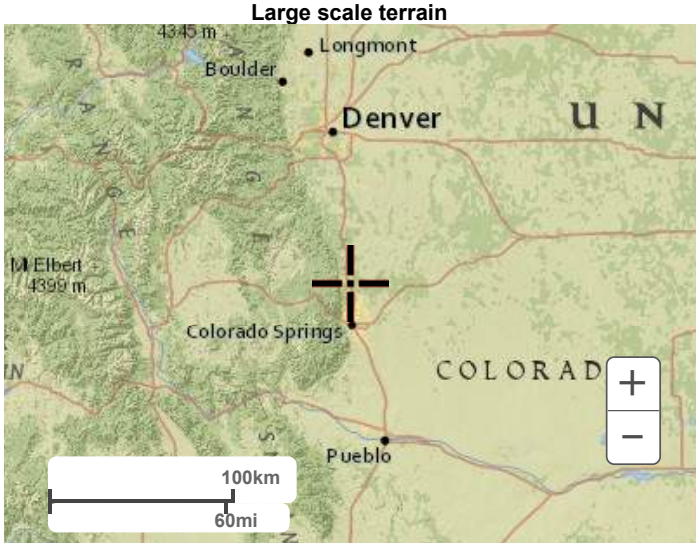
Maps & aerials

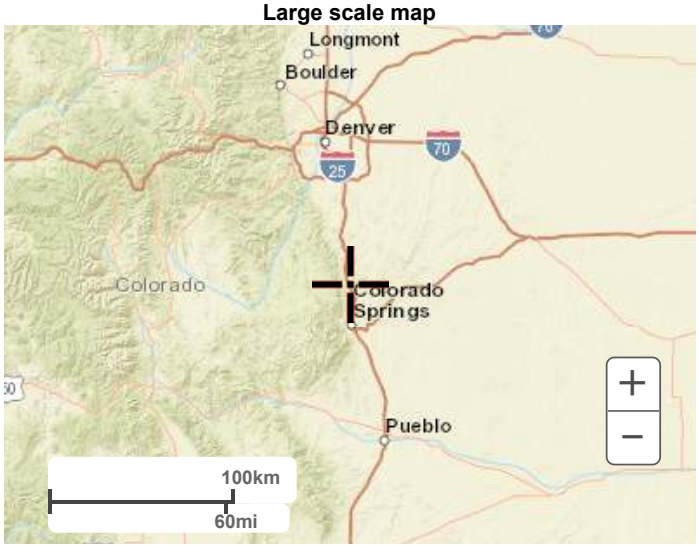
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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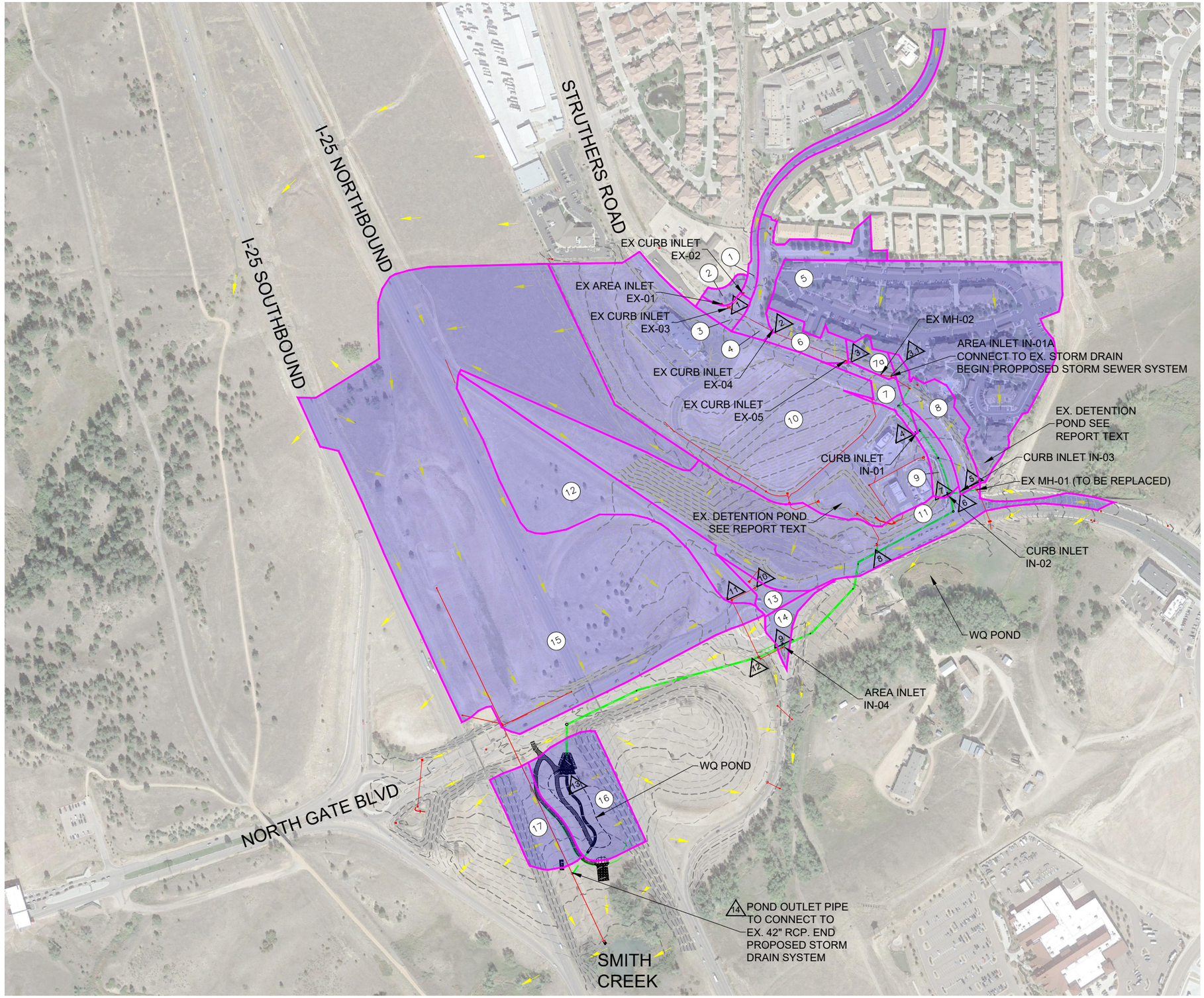
B.2
DRAINAGE BASIN MAP



LEGEND

- (4) Drainge Basin ID
- △4 Storm Sewer Design Point ID
- Existing Storm Sewer
- Proposed Storm Sewer
- Surface Flow Direction

Design Point Summary		
ID	Q5	Q100
	cfs	cfs
1	4.8	11.2
2	8.1	18.9
3	9.8	22.9
3.1	10.3	24.5
4	11.5	27.2
5	4.7	15.8
6	7.3	21.8
7	19.5	50.4
8	58.8	139.1
9	59.1	140.1
10	5.4	28.3
11	6.0	36.6
12	51.1	143.5
13	50.0	145.3
14	5.6	89.9

N

0 200' 400'

STRUTHERS AND NORTH GATE WATER QUALITY POND PROJECT - BASIN MAP

WILSON & COMPANY

WILSON &COMPANY
5755, Mark Dabling Blvd, Ste.100
Colorado Springs, CO 80919
719-520-5800 phone
719-520-0108 fax

B.3
RATIONAL METHOD PEAK RATE CALCULATIONS

Designer: Fossinger
Company: Wilson & Company
Date: 8/4/2024
Project: Struthers PWQ Pond
Location: USAFA

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Computed } t_c = t_i + t_t$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

D location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (

	2-yr	5-yr	100-yr
1-hour rainfall depth, P1 (in) =	0.90	1.20	2.53

	a	b
Rainfall Intensity Equation Coefficients =	28.50	10.00

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)			Peak Flow, Q (cfs)		
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
1	1.23	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	23.00	6816.00	6815.00	0.044	1.78	1406.00	6815.00	6774.36	0.029	20	3.40	6.89	8.68	17.08	8.68	2.58	3.4	7.2	2.3	3.2	7.5
2	0.25	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	33.00	6776.00	6775.00	0.030	2.42	120.00	6775.00	6772.00	0.025	10	1.58	1.27	3.69	11.29	5.00	3.07	4.1	8.6	0.6	0.8	1.8
3	0.36	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	41.00	6777.00	6774.50	0.061	2.14	104.00	6774.50	6774.05	0.004	20	1.32	1.31	3.45	11.92	5.00	3.07	4.1	8.6	0.8	1.1	2.6
4	1.78	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	100.00	6784.00	6783.00	0.010	6.06	742.00	6783.00	6772.11	0.011	18	1.88	6.59	12.65	16.19	12.65	2.22	2.9	6.2	2.9	4.0	9.3
5	11.94	B	70.0	0.55	0.58	0.62	0.69	0.72	0.75	0.79	182.00	6782.00	6775.00	0.038	8.10	1135.00	6775.00	6727.00	0.042	20	4.11	4.60	12.70	18.99	12.70	2.21	2.9	6.2	14.6	20.4	55.6
6	0.84	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	132.00	6776.00	6770.41	0.042	4.33	269.00	6770.41	6755.34	0.056	20	4.74	0.95	5.28	11.58	5.28	3.02	4.0	8.5	1.9	2.6	6.0
7	0.56	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88	120.00	6755.00	6749.00	0.050	3.37	270.00	6749.00	6732.00	0.063	20	5.02	0.90	4.26	10.65	5.00	3.07	4.1	8.6	1.4	1.8	4.2
7a	0.43	B	60.0	0.46	0.49	0.54	0.63	0.66	0.71	0.76	138.00	6765.00	6752.00	0.094	6.16	157.00	6752.00	6748.00	0.025	15	2.39	1.09	7.25	16.74	7.25	2.75	3.6	7.7	0.5	0.8	2.3
8	1.47	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	186.00	6758.00	6740.25	0.095	3.93	442.00	6740.25	6721.29	0.043	20	4.14	1.78	5.71	12.35	5.71	2.96	3.9	8.3	3.2	4.4	10.3
9	0.60	B	90.0	0.74	0.76	0.78	0.81	0.83	0.84	0.87	98.00	6738.00	6731.00	0.071	3.14	264.00	6731.00	6720.00	0.042	20	4.08	1.08	4.21	11.70	5.00	3.07	4.1	8.6	1.4	1.9	4.3
10	18.00	B	95.0	0.79	0.81	0.82	0.85	0.86	0.87	0.88	100.00	6770.00	6766.00	0.040	3.31	1750.00	6766.00	6715.00	0.029	18	3.07	9.49	12.80	17.51	12.80	2.21	2.9	6.2	31.2	42.7	96.4
11	9.54	B	28.0	0.19	0.21	0.28	0.42	0.48	0.56	0.64	100.00	6733.00	6729.00	0.040	10.12	1325.00	6729.00	6700.00	0.022	15	2.22	9.95	20.07	32.79	20.07	1.78	2.4	5.0	3.2	4.8	26.4
12	5.46	B	15.0	0.09	0.11	0.18	0.34	0.41	0.50	0.59	200.00	6732.00	6725.00	0.035	16.74	1200.00	6725.00	6696.20	0.024	15	2.32	8.61	25.35	35.08	25.35	1.56	2.1	4.4	0.8	1.2	11.8
13	0.43	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	150.00	6700.00	6697.00	0.020	7.52	1.00	6697.00	6696.98	0.020	15	2.12	0.01	7.53	12.41	7.53	2.71	3.6	7.6	0.8	1.0	2.6
14	0.50	B	80.0	0.64	0.67	0.70	0.75	0.77	0.80	0.83	100.00	6700.00	6695.00	0.050	4.54	150.00	6695.00	6687.50	0.050	15	3.35	0.75	5.29	12.95	5.29	3.02	4.0	8.5	1.0	1.3	3.4
15	37.09	B	10.0	0.06	0.07	0.14	0.31	0.38	0.47	0.57	300.00	6754.00	6744.10	0.033	21.72	2100.00	6644.00	6574.70	0.033	15	2.72	12.84	34.57	42.83	34.57	1.30	1.7	3.6	2.7	4.5	63.9
16	3.15	B	10.0	0.06	0.07	0.14	0.31	0.38	0.47	0.57	70.00	6677.00	6668.00	0.129	6.70	330.00	6668.00	6665.00	0.009	15	1.43	3.85	10.54	29.85	10.54	2.39	3.2	6.7	0.4	0.7	10.0
17	1.75	B	5.0	0.03	0.03	0.10	0.28	0.36	0.45	0.55	160.00	6676.50	6674.00	0.016	21.03	240.00	6674.00	6670.00	0.017	15	1.94	2.07	23.10	28.34	23.10	1.65	2.2	4.6	0.1	0.1	3.6

STRUTHERS FULL SPECTRUM PWQ POND
Rational Method Routing
7/10/2024

POINT	BASINS	Contrubuting Area	CA_5	CA_{100}	C_5	Length (ft)	Slope (%)	T_c Basin Max (min)	Length (ft)	tc basis	Velocity (fps)	T_c Pipe Routing (min)	Total (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (cfs)	Q_{100} (cfs)
DP-1	1	1.23	0.93	1.03				8.7		b1		0.0	8.7	3.4	7.2	**4.8**	**11.2**
	2	0.25	0.19	0.21				5.0									
	3	0.36	0.28	0.31				5.0									
		1.85	1.40	1.55													
DP-2	DP-1	1.85	1.40	1.55				8.7	193	b4	10.0		12.7	2.9	6.2	**8.1**	**18.9**
	4	1.78	1.35	1.49				12.7									
		3.62	2.75	3.04													
DP-3	DP-2	3.62	2.75	3.04				12.7	317	rtd dp2	10.0	0.5	13.2	2.9	6.1	**9.8**	**22.9**
	6	0.84	0.64	0.71				5.3									
		4.47	3.40	3.75													
DP-3.1	DP-3	4.47	3.40	3.75				13.2	178	rtd dp3	10	0.3	13.5	2.9	6.0	**10.3**	**24.5**
	7a	0.43	0.21	0.31				7.25									
		4.90	3.61	4.06													
DP-4	DP-3.1	4.90	3.61	4.06				13.2	305	rtd dp3.1	10.0	0.5	13.7	2.8	6.0	**11.5**	**27.2**
	7	0.56	0.45	0.49				5.0									
		5.46	4.06	4.55													
DP-5	B 5 Pond Discharge	11.94	1.38	2.30				12.7	1	b5	10.0	0.0	12.7	2.9	6.2	**4.7**	**15.8**
	(20% OF 8)	0.29	0.22	0.25				5.7									
		12.23	1.60	2.55													
DP-6	(80% OF 8)	1.18	0.90	0.99				5.7	70	rtd dp5	10.0	0.1	12.8	2.9	6.2	**7.3**	**21.8**
	DP-5	12.23	1.60	2.55				12.7									
		13.41	2.50	3.54													
DP-7	DP-6	13.41	2.50	3.54				12.8	390	rtd dp4	10.0	0.7	14.3	2.8	5.9	**19.5**	**50.4**
	DP-4	5.46	4.06	4.55				13.7									
	9	0.60	0.46	0.50				5.0									
		19.47	7.02	8.59													
DP-8	DP-7	19.47	7.02	8.59				14.3	420	rtd dp7	10.0	0.7	15.0	2.7	5.7	**58.8**	**139.1**
	10	18.00	14.58	15.66				12.8									
		37.47	21.60	24.25													
DP-9	DP-8	37.47	21.60	24.25				15.0	566	rtd dp8	10.0	0.3	15.3	2.7	5.7	**59.1**	**140.1**
	14	0.50	0.34	0.40				5.3									
		37.97	21.94	24.65													
DP-10	11	9.54	2.00	5.34				19.9	30	b11	10.0	0.1	20.0	2.4	5.0	**5.4**	**28.3**
	13	0.43	0.29	0.34				7.6									
		9.97	2.29	5.68													
DP-11	DP-10	9.97	2.29	5.68				20.0	103	b12	10.0	0.2	25.6	2.1	4.4	**6.0**	**36.6**
	12	5.46	0.60	2.73				25.4									
		15.43	2.89	8.41													
DP-12	DP-11	15.43	2.89	8.41				25.6	60	rtd dp11	10.0	0.1	25.7	2.1	4.3	**51.1**	**143.5**
	DP-9	37.97	21.94	24.65				15.3									
		53.39	24.83	33.06													
DP-13	DP-12	53.39	24.83	33.06				25.7	875	rtd dp12	10.0	1.5	27.2	2.0	4.2	**50.0**	**145.3**
	16	3.15	0.22	1.48				10.5									
		56.54	25.05	34.54													
DP-14	15	37.09	2.60	17.43				34.6	115	Start of high	10.0	0.2	55.2	1.3	2.7	**5.6**	**89.9**
	Pond Discharge	56.54	1.73	15.81				55.0		Discharge from pond							
		93.63	4.33	33.24													

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APPENDIX C – HYDRAULIC ANALYSIS

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C.1
INLET CAPACITY CALCULATIONS

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	EX-01	EX-02	EX-03	EX-04
Site Type (Urban or Rural)	RURAL			
Inlet Application (Street or Area)	AREA	STREET	STREET	STREET
Hydraulic Condition	Swale	On Grade	On Grade	On Grade
Inlet Type	CDOT Type C	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.8	3.2	1.1	4.0
Major Q_{Known} (cfs)	1.8	7.5	2.6	9.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	EX-02	EX-03
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.9	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	4.1	0.0

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.8**	**3.2**	**2.0**	**4.0**
Major Total Design Peak Flow, Q (cfs)	**1.8**	**7.5**	**6.7**	**9.3**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.9	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	4.1	0.0	0.0

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	EX-05	IN-01	IN-02	IN-03
Site Type (Urban or Rural)				
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.6	1.8	1.9	4.4
Major Q_{Known} (cfs)	6.0	6.5	4.3	10.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	EX-04	EX-05	IN-01	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.6**	**1.8**	**1.9**	**4.4**
Major Total Design Peak Flow, Q (cfs)	**6.0**	**6.5**	**4.3**	**10.3**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.1

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	IN-04	IN-01A
Site Type (Urban or Rural)	URBAN	URBAN
Inlet Application (Street or Area)	AREA	AREA
Hydraulic Condition	Swale	Swale
Inlet Type	CDOT Type C	CDOT TYPE D (Parallel)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.3	0.8
Major Q_{Known} (cfs)	3.0	2.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	
Major Bypass Flow Received, Q_b (cfs)	0.0	

Watershed Characteristics

Subcatchment Area (acres)		
Percent Impervious		
NRCS Soil Type		

Watershed Profile

Overland Slope (ft/ft)		
Overland Length (ft)		
Channel Slope (ft/ft)		
Channel Length (ft)		

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)		
One-Hour Precipitation, P_1 (inches)		

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.3**	**0.8**
Major Total Design Peak Flow, Q (cfs)	**3.0**	**2.3**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0

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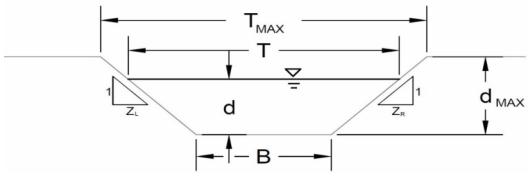
AREA INLET IN A SWALE

Enter Your Project Name Here

EX-01



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	E	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0150	ft/ft
Bottom Width	B =	2.00	ft
Left Side Slope	Z1 =	40.50	ft/ft
Right Side Slope	Z2 =	16.50	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ **Non-Cohesive**
- ○ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**25.00**	**77.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.35**	**1.54**	**feet**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**3.8**	**264.6**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.35**	**1.32**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.8**	**1.8**	**cfs**
Water Depth	**d =**	**0.20**	**0.28**	**feet**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

AREA INLET IN A SWALE

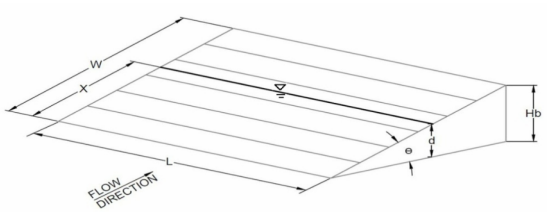
Enter Your Project Name Here

EX-01

Inlet Design Information (Input)

Type of Inlet: CDOT Type C

Inlet Type = CDOT Type C



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.96	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.20	0.28	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.7**	**2.8**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

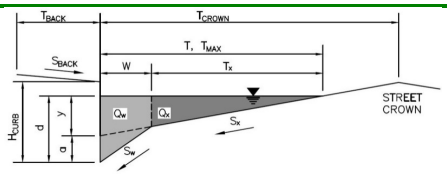
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: EX-02



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.001	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.5	30.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.9**	**32.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

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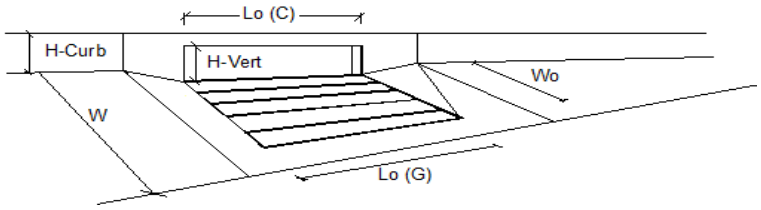


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.3**	**3.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.9**	**4.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**72**	**46**	**%**

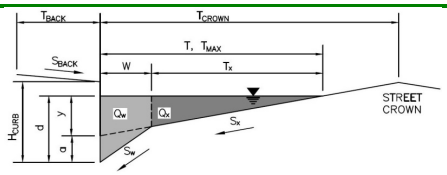
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: EX-03



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.001	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	43.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.005	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	33.0	43.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.3	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

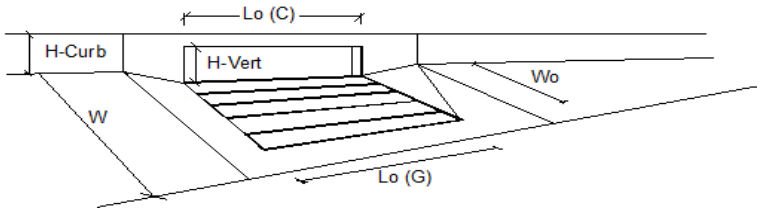
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.3**	**76.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.0**	**6.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

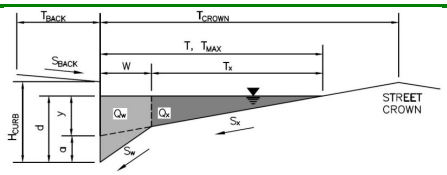
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: EX-04



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.003	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

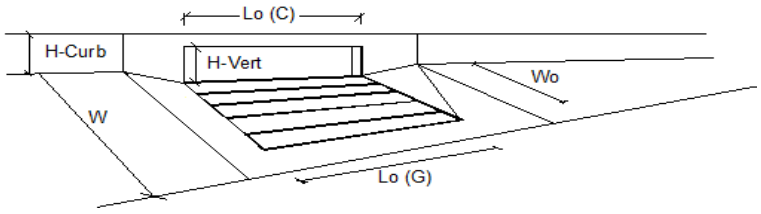
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**7.9**	**18.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.0**	**9.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

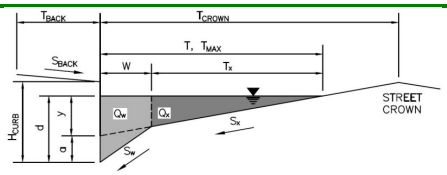
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: EX-05



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.057	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	34.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.2	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

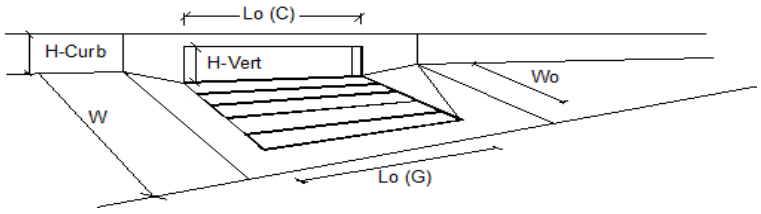
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.6**	**33.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.6**	**6.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

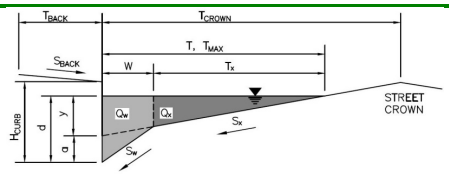
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: IN-01



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.014	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.036	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.059	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	34.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	14.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

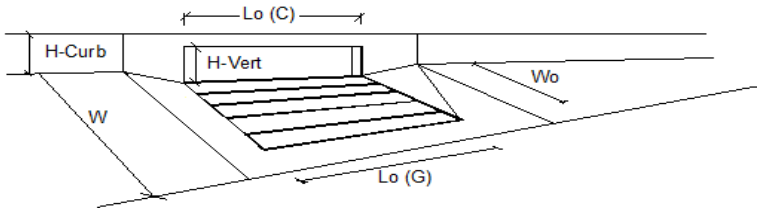
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**10.1**	**177.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.8**	**6.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

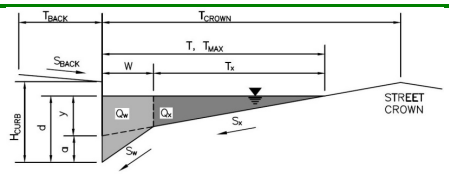
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: IN-02



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.042	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.018	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	45.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.029	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.032	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	35.5	45.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	15.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

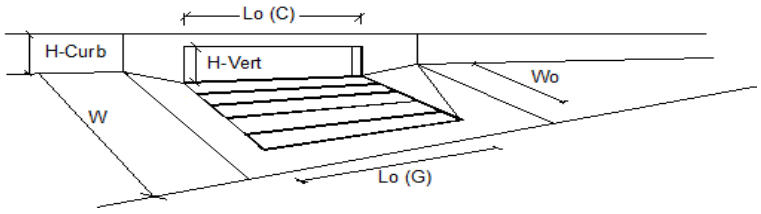
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**17.0**	**298.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.9**	**4.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

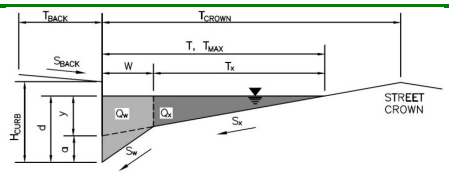
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Enter Your Project Name Here

Inlet ID: IN-03



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.022	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	28.0	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

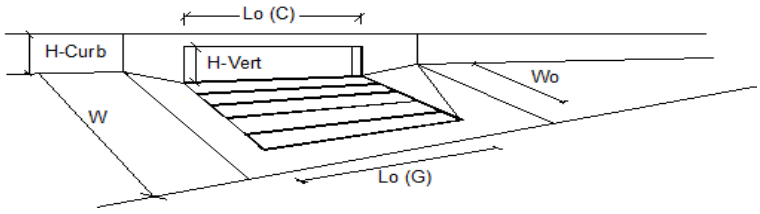
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**25.0**	**90.5**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

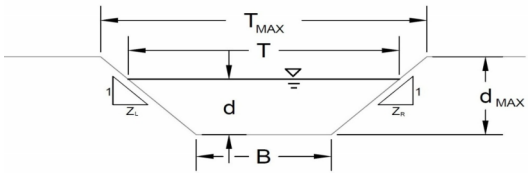
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.4**	**10.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

Version 4.05 Released March 2017

AREA INLET IN A SWALE

Enter Your Project Name Here

IN-04



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	E	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0001	ft/ft
Bottom Width	B =	5.00	ft
Left Side Slope	Z1 =	5.50	ft/ft
Right Side Slope	Z2 =	4.50	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	51.00	51.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	7.00	7.00	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	119.1	119.1	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	4.60	4.60	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	1.3	3.0	cfs
Water Depth	d =	0.98	1.34	feet

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

AREA INLET IN A SWALE

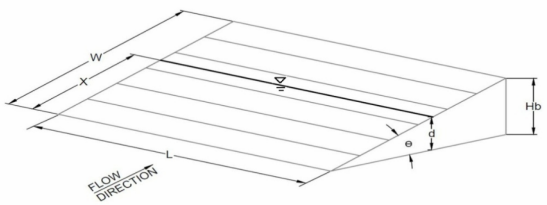
Enter Your Project Name Here

IN-04

Inlet Design Information (Input)

Type of Inlet: CDOT Type C

Inlet Type = CDOT Type C



Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.96	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.98	1.34	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**16.0**	**18.7**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

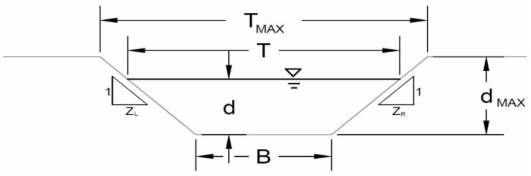
Warning 02: Depth (d) exceeds USDCM Volume I recommendation.

Version 4.05 Released March 2017

AREA INLET IN A SWALE

Enter Your Project Name Here

IN-01A



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.030	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Slope	Z2 =	4.60	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	3.20	5.40	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	0.40	0.65	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	1.3	5.4	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	0.37	0.63	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.8	2.3	cfs
Water Depth	d =	0.31	0.46	feet

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

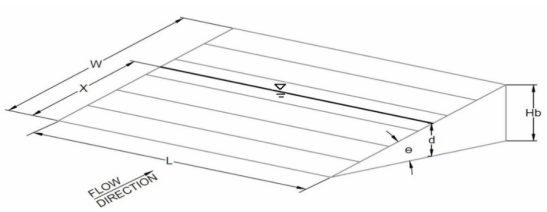
AREA INLET IN A SWALE

Enter Your Project Name Here

IN-01A

Inlet Design Information (Input)

Type of Inlet: CDOT TYPE D (Parallel) — Inlet Type = CDOT TYPE D (Parallel)



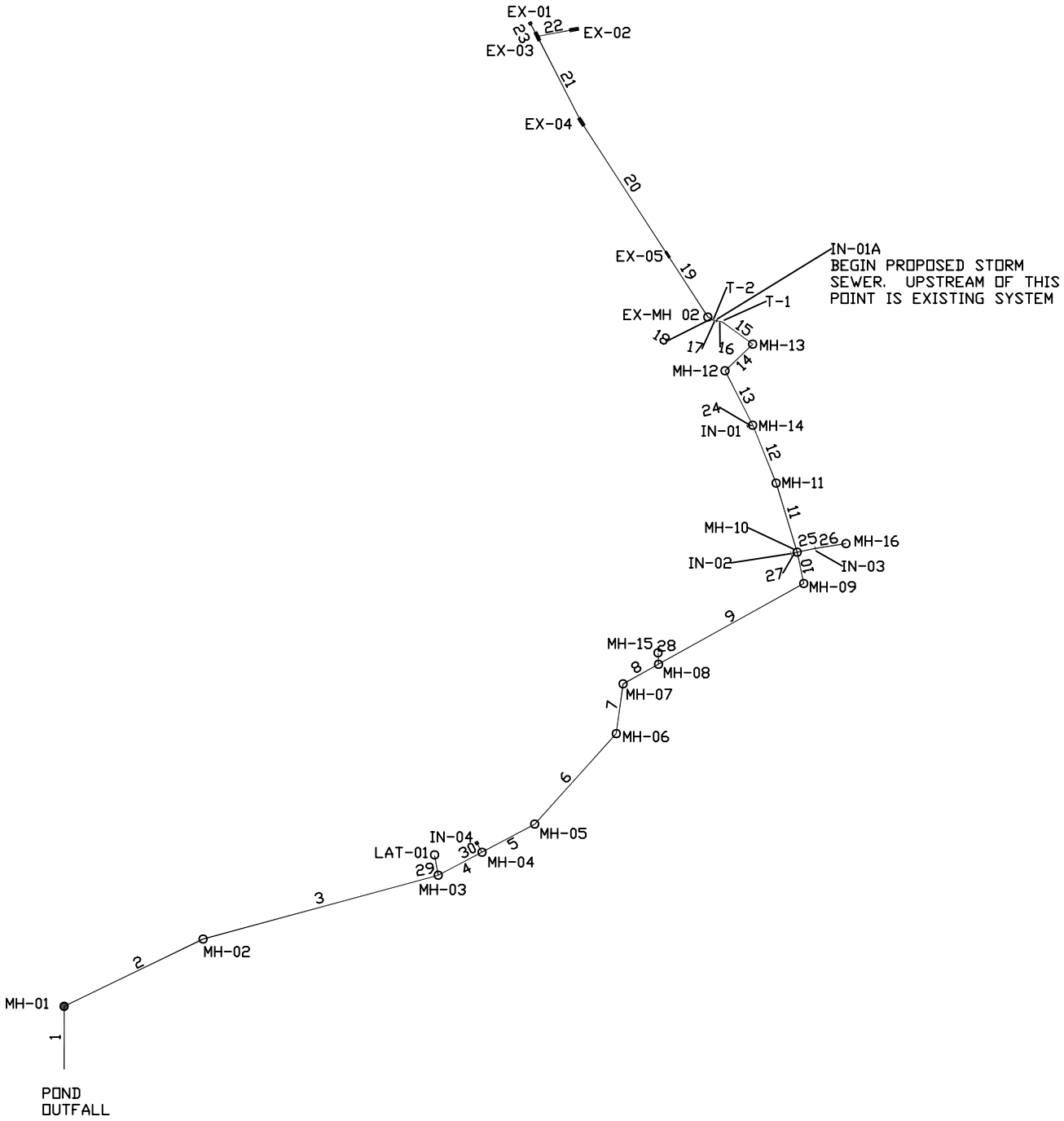
Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	6.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grade	H_B =	0.00	feet
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.76	
Orifice Coefficient	C_o =	0.50	
Weir Coefficient	C_w =	1.62	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.31	0.46	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**7.9**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

WILSON &COMPANY
5755, Mark Dabling Blvd, Ste.100
Colorado Springs, CO 80919
719-520-5800 phone
719-520-0108 fax

C.2
STORM SEWER HYDRAULIC CALCULATIONS
MAIN LINE


EX-01
EX-02
EX-03
EX-04
EX-05
EX-MH 02
IN-01A
BEGIN PROPOSED STORM
SEWER. UPSTREAM OF THIS
POINT IS EXISTING SYSTEM
T-1
T-2
MH-12
MH-13
MH-14
IN-01
MH-11
MH-10
MH-16
IN-02
IN-03
MH-09
MH-15
MH-08
MH-07
MH-06
MH-05
IN-04
LAT-01
MH-04
MH-03
MH-02
MH-01
POND
OUTFALL

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	MH-01 to OUTFALL	143.5	48	Cir	128.060	6665.65	6666.96	1.023	6672.34*	6673.62*	n/a	6674.81 i	End	Manhole
2	MH-02 to MH-01	143.5	48	Cir	312.930	6667.16	6672.04	1.559	6674.81*	6677.93*	n/a	6679.88 i	1	Manhole
3	MH-03 to MH-02	143.5	48	Cir	493.470	6672.04	6680.06	1.625	6679.88*	6684.81*	n/a	6687.90 i	2	Manhole
4	MH-04 to MH-03	140.1	48	Cir	100.510	6680.37	6681.98	1.602	6687.90*	6688.85*	n/a	6689.58 i	3	Manhole
5	MH-05 to MH-04	139.1	48	Cir	120.920	6682.18	6686.94	3.936	6689.58	6690.44	n/a	6694.42 i	4	Manhole
6	MH-06 to MH-05	139.1	48	Cir	246.770	6686.94	6696.66	3.939	6694.42	6700.16	n/a	6704.14 i	5	Manhole
7	MH-07 to MH-06	139.1	48	Cir	101.670	6696.66	6700.67	3.944	6704.14*	6705.09*	n/a	6708.15 i	6	Manhole
8	MH-08 to MH-07	139.0	48	Cir	82.130	6700.67	6703.86	3.884	6708.15*	6708.92*	n/a	6711.33 i	7	Manhole
9	MH-09 to MH-08	50.40	36	Cir	336.730	6705.18	6712.70	2.233	6711.33	6715.01	n/a	6716.70 i	8	Manhole
10	MH-10 to MH-09	50.40	36	Cir	64.780	6713.00	6713.70	1.081	6716.70*	6717.07*	n/a	6717.72 i	9	Manhole
11	MH-11 to MH-10	27.20	24	Cir	146.640	6714.80	6719.58	3.260	6717.72	6721.39	n/a	6723.87 i	10	Manhole
12	MH-14 to MH-11	27.20	24	Cir	126.370	6719.75	6726.62	5.437	6723.87	6728.43	n/a	6730.89 i	11	Manhole
13	MH-12 to MH-14	24.50	24	Cir	123.530	6726.79	6734.86	6.533	6730.89	6736.61	n/a	6738.56 i	12	Manhole
14	MH-13 to MH-12	24.50	24	Cir	77.830	6735.36	6738.80	4.420	6738.56	6740.55	n/a	6742.52 i	13	Manhole
15	T-1 to MH-13	24.50	24	Cir	76.600	6741.40	6744.64	4.230	6742.52	6746.39	0.00	6746.39	14	None
16	IN-01A to T-1	24.50	24	Cir	11.500	6744.64	6744.78	1.214	6746.39	6746.53	n/a	6748.53 i	15	Grate
17	T-2 to IN-01A	22.90	24	Cir	7.000	6744.90	6745.61	10.142	6748.53*	6748.60*	0.10	6748.70	16	None
18	EX-MH to T-2	22.90	24	Cir	12.700	6745.61	6745.84	1.811	6748.70*	6748.83*	n/a	6749.28 i	17	Manhole
19	EX-05 to EX-MH	22.90	24	Cir	151.000	6745.84	6750.50	3.086	6749.28	6752.20	n/a	6753.92 i	18	Generic
20	EX-04 to EX-05 (E)	18.90	24	Cir	320.000	6750.60	6766.74	5.044	6753.92	6768.30	n/a	6769.47 i	19	Generic
21	EX-03 to EX-04 (E)	11.20	24	Cir	195.000	6766.94	6767.92	0.503	6769.47	6769.91	0.39	6770.30	20	Generic
22	EX-02 to EX-03 (E)	3.40	18	Cir	75.886	6768.31	6768.69	0.501	6770.30*	6770.38*	0.00	6770.38	21	Curb-Horiz
23	EX-01 to EX-03	1.80	12	Cir	29.851	6768.90	6769.04	0.469	6770.30*	6770.38*	0.00	6770.38	21	Grate
24	IN-01 to MH-14	4.20	24	Cir	11.490	6726.79	6727.24	3.918	6730.89*	6730.89*	0.01	6730.90	12	Generic

Project File: Struthers_HGL_100-Year_90pct_20240711.stm | Number of lines: 30 | Run Date: 8/5/2024

NOTES: Known Qs only ; *Surcharged (HGL above crown). ; i - Inlet control.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	IN-03 to MH-10	21.80	24	Cir	36.130	6714.80	6716.10	3.599	6717.72	6718.01	n/a	6719.32 i	10	Generic
26	MH-16 to IN-03	15.80	24	Cir	64.370	6716.35	6717.60	1.942	6719.32	6719.60	n/a	6719.93 i	25	Manhole
27	IN-02 to MH-10	4.30	18	Cir	4.360	6715.31	6715.53	5.040	6717.72*	6717.73*	0.03	6717.75	10	Generic
28	MH-15 to MH-08	96.40	36	Cir	23.070	6705.39	6705.99	2.601	6711.33*	6711.81*	n/a	6715.36 i	8	Manhole
29	LAT-01 to MH-03	36.60	29	Cir	10.000	6689.12	6689.17	0.498	6691.54	6691.59	n/a	6693.32 i	3	Manhole
30	IN-04 to MH-04	3.40	18	Cir	4.000	6689.87	6690.08	5.249	6690.25	6690.78	n/a	6691.08 i	4	Grate

Project File: Struthers_HGL_100-Year_90pct_20240711.stm | Number of lines: 30 | Run Date: 8/5/2024

NOTES: Known Qs only ; *Surcharged (HGL above crown). ; i - Inlet control.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
(1)	(in) (2)	(cfs) (3)	(ft) (4)	(ft) (5)	(ft) (6)	(sqft) (7)	(ft/s) (8)	(ft) (9)	(ft) (10)	(%) (11)	(ft) (12)	(ft) (13)	(ft) (14)	(ft) (15)	(sqft) (16)	(ft/s) (17)	(ft) (18)	(ft) (19)	(%) (20)	(%) (21)	(ft) (22)	(K) (23)	(ft) (24)
1	48	143.5	6665.65	6672.34	4.00	12.56	11.42	2.03	6674.37	n/a	128.060	6666.96	6673.62	4.00	12.57	11.42	2.03	6675.65i	n/a	n/a	-0.749	1.17	n/a
2	48	143.5	6667.16	6674.81	4.00	12.56	11.42	2.03	6676.84	n/a	312.930	6672.04	6677.93	4.00	12.57	11.42	2.03	6679.96i	n/a	n/a	1.096	0.06	n/a
3	48	143.5	6672.04	6679.88	4.00	12.56	11.42	2.03	6681.91	n/a	493.470	6680.06	6684.81	4.00	12.57	11.42	2.03	6686.83i	n/a	n/a	2.898	1.18	n/a
4	48	140.1	6680.37	6687.90	4.00	12.56	11.15	1.93	6689.83	n/a	100.510	6681.98	6688.85	4.00	12.57	11.15	1.93	6690.79i	n/a	n/a	-0.976	1.23	n/a
5	48	139.1	6682.18	6689.58	4.00	11.66	11.07	1.91	6691.48	n/a	120.920	6686.94	6690.44	3.50**	11.66	11.93	2.21	6692.65i	n/a	n/a	n/a	0.26	n/a
6	48	139.1	6686.94	6694.42	4.00	11.66	11.07	1.91	6696.32	n/a	246.770	6696.66	6700.16	3.50**	11.66	11.93	2.21	6702.37i	n/a	n/a	n/a	0.34	n/a
7	48	139.1	6696.66	6704.14	4.00	12.56	11.07	1.91	6706.04	n/a	101.670	6700.67	6705.09	4.00	12.57	11.07	1.90	6707.00i	n/a	n/a	-0.951	0.83	n/a
8	48	139.0	6700.67	6708.15	4.00	12.56	11.06	1.90	6710.05	n/a	82.130	6703.86	6708.92	4.00	12.57	11.06	1.90	6710.82i	n/a	n/a	-1.133	2.08	n/a
9	36	50.40	6705.18	6711.33	3.00	5.84	7.13	0.79	6712.12	n/a	336.730	6712.70	6715.01	2.31**	5.84	8.64	1.16	6716.17i	n/a	n/a	n/a	1.21	n/a
10	36	50.40	6713.00	6716.70	3.00	7.07	7.13	0.79	6717.49	n/a	64.780	6713.70	6717.07	3.00	7.07	7.13	0.79	6717.86i	n/a	n/a	-0.420	2.99	n/a
11	24	27.20	6714.80	6717.72	2.00	2.99	8.66	1.17	6718.88	n/a	146.640	6719.58	6721.39 j	1.81**	2.99	9.09	1.29	6722.68i	n/a	n/a	n/a	0.11	n/a
12	24	27.20	6719.75	6723.87	2.00	2.99	8.66	1.17	6725.04	n/a	126.370	6726.62	6728.43 j	1.81**	2.99	9.09	1.29	6729.72i	n/a	n/a	n/a	1.24	n/a
13	24	24.50	6726.79	6730.89	2.00	2.91	7.80	0.95	6731.84	n/a	123.530	6734.86	6736.61 j	1.75**	2.91	8.41	1.10	6737.71i	n/a	n/a	n/a	1.36	n/a
14	24	24.50	6735.36	6738.56	2.00	2.91	7.80	0.95	6739.50	n/a	77.830	6738.80	6740.55 j	1.75**	2.91	8.41	1.10	6741.65i	n/a	n/a	n/a	3.62	n/a
15	24	24.50	6741.40	6742.52	1.12	1.80	13.59	1.10	6743.62	0.000	76.600	6744.64	6746.39	1.75**	2.91	8.41	1.10	6747.49	0.000	0.000	n/a	0.00	0.00
16	24	24.50	6744.64	6746.39	1.75*	2.91	8.41	1.10	6747.49	n/a	11.500	6744.78	6746.53	1.75**	2.91	8.41	1.10	6747.63i	n/a	n/a	n/a	0.00	n/a
17	24	22.90	6744.90	6748.53	2.00	3.14	7.29	0.83	6749.35	1.026	7.000	6745.61	6748.60	2.00	3.14	7.29	0.83	6749.43	1.025	1.025	0.072	0.12	0.10
18	24	22.90	6745.61	6748.70	2.00	3.14	7.29	0.83	6749.53	n/a	12.700	6745.84	6748.83	2.00	3.14	7.29	0.83	6749.66i	n/a	n/a	-0.696	0.40	n/a
19	24	22.90	6745.84	6749.28	2.00	2.85	7.29	0.83	6750.10	n/a	151.000	6750.50	6752.20 j	1.70**	2.85	8.04	1.00	6753.21i	n/a	n/a	n/a	0.44	n/a
20	24	18.90	6750.60	6753.92	2.00	2.63	6.02	0.56	6754.49	n/a	320.000	6766.74	6768.30 j	1.56**	2.63	7.17	0.80	6769.10i	n/a	n/a	n/a	0.57	n/a
21	24	11.20	6766.94	6769.47	2.00	3.14	3.57	0.20	6769.67	0.245	195.000	6767.92	6769.91	1.99	3.14	3.57	0.20	6770.11	0.234	0.240	0.467	1.96	0.39

Project File: Struthers_HGL_100-Year_90pct_20240711.stm | Number of lines: 30 | Run Date: 8/5/2024

Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in) (2)	(cfs) (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft) (12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K) (23)	(ft) (24)
22	18	3.40	6768.31	6770.30	1.50	1.77	1.92	0.06	6770.36	0.105	75.886	6768.69	6770.38	1.50	1.77	1.92	0.06	6770.44	0.105	0.105	0.080	0.01	0.00
23	12	1.80	6768.90	6770.30	1.00	0.79	2.29	0.08	6770.38	0.256	29.851	6769.04	6770.38	1.00	0.79	2.29	0.08	6770.46	0.255	0.256	0.076	0.05	0.00
24	24	4.20	6726.79	6730.89	2.00	3.14	1.34	0.03	6730.92	0.034	11.490	6727.24	6730.89	2.00	3.14	1.34	0.03	6730.92	0.034	0.034	0.004	0.23	0.01
25	24	21.80	6714.80	6717.72	2.00	3.14	6.94	0.75	6718.47	n/a	36.130	6716.10	6718.01	1.90	3.09	7.06	0.78	6718.78i	n/a	n/a	-0.461	0.42	n/a
26	24	15.80	6716.35	6719.32	2.00	3.14	5.03	0.39	6719.71	n/a	64.370	6717.60	6719.60	2.00	3.14	5.03	0.39	6719.99i	n/a	n/a	-0.117	0.01	n/a
27	18	4.30	6715.31	6717.72	1.50	1.77	2.43	0.09	6717.81	0.168	4.360	6715.53	6717.73	1.50	1.77	2.43	0.09	6717.82	0.168	0.168	0.007	0.30	0.03
28	36	96.40	6705.39	6711.33	3.00	7.07	13.64	2.89	6714.22	n/a	23.070	6705.99	6711.81	3.00	7.07	13.64	2.89	6714.71i	n/a	n/a	-2.410	0.06	n/a
29	29	36.60	6689.12	6691.54	2.42*	4.59	7.98	0.99	6692.53	n/a	10.000	6689.17	6691.59	2.42	4.59	7.98	0.99	6692.58i	n/a	n/a	-0.940	0.01	n/a
30	18	3.40	6689.87	6690.25	0.38*	0.35	9.63	0.27	6690.52	n/a	4.000	6690.08	6690.78	0.70**	0.81	4.18	0.27	6691.06i	n/a	n/a	n/a	0.00	n/a

Project File: Struthers_HGL_100-Year_90pct_20240711.stm | Number of lines: 30 | Run Date: 8/5/2024

Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

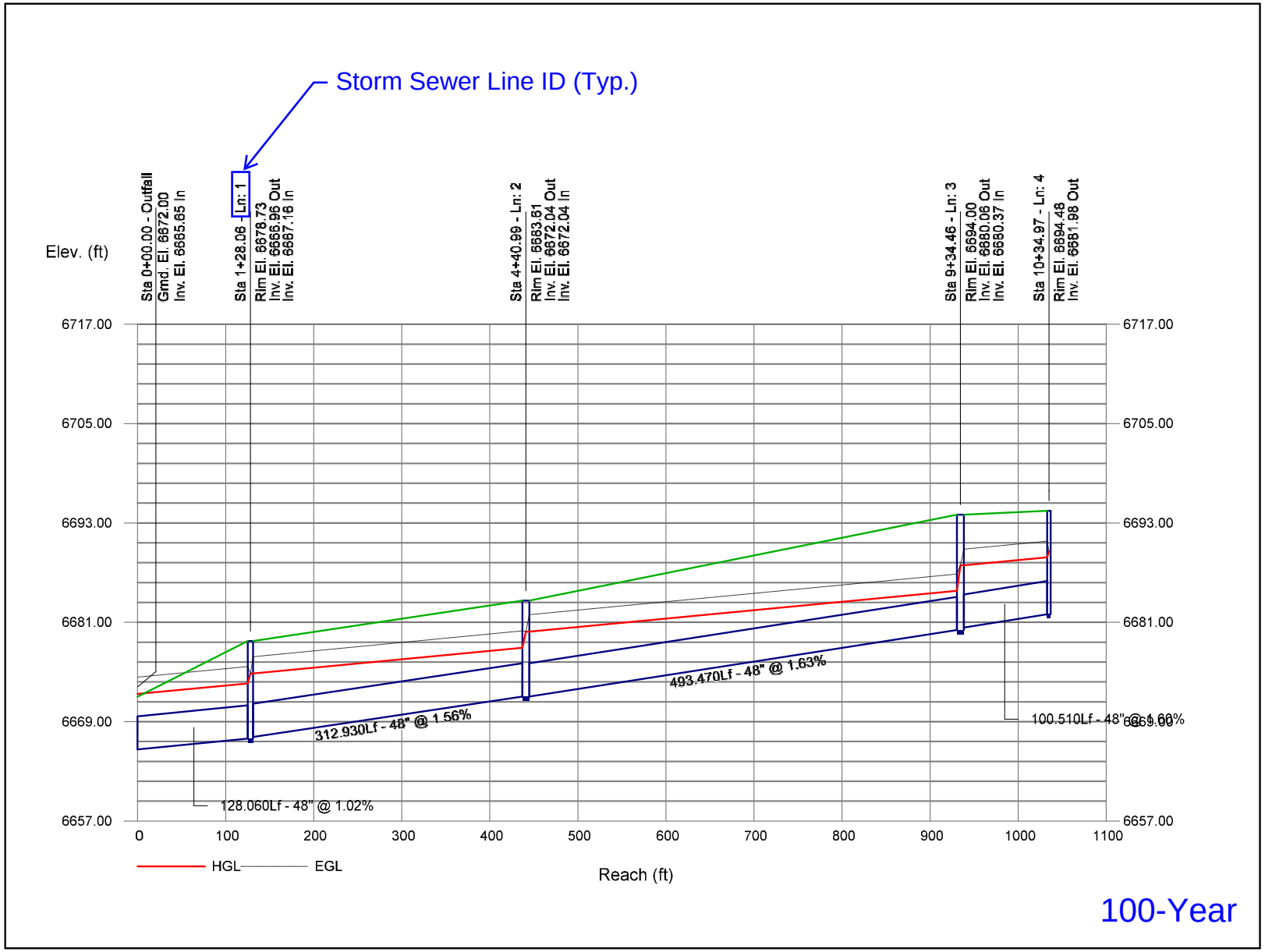
Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

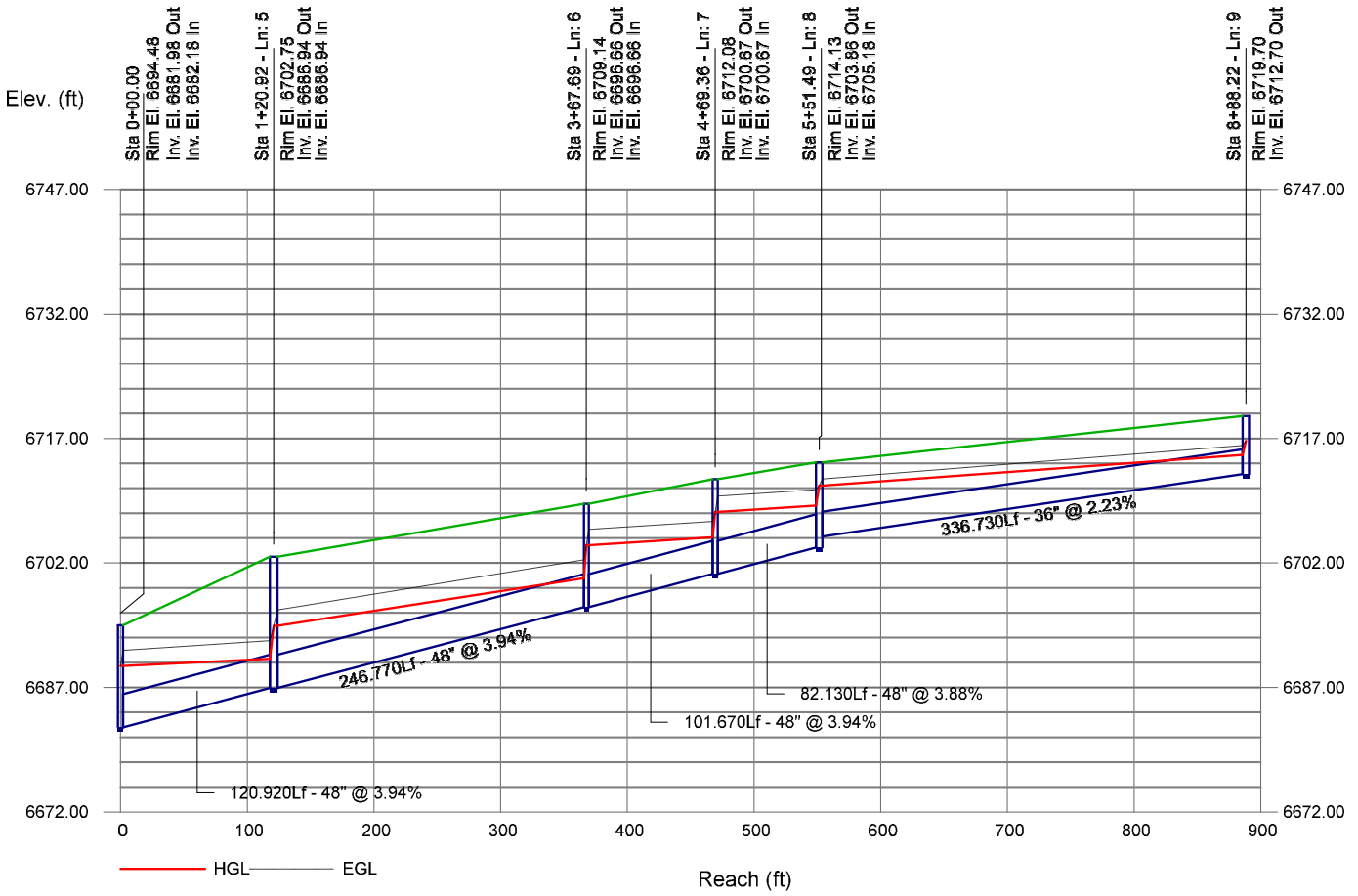
Storm Sewer Profile

Proj. file: Struthers_HGL_100-Year_90pct_20240711.stm



Storm Sewer Profile

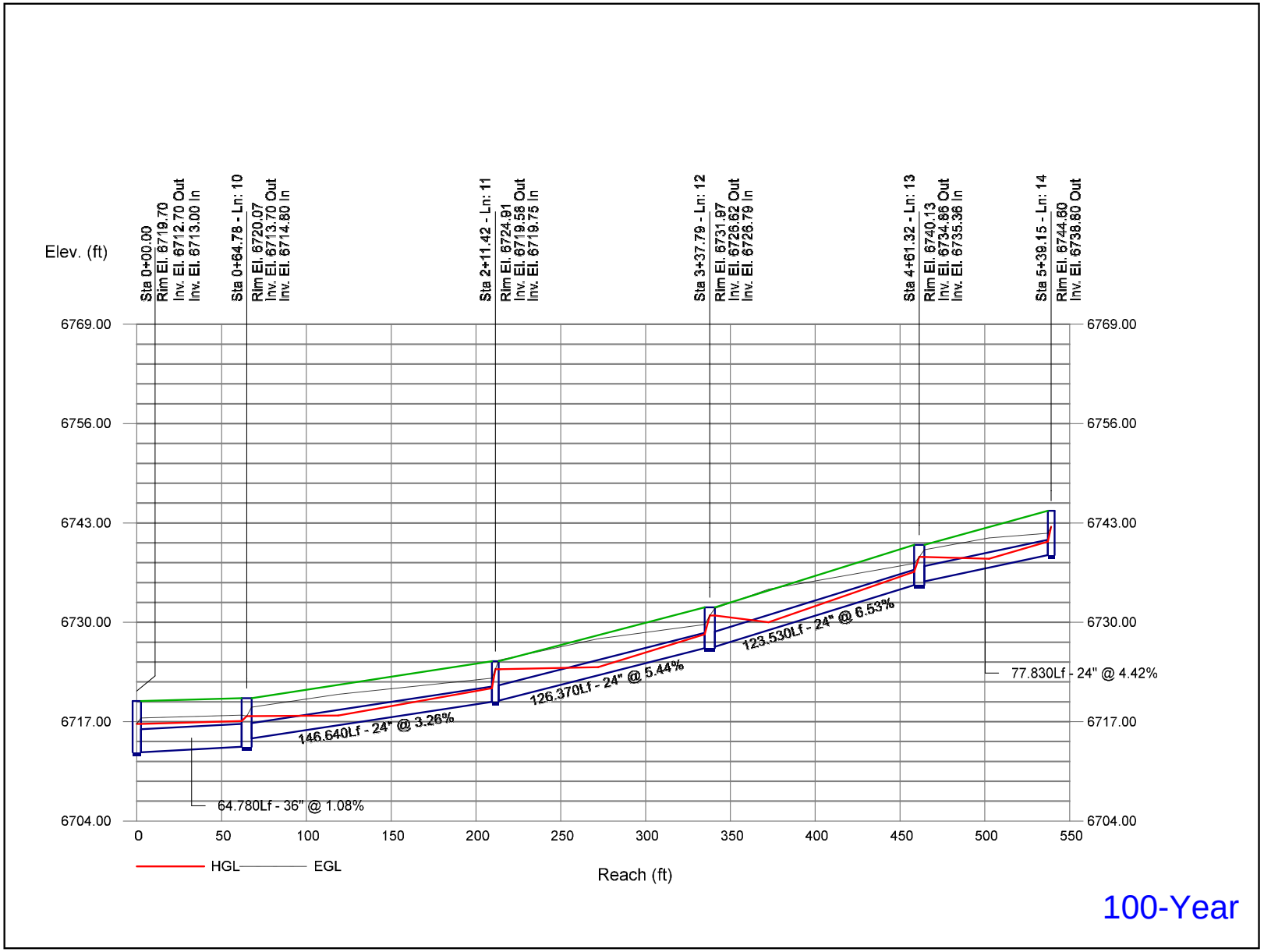
Proj. file: Struthers_HGL_100-Year_90pct_20240711.stm



100-Year

Storm Sewer Profile

Proj. file: Struthers_HGL_100-Year_90pct_20240711.stm



100-Year

Storm Sewer Profile

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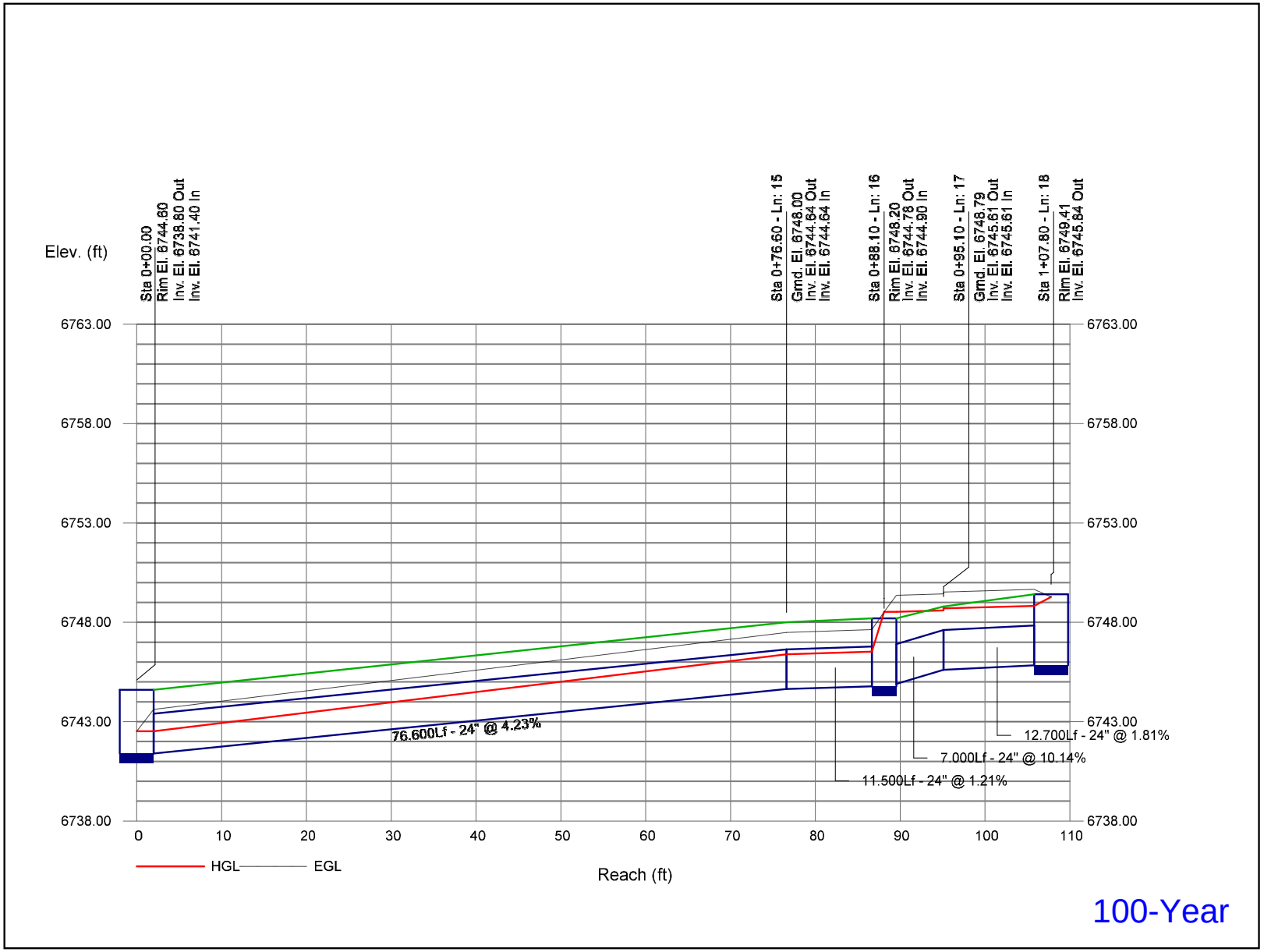

Storm Sewer Profile

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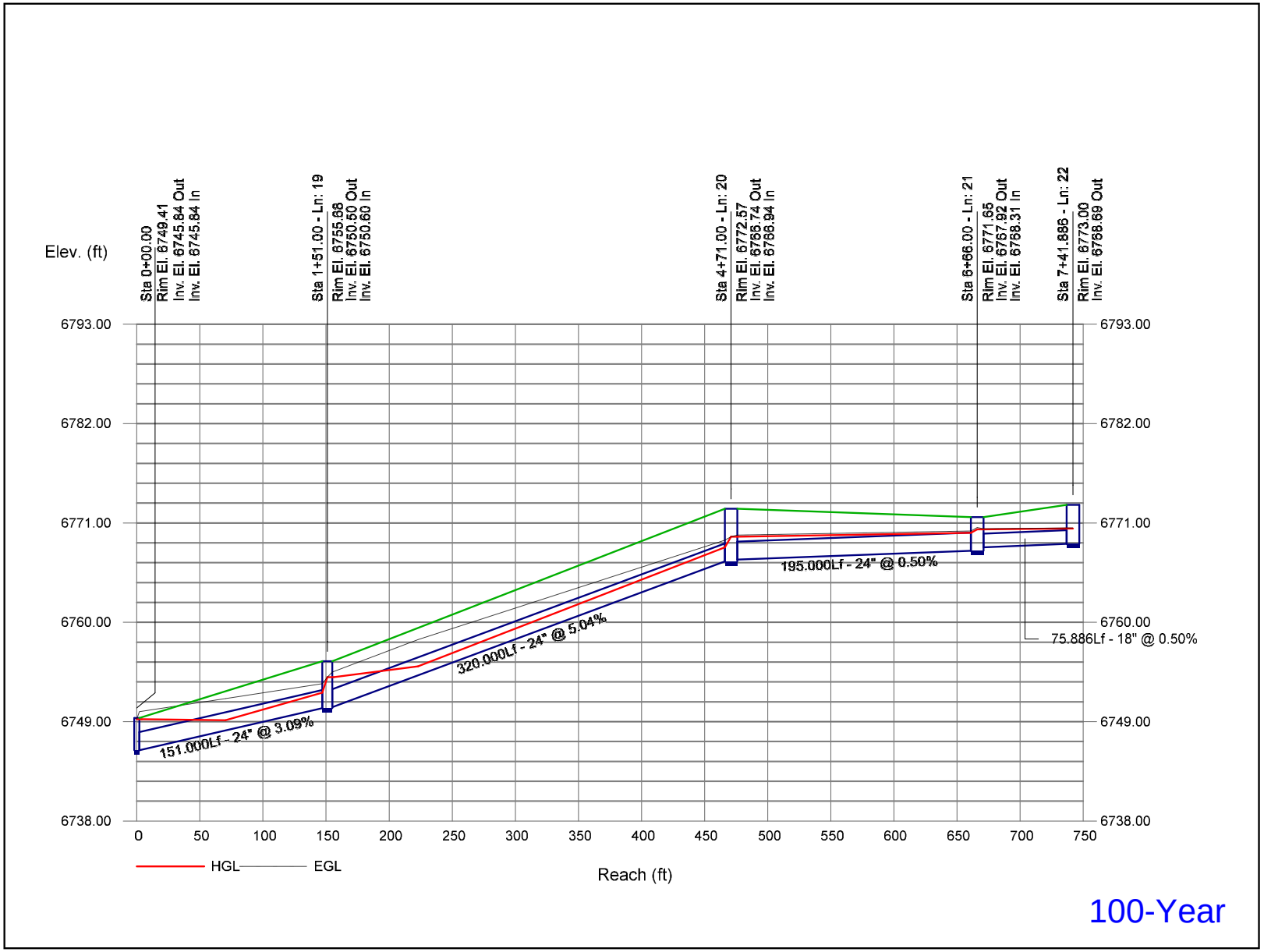

Storm Sewer Profile

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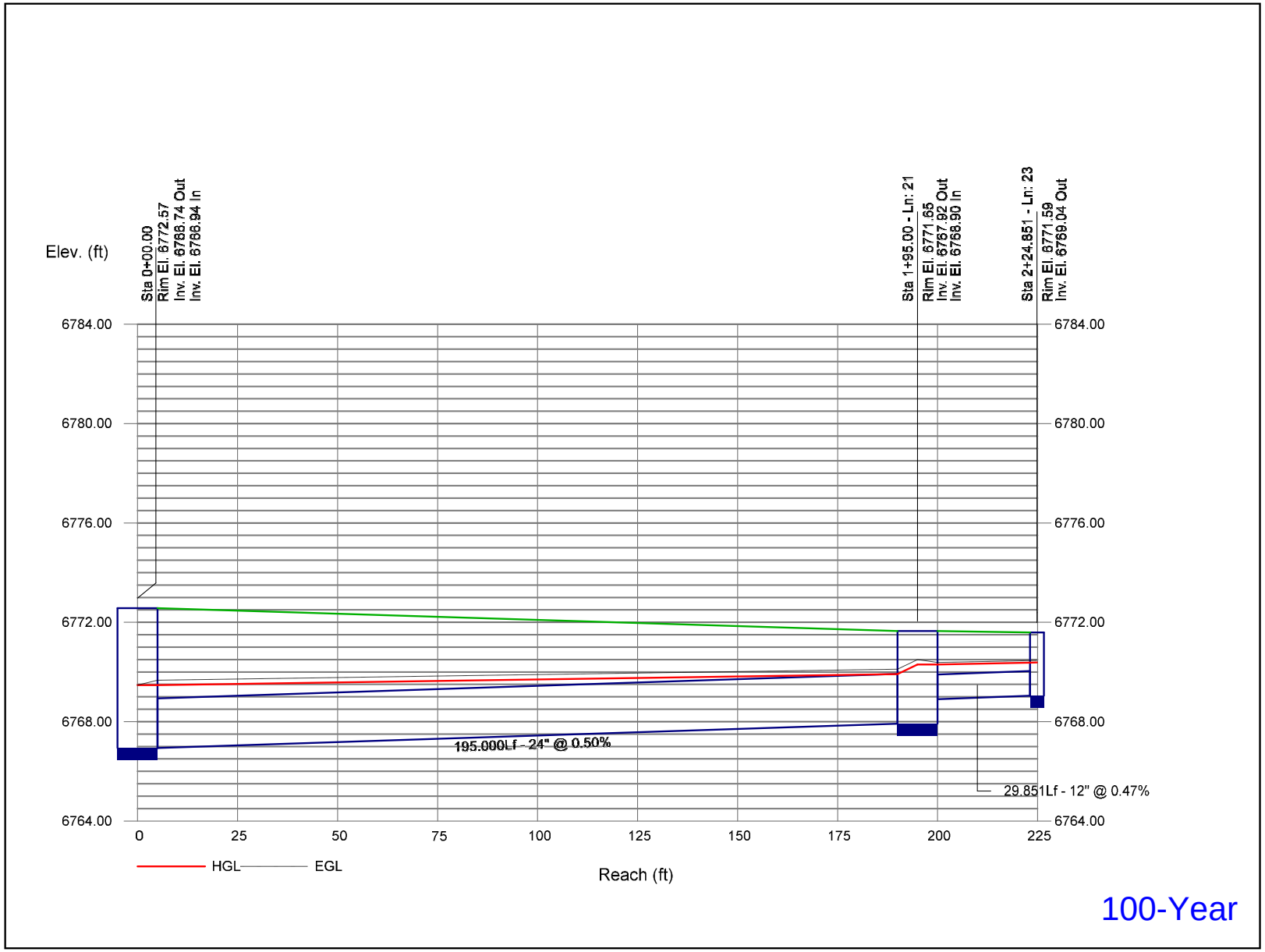

Storm Sewer Profile

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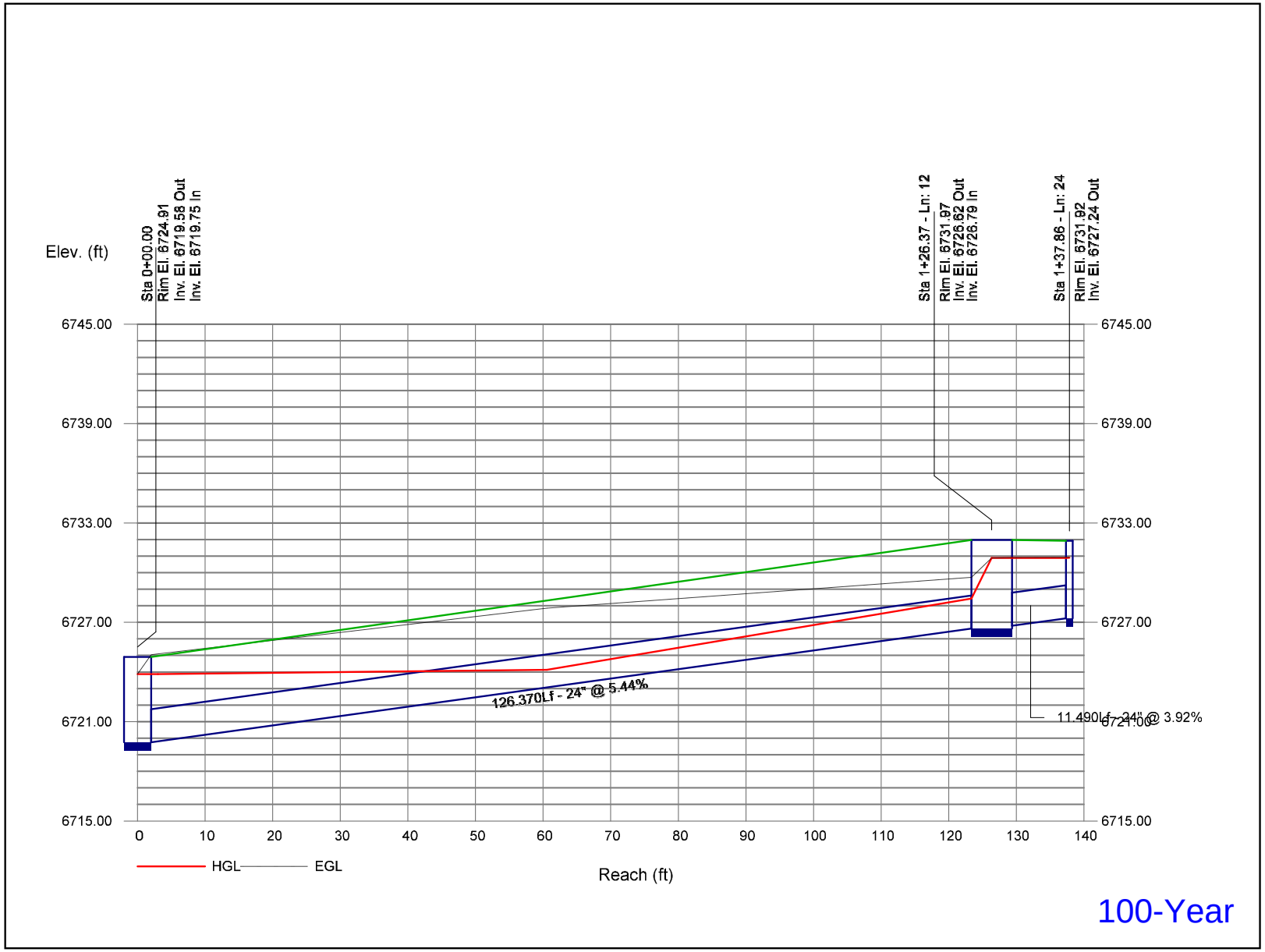

Storm Sewer Profile

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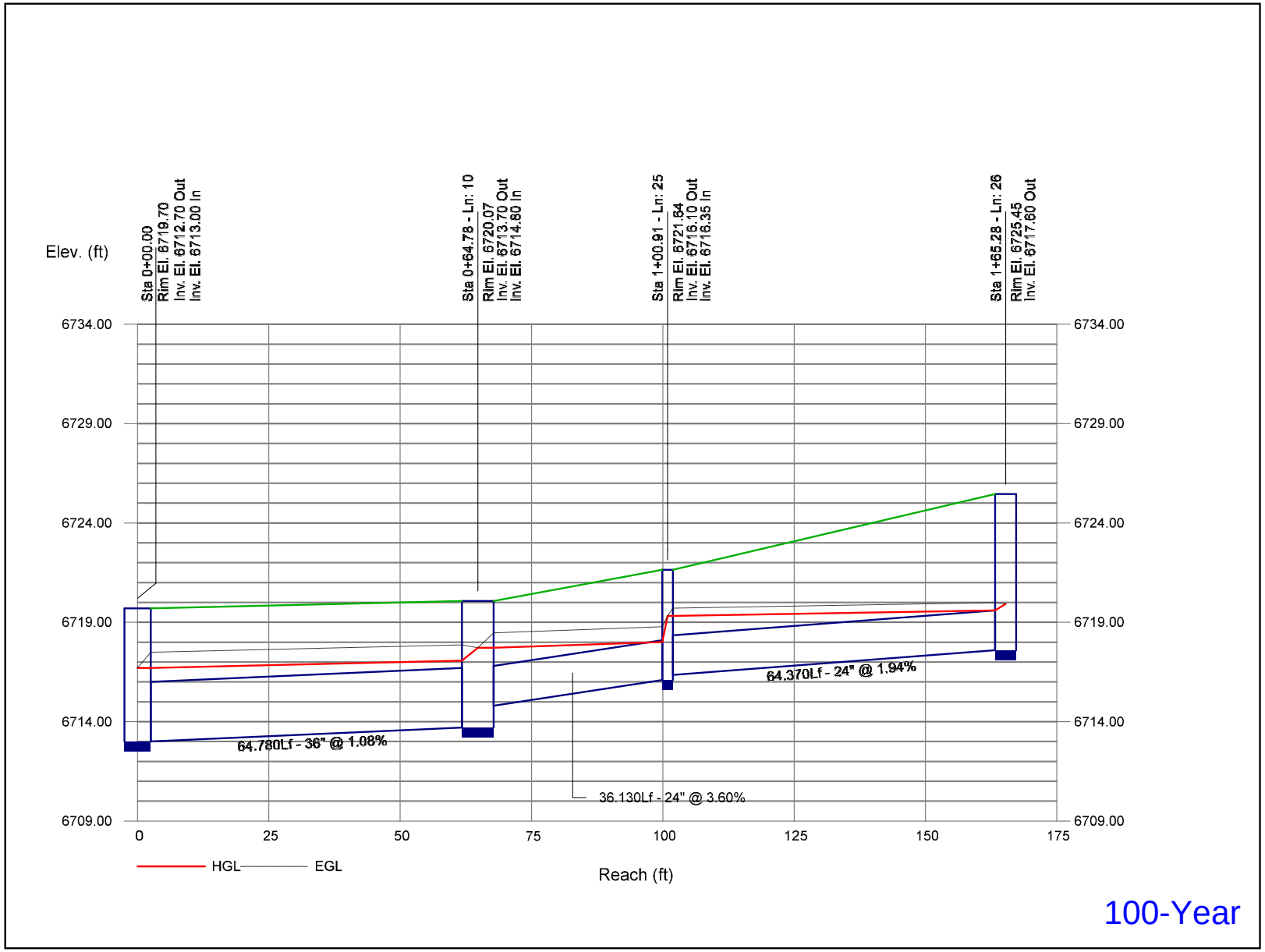

Storm Sewer Profile

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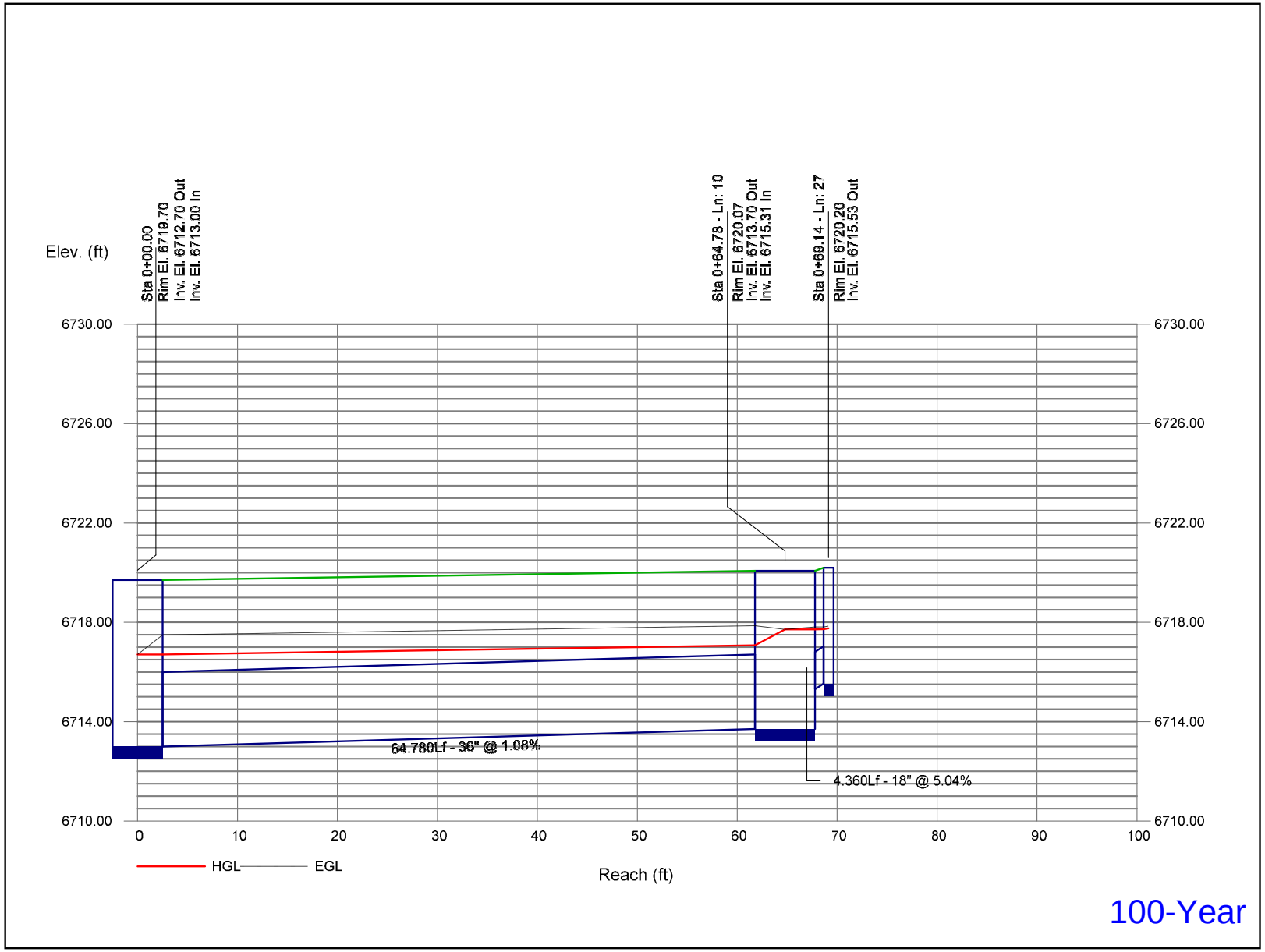

Storm Sewer Profile

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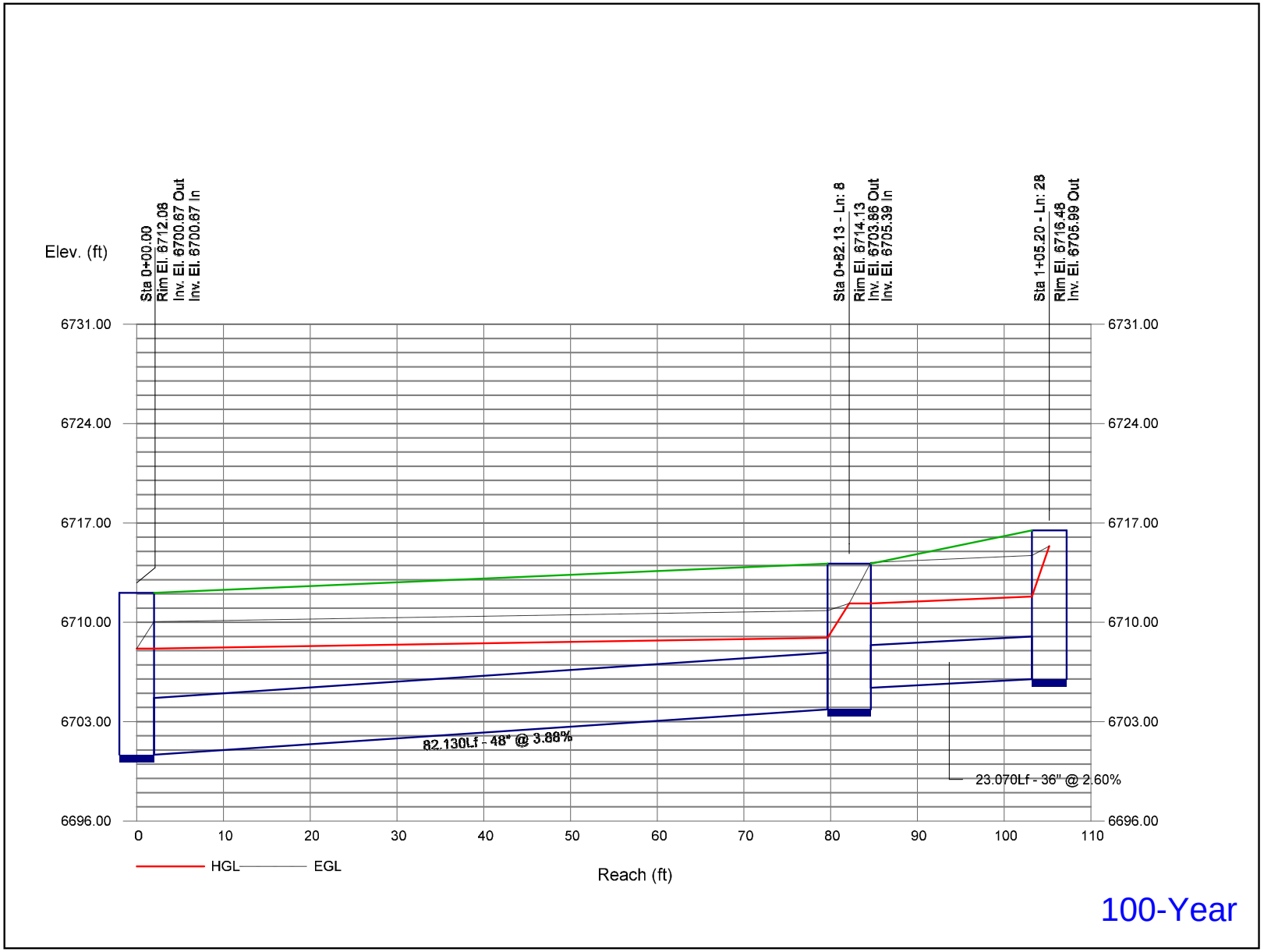

Storm Sewer Profile

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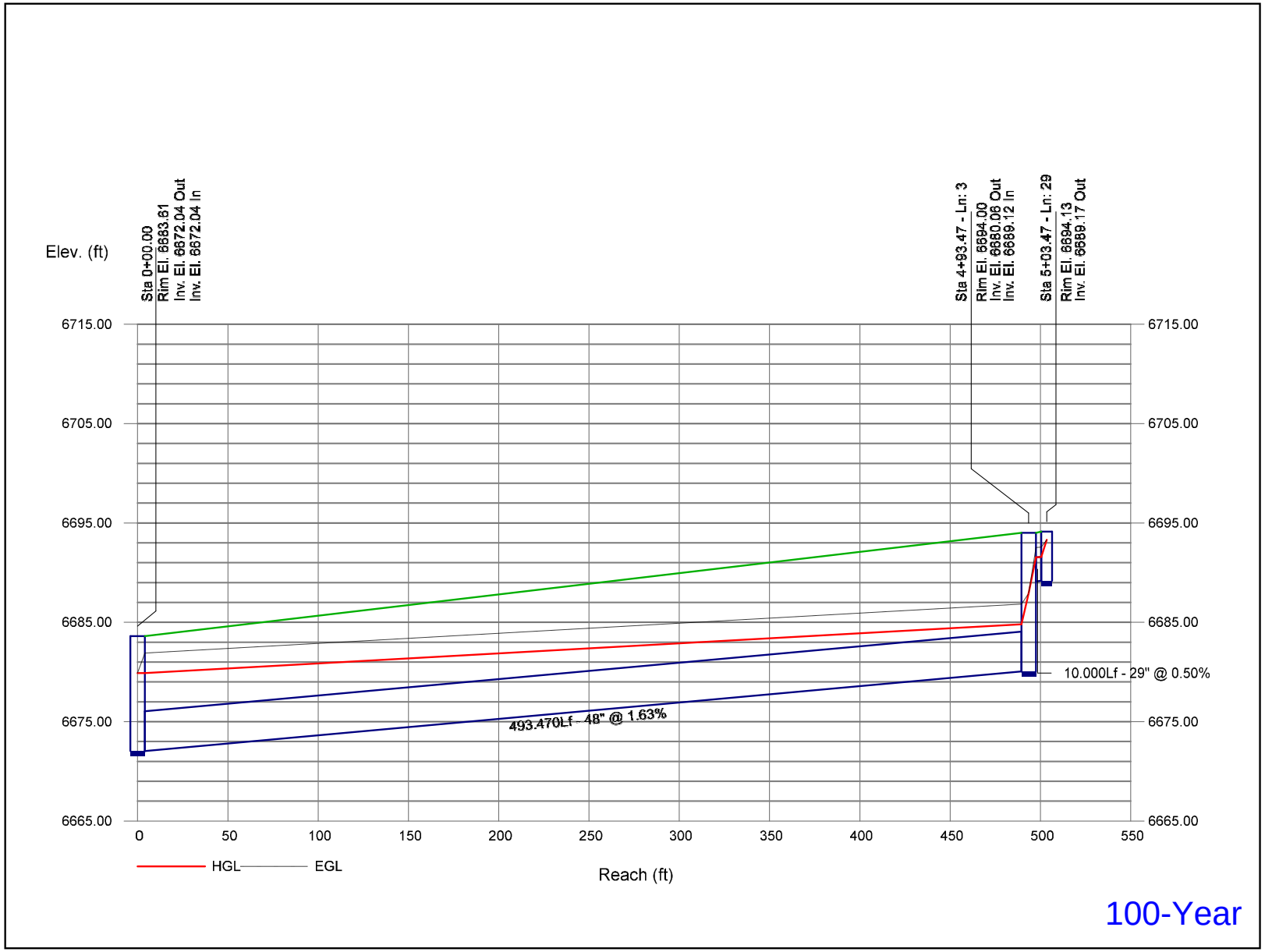
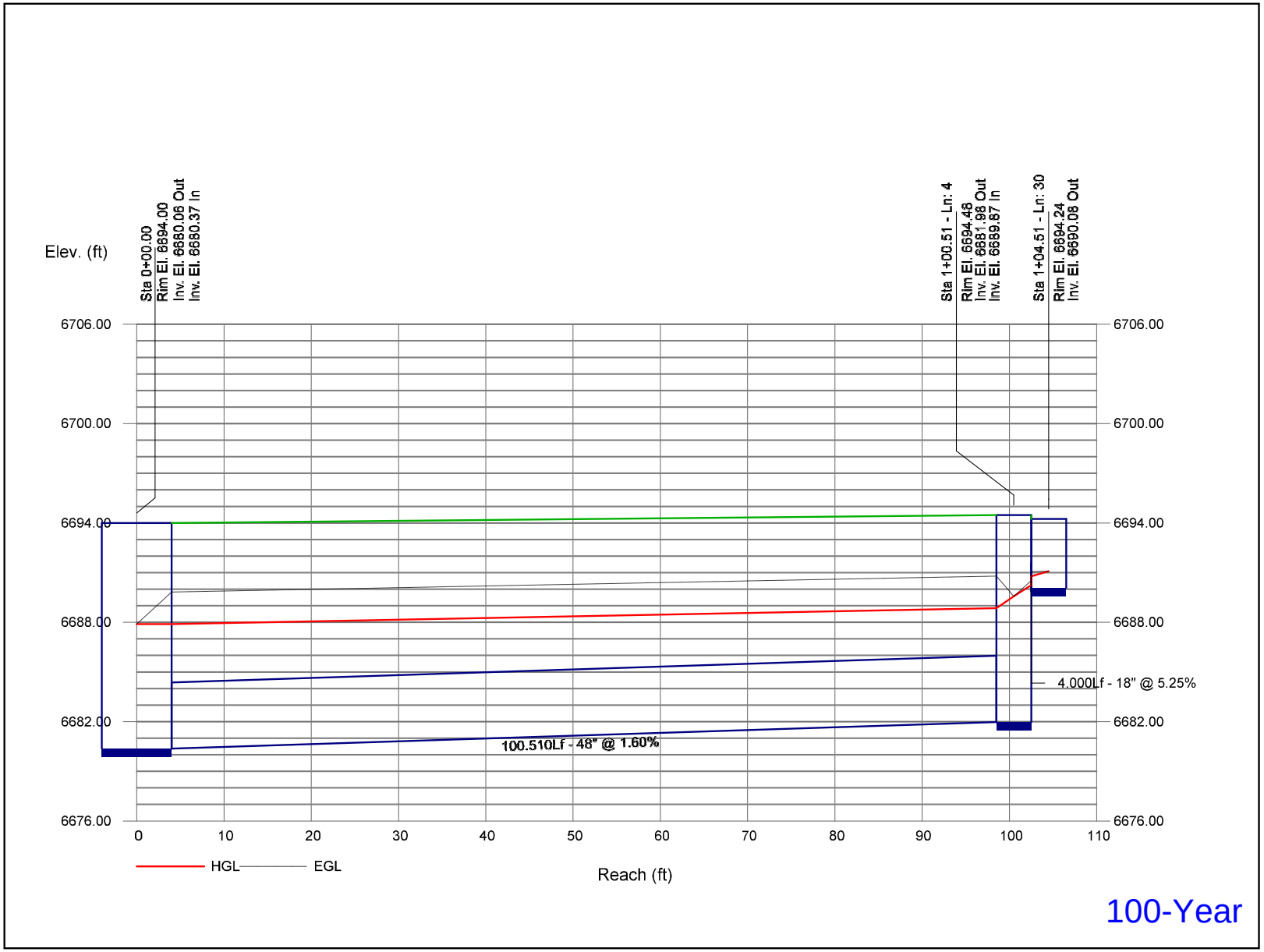


Storm Sewers

Storm Sewer Profile

Proj. file: Struthers_HGL_100-Year_90pct_20240711.stm



WILSON &COMPANY
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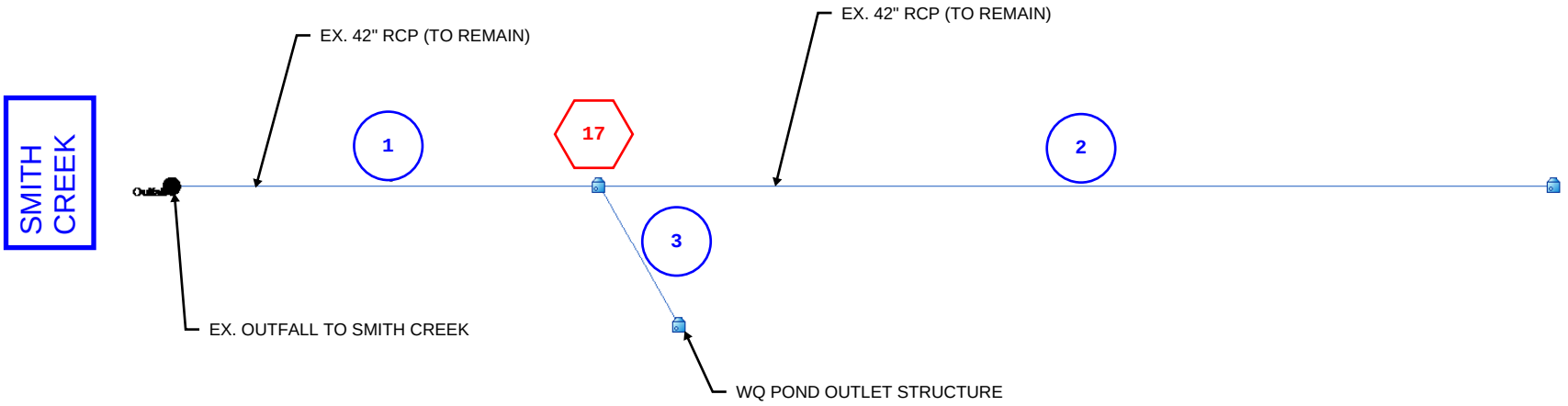
Colorado Springs, CO 80919
719-520-5800 phone
719-520-0108 fax

C.3
STORM SEWER HYDRAULIC CALCULATIONS
EXISTING 42″ AND POND OUTFALL

STORM DRAIN CALCULATIONS FOR POND OUTFALL



LEGEND

PIPE LINE NO.: 3

MANHOLE 3

INLET ID 3

Storm Sewer Summary Report

100 YEAR PEAK RUNOFF FROM WQ POND OUTFALL

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		89.80	42	Cir	291.660	6654.95	6656.40	0.497	6662.10*	6664.43*	1.21	6665.63	End	Manhole
2		47.10	42	Cir	650.230	6656.43	6662.03	0.861	6665.63*	6667.06*	0.37	6667.43	1	Manhole
3		42.70	36	Cir	110.000	6662.27	6662.93	0.600	6665.63*	6666.08*	0.57	6666.65	1	Manhole

Ex42 inch SD

Number of lines: 3

Run Date: 8/15/2024

NOTES: Known Qs only ; *Surcharged (HGL above crown).

Hydraulic Grade Line Computations

100 YEAR PEAK RUNOFF FROM WQ POND OUTFALL

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in) (2)	(cfs) (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft) (12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K) (23)	(ft) (24)
1	42	89.80	6654.95	6662.10	3.50	9.62	9.34	1.35	6663.46	0.797	291.66	6656.40	6664.43	3.50	9.62	9.33	1.35	6665.78	0.797	0.797	2.324	0.89	1.21
2	42	47.10	6656.43	6665.63	3.50	9.62	4.90	0.37	6666.00	0.219	650.23	6662.03	6667.06	3.50	9.62	4.90	0.37	6667.43	0.219	0.219	1.425	1.00	0.37
3	36	42.70	6662.27	6665.63	3.00	7.07	6.04	0.57	6666.20	0.410	110.00	6662.93	6666.08	3.00	7.07	6.04	0.57	6666.65	0.410	0.410	0.451	1.00	0.57

Ex42 inch SD | Number of lines: 3 | Run Date: 8/15/2024

; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

100 YEAR PEAK RUNOFF FROM WQ POND OUTFALL

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

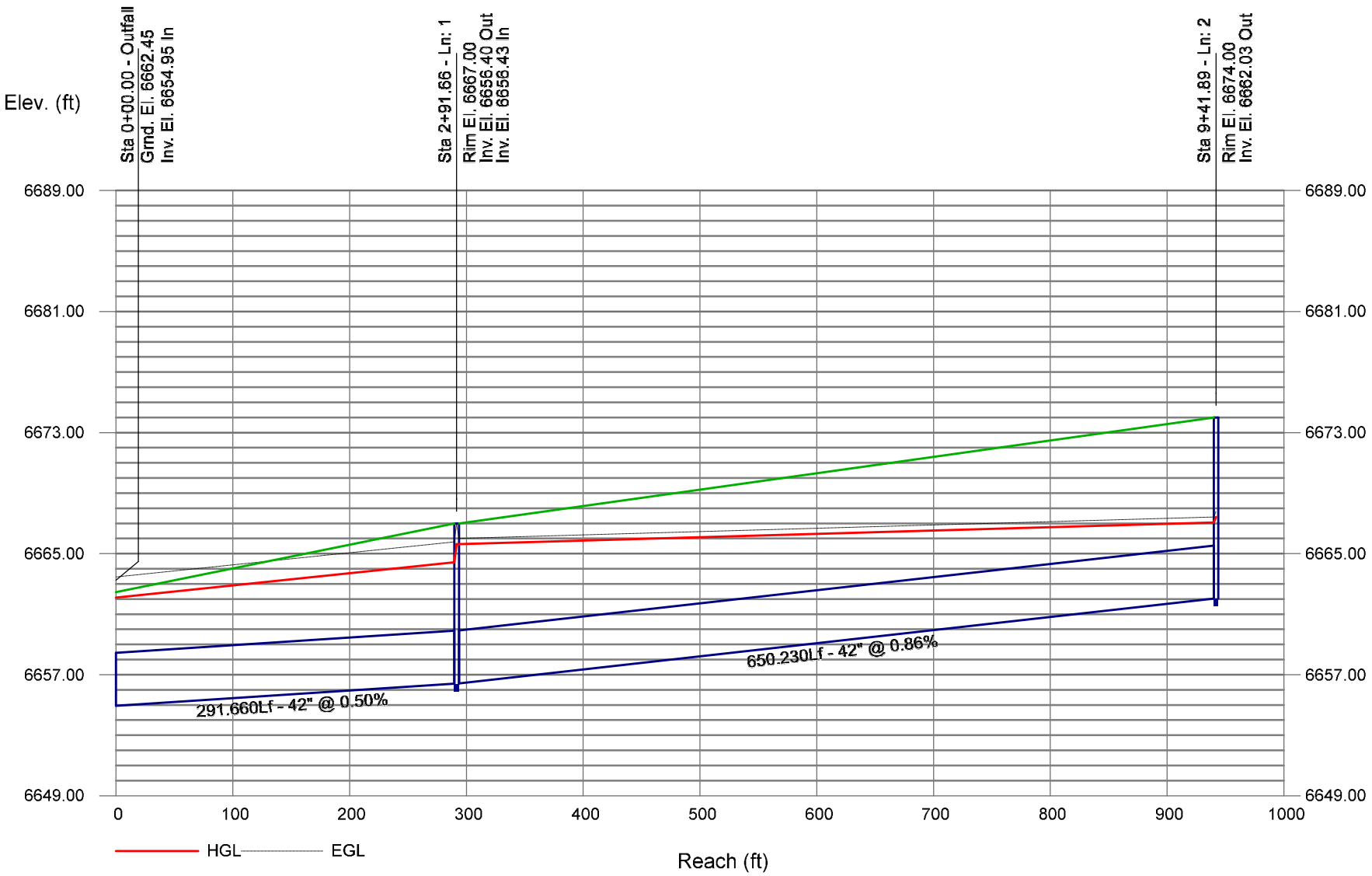
Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Profile

Proj. file: Pond Outflow_100-(Pond High Flow).stm

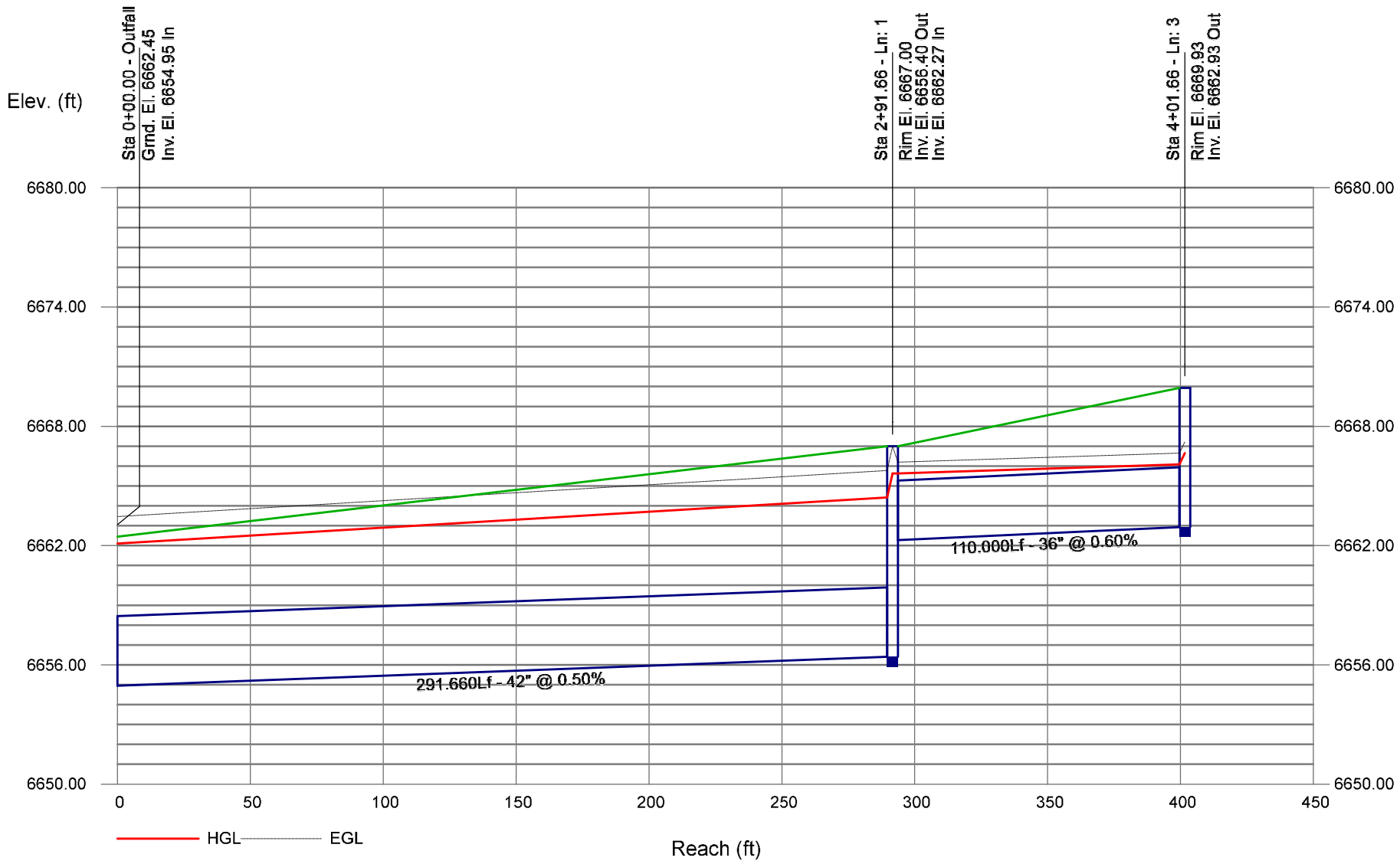
100 YEAR PEAK RUNOFF FROM WQ POND OUTFALL
PIPE ID: 1 TO 2



Storm Sewer Profile

Proj. file: Pond Outflow_100-(Pond High Flow).stm

100 YEAR PEAK RUNOFF FROM WQ POND OUTFALL
PIPE ID: 1 TO 3



Storm Sewer Summary Report

100 YEAR PEAK RUNOFF FROM EX 42" RCP WATERSHED

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1		66.90	42	Cir	291.660	6654.95	6656.40	0.497	6662.10*	6663.39*	0.67	6664.06	End	Manhole
2		63.90	42	Cir	650.230	6656.43	6662.03	0.861	6664.06*	6666.68*	0.69	6667.37	1	Manhole
3		3.00	36	Cir	110.000	6662.27	6662.93	0.600	6664.06	6663.47	n/a	6663.47	1	Manhole

Ex42 inch SD

Number of lines: 3

Run Date: 8/16/2024

NOTES: Known Qs only ; *Surcharged (HGL above crown).

Hydraulic Grade Line Computations

100 YEAR PEAK RUNOFF FROM EX 42" RCP WATERSHED

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in) (2)	(cfs) (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft) (12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K) (23)	(ft) (24)
1	42	66.90	6654.95	6662.10	3.50	9.62	6.95	0.75	6662.85	0.442	291.66	6656.40	6663.39	3.50	9.62	6.95	0.75	6664.14	0.442	0.442	1.290	0.89	0.67
2	42	63.90	6656.43	6664.06	3.50	9.62	6.64	0.69	6664.75	0.404	650.23	6662.03	6666.68	3.50	9.62	6.64	0.69	6667.37	0.403	0.403	2.624	1.00	0.69
3	36	3.00	6662.27	6664.06	1.79	0.86	0.68	0.19	6664.25	0.000	110.00	6662.93	6663.47	0.54**	0.86	3.48	0.19	6663.66	0.000	0.000	n/a	1.00	n/a

Ex42 inch SD | Number of lines: 3 | Run Date: 8/15/2024

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

100 YEAR PEAK RUNOFF FROM EX 42" RCP WATERSHED

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

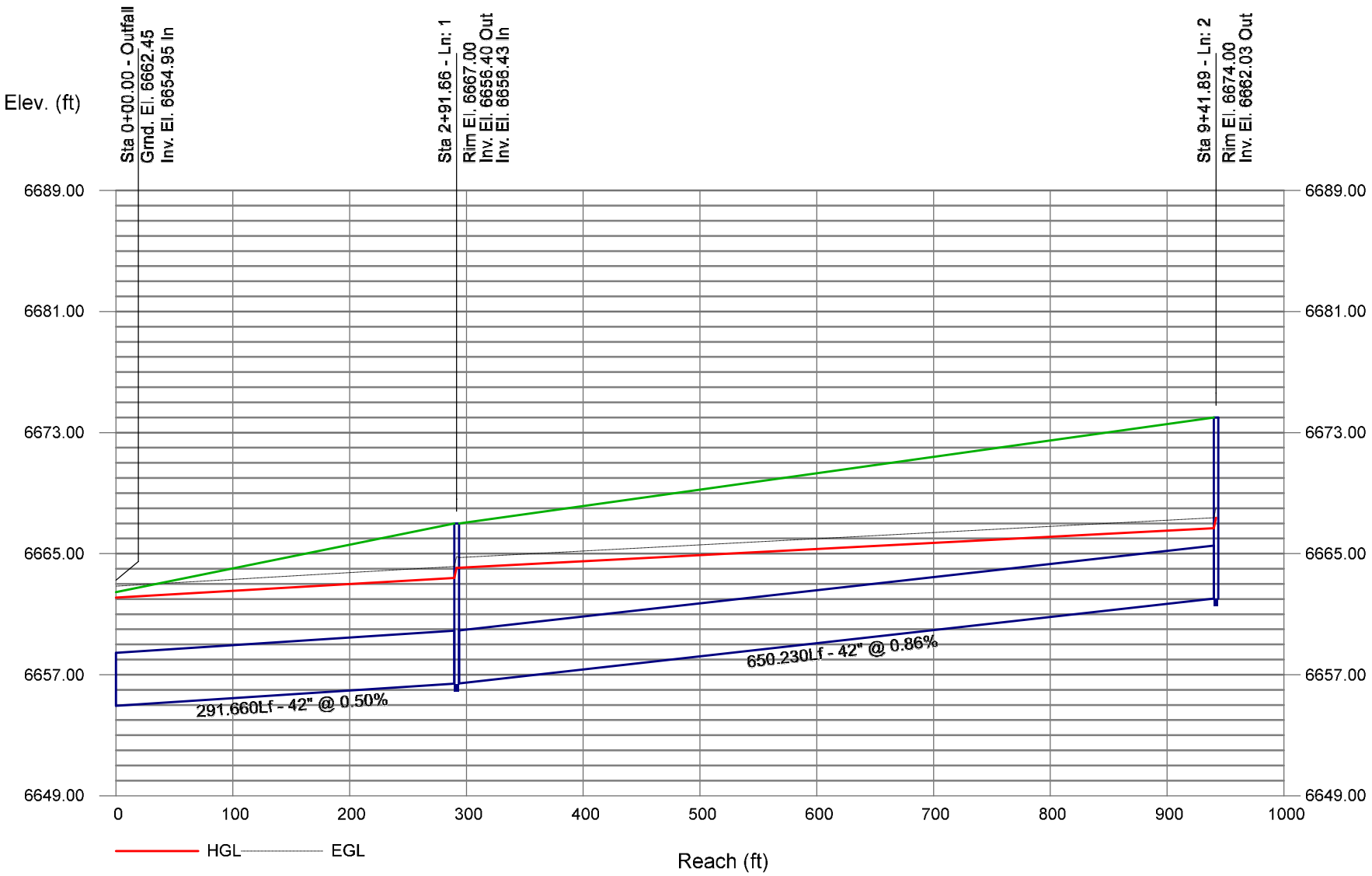
Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Profile

Proj. file: Pond Outflow_100-(PIPE High Flow).stm

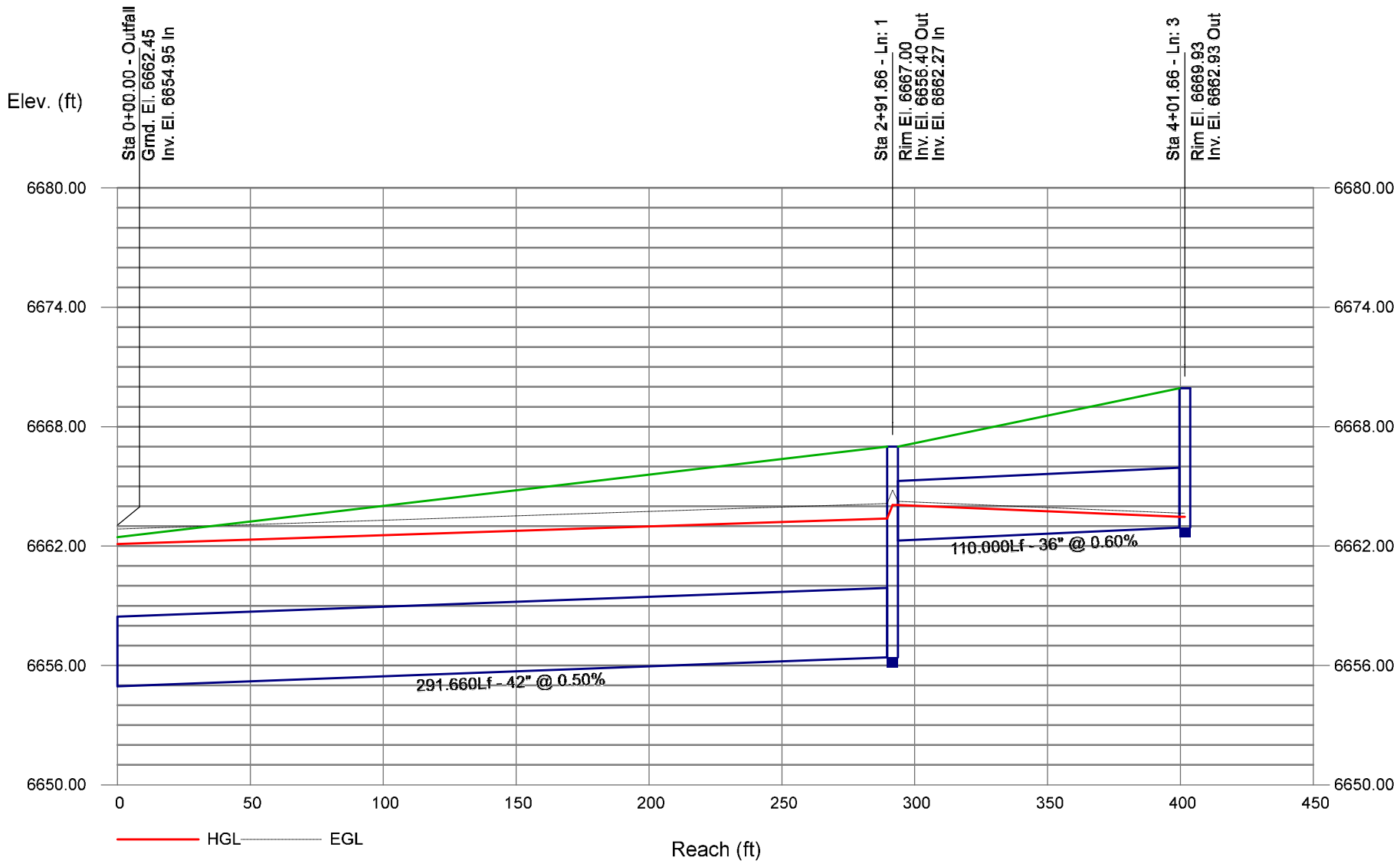
100 YEAR PEAK RUNOFF FROM EX 42" RCP WATERSHED
PIPE ID: 1 TO 2



Storm Sewer Profile

Proj. file: Pond Outflow_100-(PIPE High Flow).stm

100 YEAR PEAK RUNOFF FROM EX 42" RCP WATERSHED
PIPE ID: 1 TO 3



Struthers Pond Outlet Structure - Backwater Check

100-Yr Pond Outlet Structure Discharge = 44.7 cfs
100-Yr hgl in Pond = 6672.34
100-Yr Backwater HGL in Outlet Structure = 6666.08
36" Outlet Pipe Invert Elevation = 6662.93
Restrictor Plate Elevation Above Invert = 6664.31

Orifice Area = 3.16 sq-ft
H = 6672.34 - 6666.08 = 6.26 ft

Orifice Equation
$Q = C_d A(2gH)^{0.5}$
C_d = coefficient of discharge 0.61 for sharp edged orifices (used for top edge of the opening, L = 2.99 ft)
C_d = coefficient of discharge 0.81 for short-tube orifices (used for the RCP portion of the opening, L = 4.46 ft)
Weighted C_d = 0.72
A = area of orifice in square feet
H = Differential head of water above the orifice (Pond Water Surface less HGL in 36" Pipe)

C_d	A	H	Q		
(ft)	(ft)	(ft)	(cfs)		
0.72	3.16	6.26	45.7	> 44.7 cfs	therefore backwater does not negatively affect outlet structure function

WILSON &COMPANY
5755, Mark Dabling Blvd, Ste.100
Colorado Springs, CO 80919
719-520-5800 phone
719-520-0108 fax

C.4
FULL SPECTRUM DETENTION/PWQ POND
DESIGN ANALYSIS

North Gate / Struthers PWQ Pond
Detention Pond Watershed Total Area & Impervoius Area Summary
8/4/2024

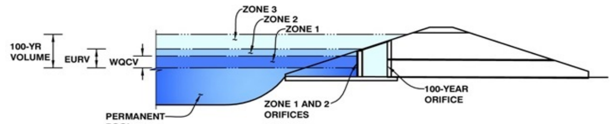
Basin ID	Basin Area (acres)	Basin Imperviousness (percent)	Weighted Imperviousness ((Basin Area X %Imp X .01)/ Total Area)	Impervious Area (acres)
1	1.23	90	0.020	1.11
2	0.25	90	0.004	0.23
3	0.36	90	0.006	0.32
4	1.78	90	0.028	1.60
5	11.94	70	0.148	8.36
6	0.84	90	0.013	0.76
7	0.56	95	0.009	0.53
7a	0.43	60	0.005	0.26
8	1.47	90	0.023	1.32
9	0.6	90	0.010	0.54
10	18	95	0.302	17.10
11	9.54	28	0.047	2.67
12	5.46	15	0.014	0.82
13	0.43	80	0.006	0.34
14	0.5	80	0.007	0.40
16	3.15	10	0.006	0.32
Total	**56.54**		**65%**	**36.67**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Struthers Full Spectrum PWQ Pond with no Outlet Clogging

Basin ID: Pond Watershed



Example Zone Configuration (Retention Pond)

Depth Increment = ft

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	56.54	acres		
Watershed Length =	3,500	ft		
Watershed Length to Centroid =	1,680	ft		
Watershed Slope =	0.030	ft/ft		
Watershed Imperviousness =	65.00%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	100.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.197	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.012	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.9 in.) =	2.580	acre-feet	0.90	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	3.701	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	4.833	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	6.874	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.18 in.) =	8.468	acre-feet	2.18	inches
100-yr Runoff Volume (P1 = 2.53 in.) =	10.326	acre-feet	2.53	inches
500-yr Runoff Volume (P1 = 0.01 in.) =	0.000	acre-feet	0.01	inches
Approximate 2-yr Detention Volume =	2.353	acre-feet		
Approximate 5-yr Detention Volume =	3.337	acre-feet		
Approximate 10-yr Detention Volume =	4.436	acre-feet		
Approximate 25-yr Detention Volume =	5.299	acre-feet		
Approximate 50-yr Detention Volume =	5.779	acre-feet		
Approximate 100-yr Detention Volume =	6.474	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.197	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.815	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.462	acre-feet
Total Detention Basin Volume =	6.474	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	16	0.000		
	--	0.70	--	--	--	399	0.009	145	0.003
	--	1.20	--	--	--	1,235	0.028	554	0.013
	--	1.70	--	--	--	4,084	0.094	1,883	0.043
	--	2.20	--	--	--	10,765	0.247	5,596	0.128
	--	2.70	--	--	--	18,353	0.421	12,875	0.296
	--	3.20	--	--	--	26,381	0.606	24,059	0.552
	--	3.70	--	--	--	32,742	0.752	38,839	0.892
	--	4.20	--	--	--	36,474	0.837	56,143	1.289
	--	4.70	--	--	--	38,847	0.892	74,974	1.721
	--	5.20	--	--	--	41,276	0.948	95,004	2.181
	--	5.70	--	--	--	43,764	1.005	116,264	2.669
	--	6.20	--	--	--	46,310	1.063	138,783	3.186
	--	6.70	--	--	--	48,914	1.123	162,589	3.733
	--	7.20	--	--	--	51,628	1.185	187,724	4.310
	--	7.70	--	--	--	54,400	1.249	214,231	4.918
	--	8.20	--	--	--	57,228	1.314	242,138	5.559
	--	8.70	--	--	--	60,114	1.380	271,474	6.232
	--	9.20	--	--	--	63,081	1.448	302,273	6.939
	--	9.70	--	--	--	65,603	1.506	334,444	7.678
	--	10.20	--	--	--	68,228	1.566	367,901	8.446
	--	10.70	--	--	--	70,957	1.629	402,698	9.245
	--	11.20	--	--	--	73,795	1.694	438,886	10.075
	--	11.70	--	--	--	76,747	1.762	476,521	10.939
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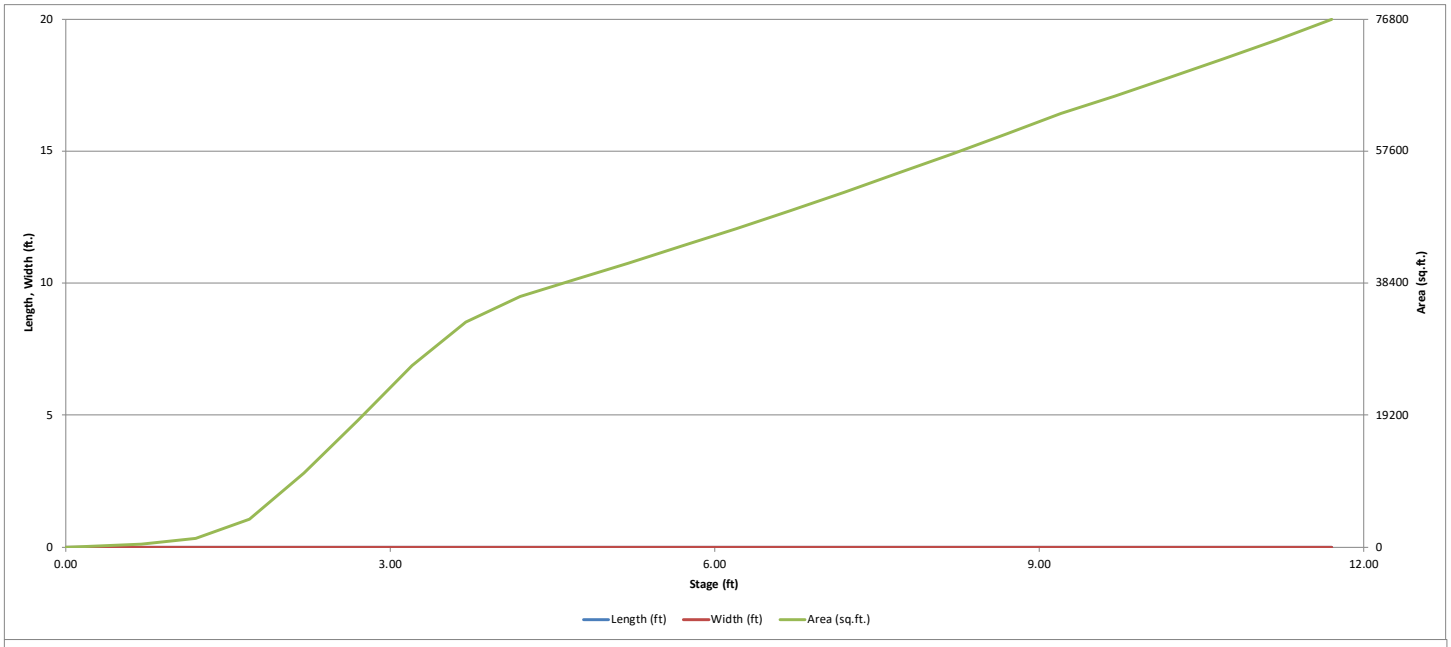
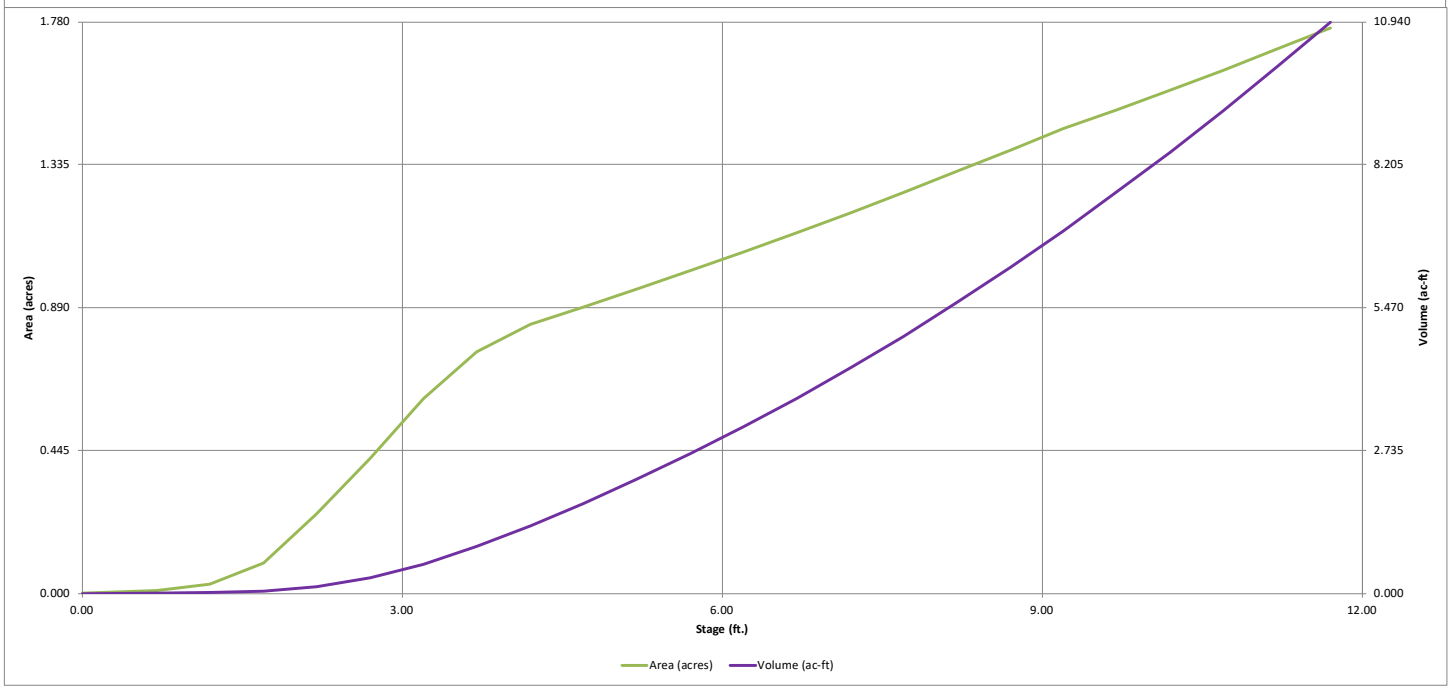
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



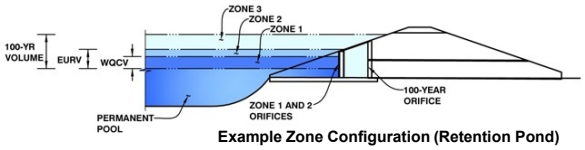


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Struthers Full Spectrum PWQ Pond with no Outlet Clogging

Basin ID: Pond Watershed



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.09	1.197	Orifice Plate
Zone 2 (EURV)	6.95	2.815	Rectangular Orifice
Zone 3 (100-year)	8.88	2.462	Weir&Pipe (Restrict)
Total (all zones)		6.474	

1.25

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.09	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.07	1.25	2.50					
Orifice Area (sq. inches)	2.64	2.64	2.64					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.45	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.42	N/A	feet
Vertical Orifice Height =	10.00	N/A	inches				
Vertical Orifice Width =	6.50		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.45	N/A	feet
Overflow Weir Front Edge Length =	7.00	N/A	feet	Overflow Weir Slope Length =	6.18	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	9.54	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	30.13	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	30.13	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.37	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.16	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	0.80	N/A	feet
Restrictor Plate Height Above Pipe Invert =	16.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.33	feet
Spillway Crest Length =	26.00	feet	Stage at Top of Freeboard =	10.53	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	1.61	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	8.97	acre-ft

Calculated Parameters for Spillway

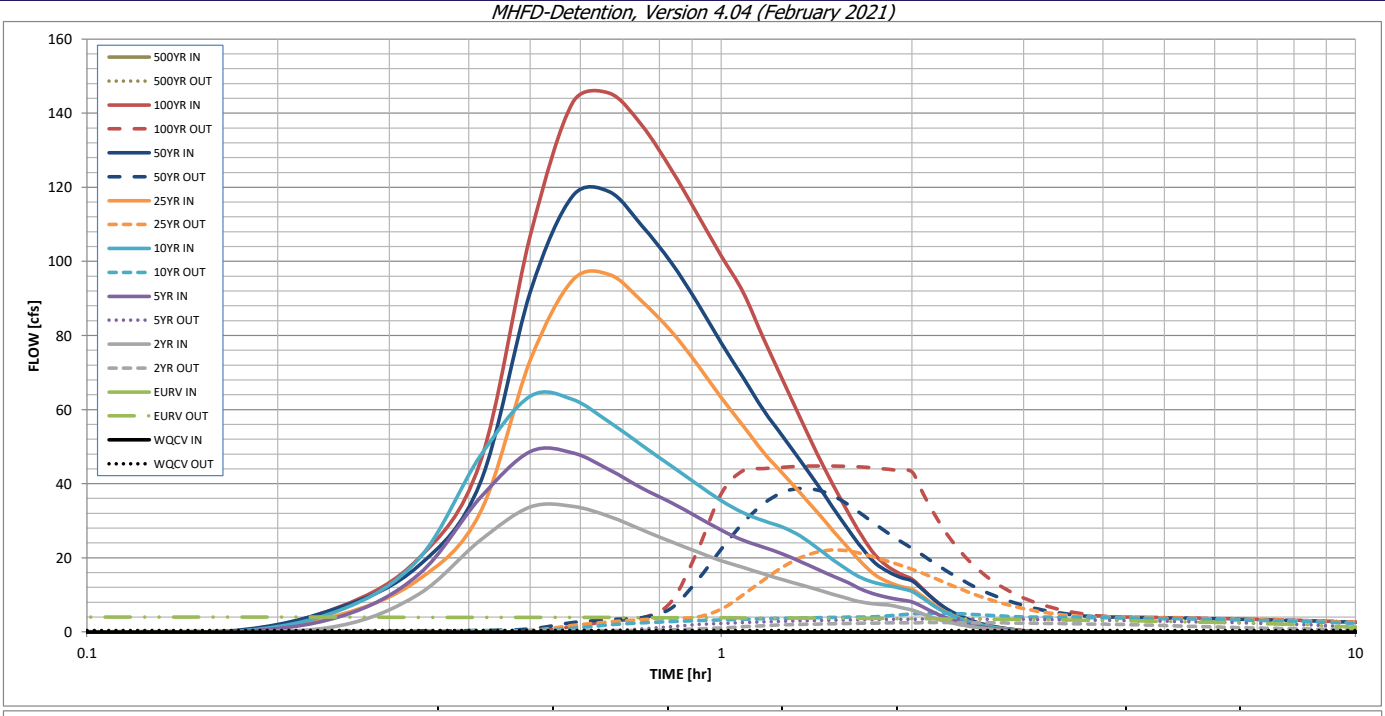
Routed Hydrograph Results

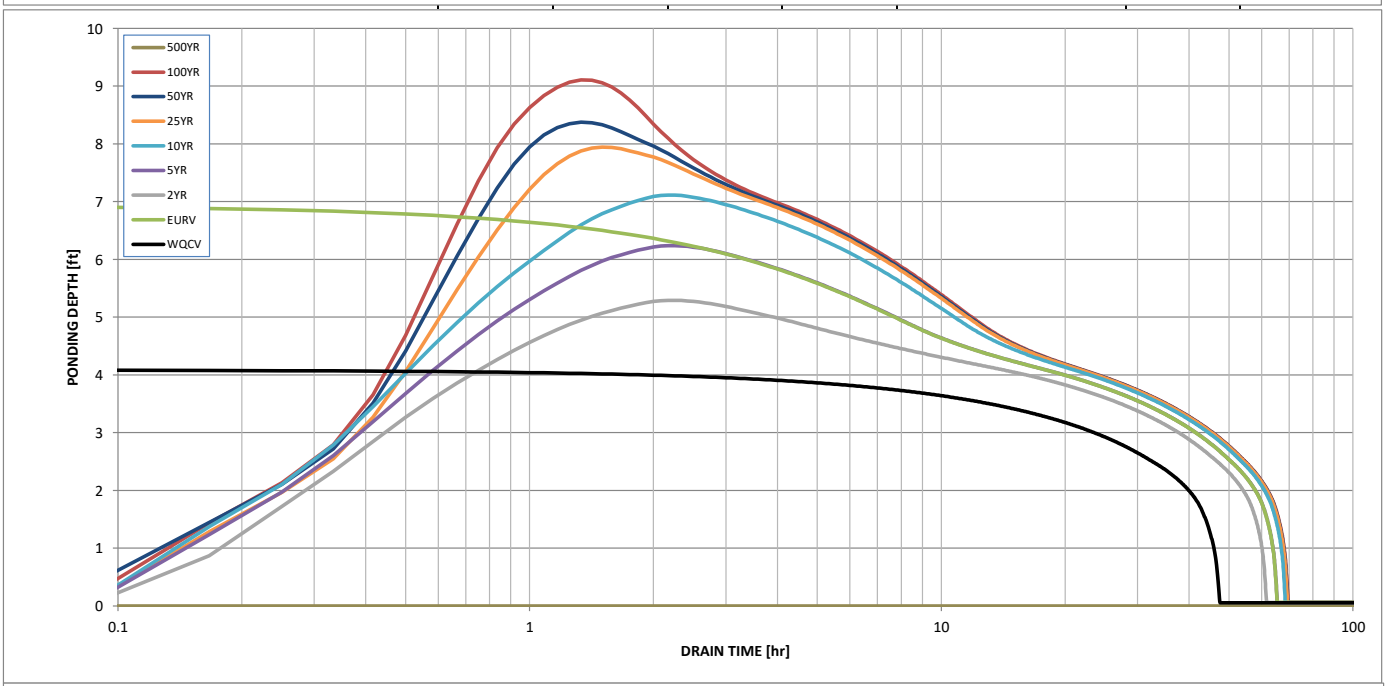
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

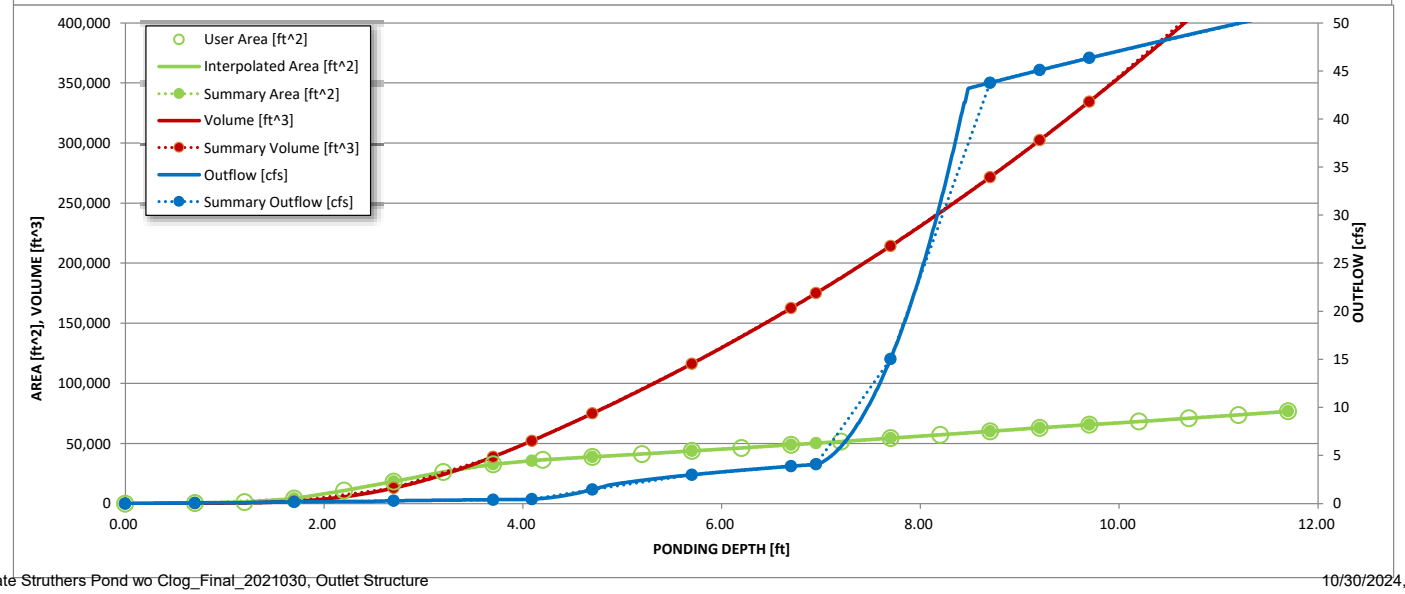
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.90	1.20	1.46	1.85	2.18	2.53
CUHP Runoff Volume (acre-ft) =	1.197	4.012	2.580	3.701	4.833	6.874	8.468	10.326
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.580	3.701	4.833	6.874	8.468	10.326
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	3.3	10.2	30.2	42.3	57.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.18	0.53	0.75	1.02
Peak Inflow Q (cfs) =	N/A	N/A	34.0	48.7	63.6	96.5	118.8	145.4
Peak Outflow Q (cfs) =	0.5	4.1	2.5	3.5	5.1	22.1	38.8	44.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.5	0.7	0.9	0.8
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.6	1.1	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	56	55	57	58	55	53	51
Time to Drain 99% of Inflow Volume (hours) =	**45**	61	58	61	63	63	62	61
Maximum Ponding Depth (ft) =	4.09	6.95	5.30	6.24	7.12	7.95	8.38	9.11
Area at Maximum Ponding Depth (acres) =	0.82	1.15	0.96	1.07	1.17	1.28	1.34	1.43
Maximum Volume Stored (acre-ft) =	1.198	4.017	2.267	3.229	4.203	5.222	5.784	6.795

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: *Outflow Hydrograph*

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.07	0.00
	0:15:00	0.00	0.00	1.68	4.15	5.89	4.67	6.59	6.79	0.00
	0:20:00	0.00	0.00	10.19	15.50	19.66	14.15	17.88	19.84	0.00
	0:25:00	0.00	0.00	24.72	36.16	47.38	32.07	40.07	45.57	0.00
	0:30:00	0.00	0.00	33.71	48.67	63.62	73.31	91.68	106.89	0.00
	0:35:00	0.00	0.00	33.96	48.37	62.74	94.97	117.72	142.92	0.00
	0:40:00	0.00	0.00	31.19	43.76	56.60	96.47	118.81	145.40	0.00
	0:45:00	0.00	0.00	27.58	38.88	50.41	89.24	109.71	136.74	0.00
	0:50:00	0.00	0.00	24.40	34.97	44.89	81.25	99.81	124.99	0.00
	0:55:00	0.00	0.00	21.68	31.11	39.90	72.27	88.91	112.85	0.00
	1:00:00	0.00	0.00	19.26	27.49	35.50	63.31	78.02	101.57	0.00
	1:05:00	0.00	0.00	17.43	24.74	32.17	55.63	68.65	91.63	0.00
	1:10:00	0.00	0.00	15.69	22.90	30.01	48.43	59.81	79.13	0.00
	1:15:00	0.00	0.00	14.13	21.07	28.29	42.83	52.88	68.04	0.00
	1:20:00	0.00	0.00	12.74	19.01	25.88	37.42	46.16	57.62	0.00
	1:25:00	0.00	0.00	11.46	16.99	22.70	32.38	39.87	48.12	0.00
	1:30:00	0.00	0.00	10.22	15.07	19.53	27.39	33.62	39.83	0.00
	1:35:00	0.00	0.00	9.02	13.34	16.75	22.76	27.79	32.38	0.00
	1:40:00	0.00	0.00	8.07	11.48	14.54	18.66	22.66	25.85	0.00
	1:45:00	0.00	0.00	7.54	10.15	13.28	15.38	18.59	20.68	0.00
	1:50:00	0.00	0.00	7.30	9.32	12.53	13.50	16.27	17.63	0.00
	1:55:00	0.00	0.00	6.64	8.72	11.84	12.30	14.77	15.66	0.00
	2:00:00	0.00	0.00	5.93	8.13	10.94	11.52	13.76	14.26	0.00
	2:05:00	0.00	0.00	4.86	6.71	9.01	9.47	11.29	11.51	0.00
	2:10:00	0.00	0.00	3.79	5.22	7.01	7.30	8.69	8.67	0.00
	2:15:00	0.00	0.00	2.95	4.04	5.41	5.59	6.64	6.48	0.00
	2:20:00	0.00	0.00	2.27	3.11	4.14	4.26	5.05	4.86	0.00
	2:25:00	0.00	0.00	1.75	2.38	3.14	3.26	3.85	3.72	0.00
	2:30:00	0.00	0.00	1.34	1.79	2.35	2.45	2.88	2.80	0.00
	2:35:00	0.00	0.00	1.01	1.32	1.76	1.82	2.14	2.11	0.00
	2:40:00	0.00	0.00	0.75	0.97	1.32	1.36	1.60	1.59	0.00
	2:45:00	0.00	0.00	0.54	0.71	0.97	1.02	1.20	1.19	0.00
	2:50:00	0.00	0.00	0.37	0.49	0.68	0.72	0.85	0.84	0.00
	2:55:00	0.00	0.00	0.23	0.32	0.44	0.48	0.56	0.56	0.00
	3:00:00	0.00	0.00	0.13	0.19	0.25	0.29	0.33	0.33	0.00
	3:05:00	0.00	0.00	0.06	0.09	0.12	0.14	0.16	0.16	0.00
	3:10:00	0.00	0.00	0.02	0.03	0.03	0.05	0.05	0.05	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
6663.3 Top of Micropool	0.00	16	0.000	0	0.000	0.00
64.0	0.70	399	0.009	145	0.003	0.07
6665	1.70	4,084	0.094	1,883	0.043	0.17
6666	2.70	18,353	0.421	12,875	0.296	0.29
6667	3.70	32,742	0.752	38,839	0.892	0.40
6667.39 Top of WQV	4.09	35,653	0.818	52,176	1.198	0.45
6668	4.70	38,847	0.892	74,974	1.721	1.46
6669	5.70	43,764	1.005	116,264	2.669	3.00
6670	6.70	48,914	1.123	162,589	3.733	3.88
6670.15 Top of EURV	6.95	50,271	1.154	174,987	4.017	4.07
6671	7.70	54,400	1.249	214,231	4.918	15.04
6672	8.70	60,114	1.380	271,474	6.232	43.76
6672.5 Spillway Crest	9.20	63,081	1.448	302,273	6.939	45.07
6673	9.70	65,603	1.506	334,444	7.678	46.33
6675	11.70	76,747	1.762	476,521	10.939	51.09

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

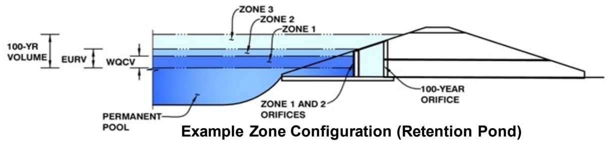
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Struthers Full Spectrum PWQ Pond with Outlet Trash Rack 50% Clogged

Basin ID: Pond Watershed



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	56.54	acres
Watershed Length =	3,500	ft
Watershed Length to Centroid =	1,680	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.197	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.012	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.9 in.) =	2.580	acre-feet	0.90	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	3.701	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	4.833	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	6.874	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.18 in.) =	8.468	acre-feet	2.18	inches
100-yr Runoff Volume (P1 = 2.53 in.) =	10.326	acre-feet	2.53	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	13.363	acre-feet		inches
Approximate 2-yr Detention Volume =	2.353	acre-feet		
Approximate 5-yr Detention Volume =	3.337	acre-feet		
Approximate 10-yr Detention Volume =	4.436	acre-feet		
Approximate 25-yr Detention Volume =	5.299	acre-feet		
Approximate 50-yr Detention Volume =	5.779	acre-feet		
Approximate 100-yr Detention Volume =	6.474	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.197	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.815	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.462	acre-feet
Total Detention Basin Volume =	6.474	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	16	0.000		
	--	0.70	--	--	--	399	0.009	145	0.003
	--	1.20	--	--	--	1,235	0.028	554	0.013
	--	1.70	--	--	--	4,084	0.094	1,883	0.043
	--	2.20	--	--	--	10,765	0.247	5,596	0.128
	--	2.70	--	--	--	18,353	0.421	12,875	0.296
	--	3.20	--	--	--	26,381	0.606	24,059	0.552
	--	3.70	--	--	--	32,742	0.752	38,839	0.892
	--	4.20	--	--	--	36,474	0.837	56,143	1.289
	--	4.70	--	--	--	38,847	0.892	74,974	1.721
	--	5.20	--	--	--	41,276	0.948	95,004	2.181
	--	5.70	--	--	--	43,764	1.005	116,264	2.669
	--	6.20	--	--	--	46,310	1.063	138,783	3.186
	--	6.70	--	--	--	48,914	1.123	162,589	3.733
	--	7.20	--	--	--	51,628	1.185	187,724	4.310
	--	7.70	--	--	--	54,400	1.249	214,231	4.918
	--	8.20	--	--	--	57,228	1.314	242,138	5.559
	--	8.70	--	--	--	60,114	1.380	271,474	6.232
	--	9.20	--	--	--	63,081	1.448	302,273	6.939
	--	9.70	--	--	--	65,603	1.506	334,444	7.678
	--	10.20	--	--	--	68,228	1.566	367,901	8.446
	--	10.70	--	--	--	70,957	1.629	402,698	9.245
	--	11.20	--	--	--	73,795	1.694	438,886	10.075
	--	11.70	--	--	--	76,747	1.762	476,521	10.939
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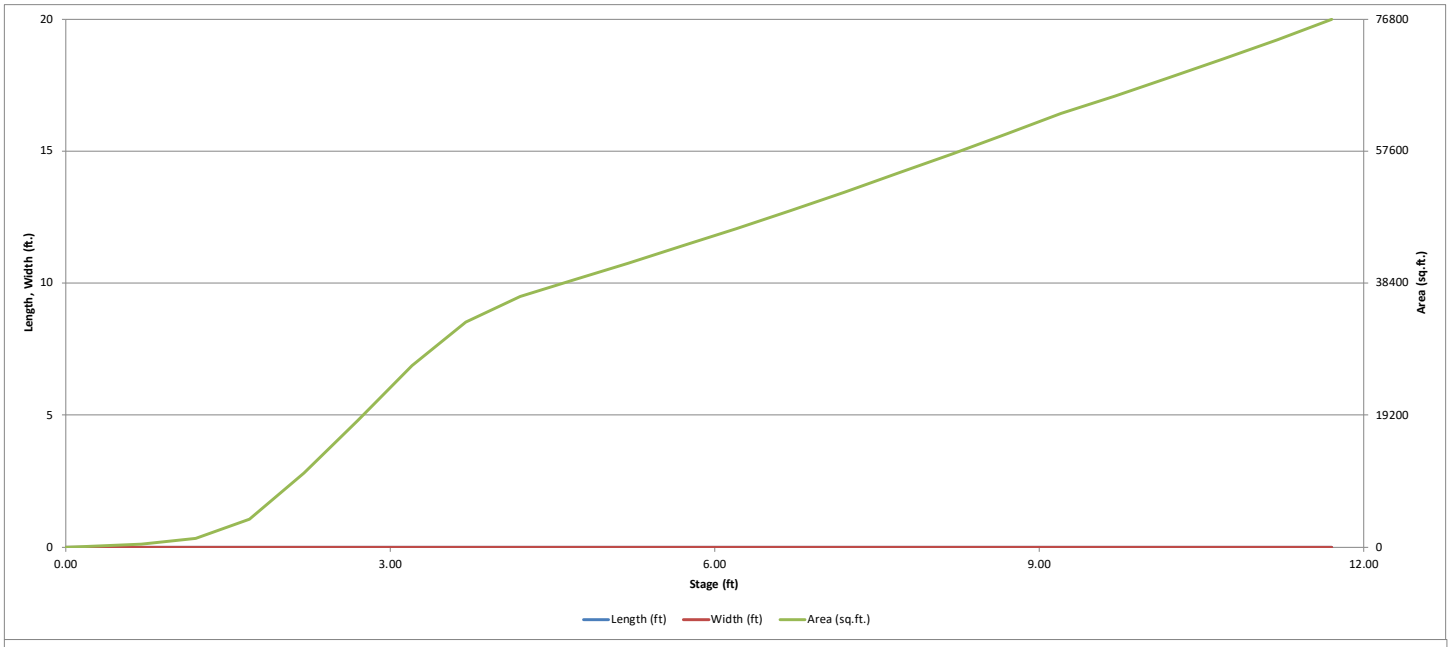
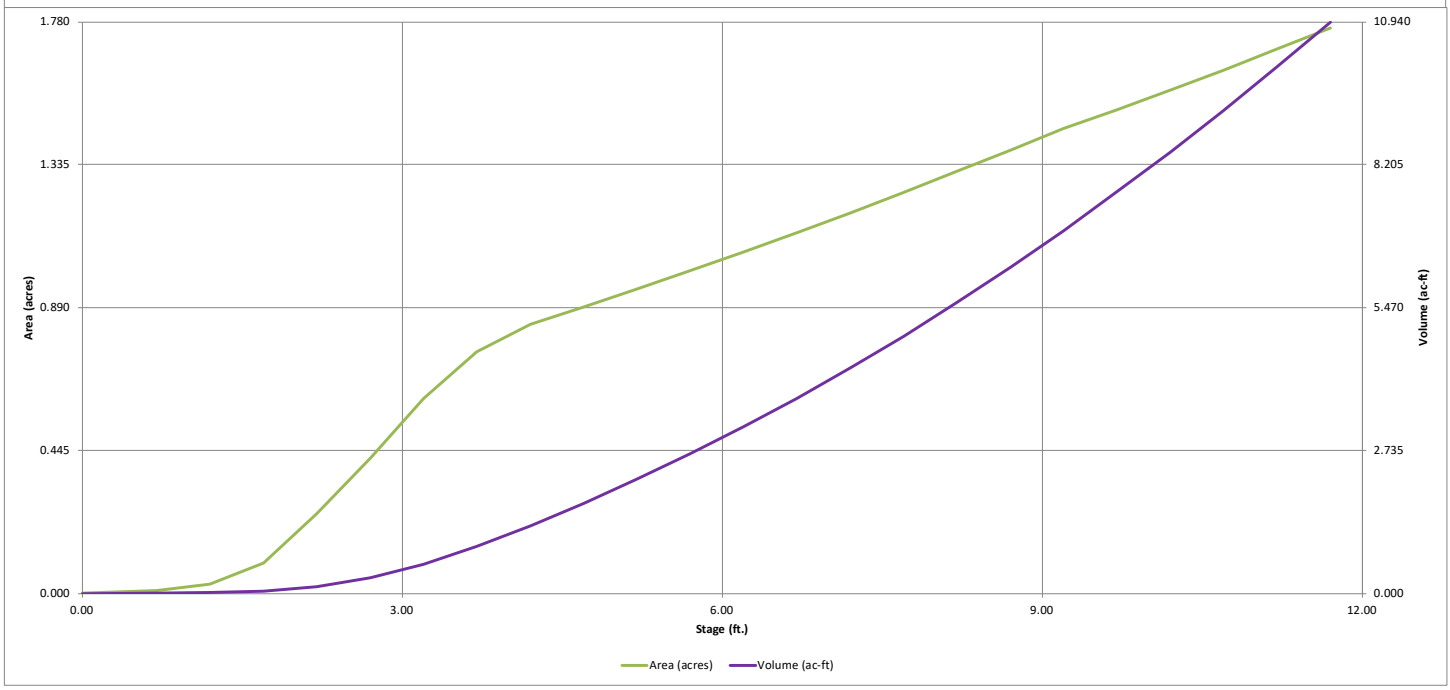
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



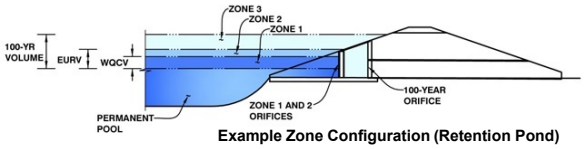


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Struthers Full Spectrum PWQ Pond with Outlet Trash Rack 50% Clogged

Basin ID: Pond Watershed



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.09	1.197	Orifice Plate
Zone 2 (EURV)	6.95	2.815	Rectangular Orifice
Zone 3 (100-year)	8.88	2.462	Weir&Pipe (Restrict)
Total (all zones)		6.474	

1.25

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.09	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.07	1.25	2.50					
Orifice Area (sq. inches)	2.64	2.64	2.64					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.02	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.45	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.42	N/A	feet
Vertical Orifice Height =	10.00	N/A	inches				
Vertical Orifice Width =	6.50		inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.45	N/A	feet
Overflow Weir Front Edge Length =	7.00	N/A	feet	Overflow Weir Slope Length =	6.18	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	9.54	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	30.13	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	15.07	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.37	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	3.16	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	0.80	N/A	feet
Restrictor Plate Height Above Pipe Invert =	16.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.33	feet
Spillway Crest Length =	26.00	feet	Stage at Top of Freeboard =	10.53	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	1.61	acres
Freeboard above Max Water Surface =		feet	Basin Volume at Top of Freeboard =	8.97	acre-ft

Calculated Parameters for Spillway

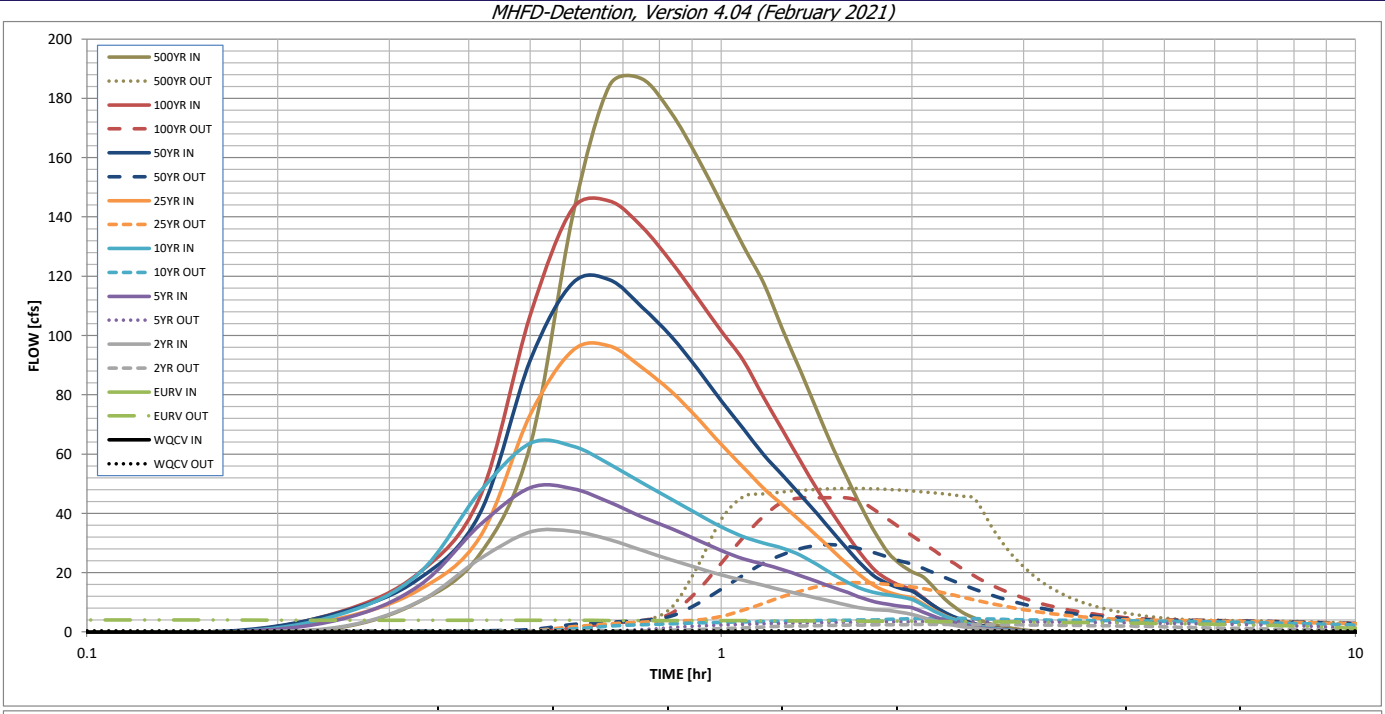
Routed Hydrograph Results

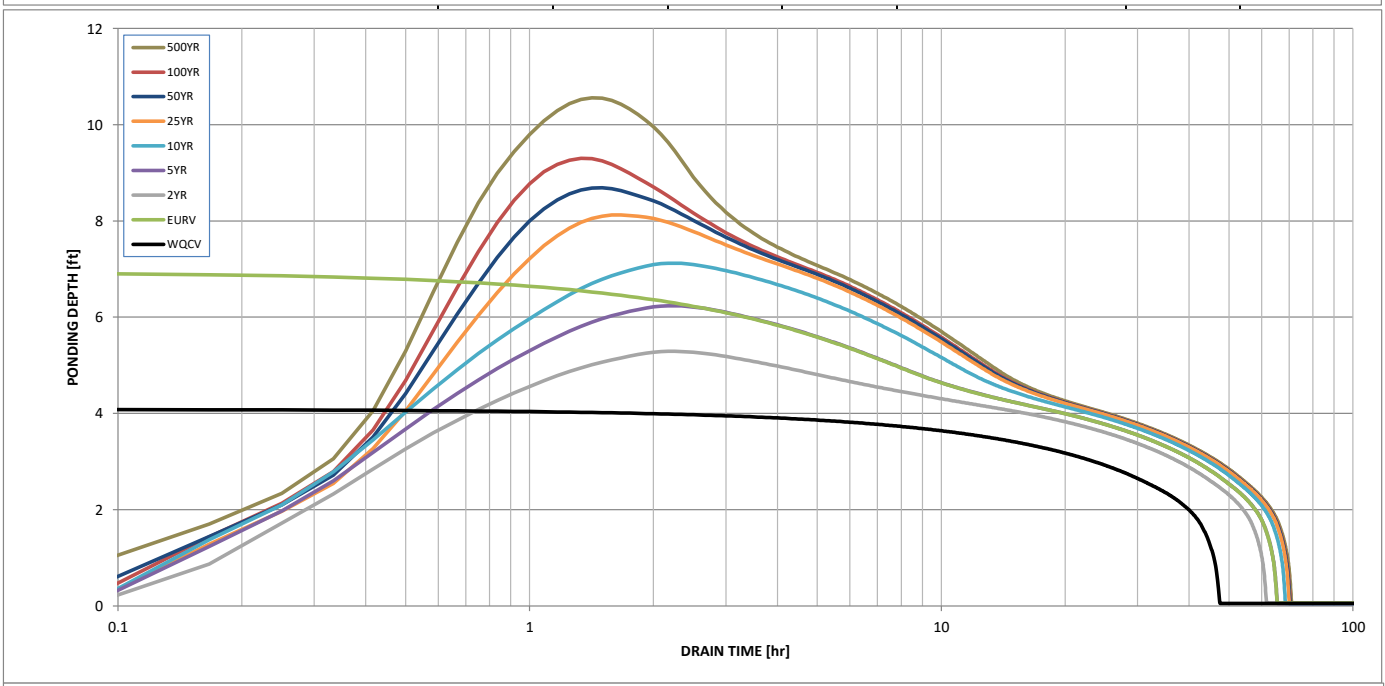
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

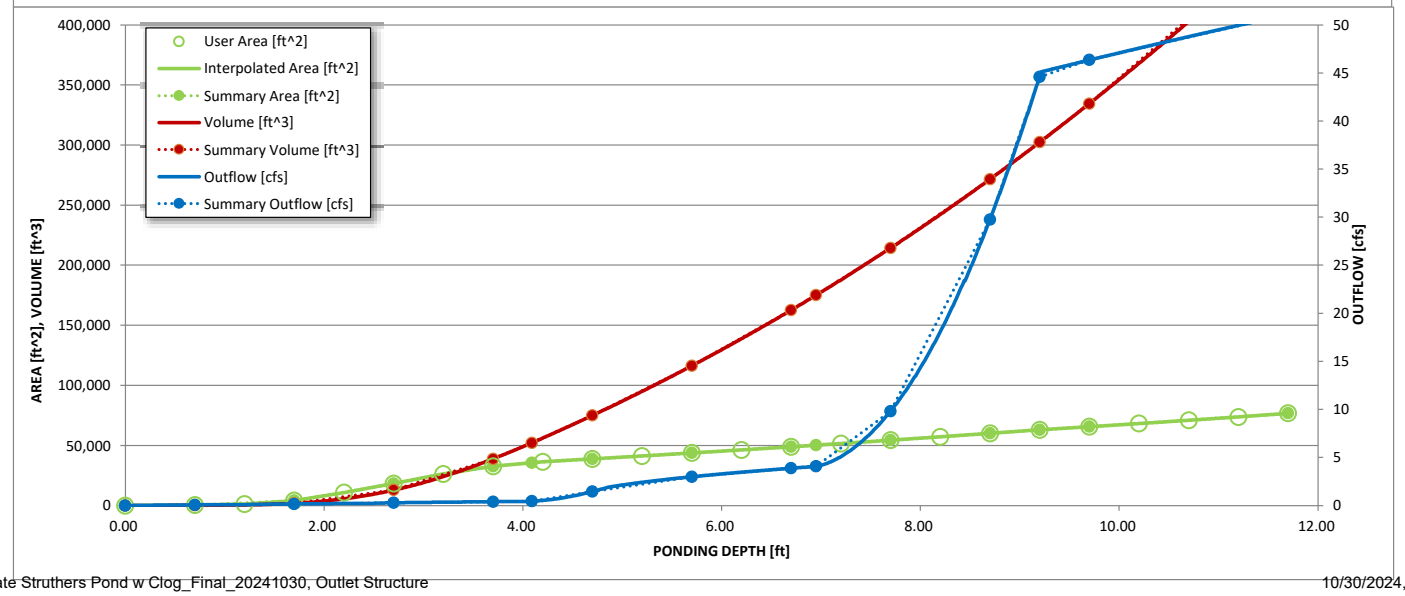
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.90	1.20	1.46	1.85	2.18	2.53
CUHP Runoff Volume (acre-ft) =	1.197	4.012	2.580	3.701	4.833	6.874	8.468	10.326
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.580	3.701	4.833	6.874	8.468	10.326
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.4	3.3	10.2	30.2	42.3	57.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.06	0.18	0.53	0.75	1.02
Peak Inflow Q (cfs) =	N/A	N/A	34.0	48.7	63.6	96.5	118.8	145.4
Peak Outflow Q (cfs) =	0.5	4.1	2.5	3.5	4.7	16.6	29.5	45.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.5	0.6	0.7	0.8
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.4	0.8	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	56	55	57	58	56	54	52
Time to Drain 99% of Inflow Volume (hours) =	**45**	61	58	61	63	64	63	62
Maximum Ponding Depth (ft) =	4.09	6.95	5.30	6.24	7.13	8.13	8.69	9.30
Area at Maximum Ponding Depth (acres) =	0.82	1.15	0.96	1.07	1.18	1.30	1.38	1.46
Maximum Volume Stored (acre-ft) =	1.198	4.017	2.267	3.229	4.215	5.454	6.205	7.085

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: *Outflow Hydrograph*

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.07	1.48
	0:15:00	0.00	0.00	1.68	4.15	5.89	4.67	6.59	6.79	10.12
	0:20:00	0.00	0.00	10.19	15.50	19.66	14.15	17.88	19.84	26.29
	0:25:00	0.00	0.00	24.72	36.16	47.38	32.07	40.07	45.57	62.88
	0:30:00	0.00	0.00	33.71	48.67	63.62	73.31	91.68	106.89	140.41
	0:35:00	0.00	0.00	33.96	48.37	62.74	94.97	117.72	142.92	184.38
	0:40:00	0.00	0.00	31.19	43.76	56.60	96.47	118.81	145.40	186.68
	0:45:00	0.00	0.00	27.58	38.88	50.41	89.24	109.71	136.74	175.25
	0:50:00	0.00	0.00	24.40	34.97	44.89	81.25	99.81	124.99	160.26
	0:55:00	0.00	0.00	21.68	31.11	39.90	72.27	88.91	112.85	144.77
	1:00:00	0.00	0.00	19.26	27.49	35.50	63.31	78.02	101.57	130.31
	1:05:00	0.00	0.00	17.43	24.74	32.17	55.63	68.65	91.63	117.67
	1:10:00	0.00	0.00	15.69	22.90	30.01	48.43	59.81	79.13	102.01
	1:15:00	0.00	0.00	14.13	21.07	28.29	42.83	52.88	68.04	88.08
	1:20:00	0.00	0.00	12.74	19.01	25.88	37.42	46.16	57.62	74.61
	1:25:00	0.00	0.00	11.46	16.99	22.70	32.38	39.87	48.12	62.21
	1:30:00	0.00	0.00	10.22	15.07	19.53	27.39	33.62	39.83	51.42
	1:35:00	0.00	0.00	9.02	13.34	16.75	22.76	27.79	32.38	41.75
	1:40:00	0.00	0.00	8.07	11.48	14.54	18.66	22.66	25.85	33.31
	1:45:00	0.00	0.00	7.54	10.15	13.28	15.38	18.59	20.68	26.76
	1:50:00	0.00	0.00	7.30	9.32	12.53	13.50	16.27	17.63	22.85
	1:55:00	0.00	0.00	6.64	8.72	11.84	12.30	14.77	15.66	20.31
	2:00:00	0.00	0.00	5.93	8.13	10.94	11.52	13.76	14.26	18.50
	2:05:00	0.00	0.00	4.86	6.71	9.01	9.47	11.29	11.51	14.92
	2:10:00	0.00	0.00	3.79	5.22	7.01	7.30	8.69	8.67	11.24
	2:15:00	0.00	0.00	2.95	4.04	5.41	5.59	6.64	6.48	8.40
	2:20:00	0.00	0.00	2.27	3.11	4.14	4.26	5.05	4.86	6.29
	2:25:00	0.00	0.00	1.75	2.38	3.14	3.26	3.85	3.72	4.80
	2:30:00	0.00	0.00	1.34	1.79	2.35	2.45	2.88	2.80	3.61
	2:35:00	0.00	0.00	1.01	1.32	1.76	1.82	2.14	2.11	2.71
	2:40:00	0.00	0.00	0.75	0.97	1.32	1.36	1.60	1.59	2.04
	2:45:00	0.00	0.00	0.54	0.71	0.97	1.02	1.20	1.19	1.52
	2:50:00	0.00	0.00	0.37	0.49	0.68	0.72	0.85	0.84	1.08
	2:55:00	0.00	0.00	0.23	0.32	0.44	0.48	0.56	0.56	0.71
	3:00:00	0.00	0.00	0.13	0.19	0.25	0.29	0.33	0.33	0.42
	3:05:00	0.00	0.00	0.06	0.09	0.12	0.14	0.16	0.16	0.20
	3:10:00	0.00	0.00	0.02	0.03	0.03	0.05	0.05	0.05	0.06
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
6663.3 Top of Micropool	0.00	16	0.000	0	0.000	0.00
64.0	0.70	399	0.009	145	0.003	0.07
6665	1.70	4,084	0.094	1,883	0.043	0.17
6666	2.70	18,353	0.421	12,875	0.296	0.29
6667	3.70	32,742	0.752	38,839	0.892	0.40
6667.39 Top of WQV	4.09	35,653	0.818	52,176	1.198	0.45
6668	4.70	38,847	0.892	74,974	1.721	1.46
6669	5.70	43,764	1.005	116,264	2.669	3.00
6670	6.70	48,914	1.123	162,589	3.733	3.88
6670.15 Top of EURV	6.95	50,271	1.154	174,987	4.017	4.07
6671	7.70	54,400	1.249	214,231	4.918	9.82
6672	8.70	60,114	1.380	271,474	6.232	29.75
6672.5 Spillway Crest	9.20	63,081	1.448	302,273	6.939	44.58
6673	9.70	65,603	1.506	334,444	7.678	46.33
6675	11.70	76,747	1.762	476,521	10.939	51.09

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

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C.5
RIPRAP CALCULATIONS

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Struthers - Basin 17 - Riprap Rundown **County:** El Paso
Designer: DWD **Checked by:**
Date: July 25, 2024 **Date:**

Input Geometry:

→ Upstream Channel	→ Chute		→ Downstream Channel
Bw = 0.0 ft.	Bw = 6.0 ft.		Bw = 0.0 ft.
Side slopes = 10.0(m:1)	Factor of safety = 1.20 (F_s)	1.2 Min	Side slopes = 20.0(m:1)
Velocity n-value = 0.030	Side slopes = 3.5 (m:1)	→ 2.0:1 max.	Velocity n-value = 0.030
Bed slope = 0.0170 ft./ft.	Bed slope (6.8:1) = 0.146 ft./ft	→ 3.0:1 max.	Bed slope = 0.0050 ft./ft.
Note: n value = a) velocity n from waterway program	Freeboard = 0.0 ft.	→ Increase Freeboard	
or b) computed mannings n for channel	Outlet apron depth, d = 0.0 ft.		Base flow = 0.0 cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet = 71.0 ft. ------- Outlet 67.8 ft. --- (H_{drop} = 3.3 ft.)

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410
Q_5 = Runofff from a 5-year,24-hour storm.

Q_{high} = 3.6 cfs High flow storm through chute → Tw (ft.) = Program
Q_5 = 0.1 cfs Low flow storm through chute → Tw (ft.) = Program

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*
***Input tailwater (Tw)**:* 0.15 1.20

Profile and Cross Section (Output):

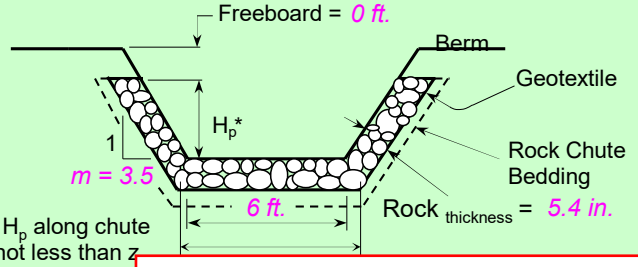
Starting Station = 0+00.0
h_{pv} = #NUM!
H_{pe} = #NUM!
Energy Grade Line
h_{cv} = 0.1 ft. (0.01 ft.)
H_{ce} = 0.31 ft.
H_p = 30 ft. (30 ft.)
Inlet Channel
Slope = 0.017 ft./ft.
y_c = 0.21 ft. (0.02 ft.)
0.715y_c = 0.15 ft. (0.01 ft.)
z_1 = 0.14 ft. (0.01 ft.)
Hydraulic Jump Height, z_2 = 0.21 ft. (0.03 ft.)
Inlet Apron
[1] y_n = 0.4 ft. (0.11 ft.)
10y_c = 2 ft.
H_{drop} = 3.3 ft.
Tw+d = 0.39 ft. - Tw o.k. (0.1 ft.) - Tw o.k.
40(D_{50}) = 8 ft. radius
Velocity$_{inlet}$ = 2.22 fps at normal depth
n = 0.04 (0.03)
0.39 ft. (0.1 ft.)
Outlet Channel
Slope = 0.005 ft./ft.
Critical Slope check upstream is OK
Geotextile
1
6.8
Outlet Apron
3 ft.
15(D_{50})(F_s)
2.5
1
d = 0 ft. {1 ft. minimum suggested}
Rock Chute Bedding
Velocity$_{outlet}$ = 1.18 fps at normal depth

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than z

	0.56 cfs/ft.	Equivalent unit discharge
F_S =	1.20	Factor of safety (multiplier)
z_1 =	0.14 ft.	Normal depth in chute
n-value =	0.04	Manning's roughness coefficient
$D_{50}(F_s)$ =	2.7 in.	Minimum Design D50*
$2(D_{50})(F_s)$ =	5.4 in.	Rock chute thickness
Tw + d =	0.39 ft.	Tailwater above outlet apron
z_2 =	0.21 ft.	Hydraulic jump height
*** The outlet	will	function adequately

Type L Soil Riprap used for the rundown

High Flow Storm Information

Project: Struthers PWQ Pond Task: Riprap Apron

Designer: VSF Date: 7/29/24

Checker: DWD Date: 8/8/24

WILSON & COMPANY
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Struthers 42" Outfall to Smith Creek

Sizing for riprap apron (USDCM Vol. 2 Section 3.2.1)

42" pipe D = W = 3.5 ft

Full Area = 9.62 sq-ft

Q100 = 90 cfs; pipe full velocity V = Q/A = 9.4 fps

Tailwater (Y_t) = 1.9 ft based on normal depth of d/s channel with culvert flow only

$Y_t/D = 1.9/3.5 = 0.54$

$Q/D^{2.5} = 90/(3.5)^{2.5} = 3.93$

Expansion Factor (Fig 9-35) EF = 5.6

Allowable non-eroding velocity in d/s channel V = 5 fps

$A_t = Q/V = 90/5 = 18$ sq-ft

Length of protection $L_p = EF\ (A_t/Y_t - W) = 5.6\ ((18/1.9) - 3.5) = 33.5$ ft

The above length of protection is very conservative.

Per the Monument Creek Restoration Plan:

Smith Creek Q10 = 280 cfs and W.S.E = 6657.8 at outlet of 42" pipe

Invert of Smith Creek at outlet of 42" pipe = 6654.80 => Y_t = 6657.83 - 6654.80 = 3.3 ft

$Y_t/D = 3.0/3.5 = 0.86$ => Expansion Factor = 6.7

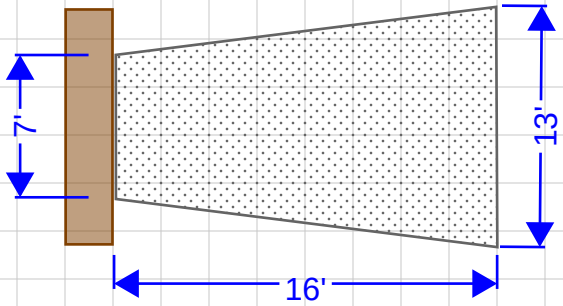
Lp = EF (At/Yt - W) = 6.7 ((18/3.03) - 3.5) = 16 ft <= more reasonable length

Riprap Size (Fig. 9-38)

$Q/D^{1.5} = 90/(3.5)^{1.5} = 13.74$

Yt/D = 3.0/3.5 = 0.86

Use Type L Riprap (D_{50} = 9 inches)



See Construction Plans for more detail.

Project: Struthers WQP

Location: Existing 42" Pipe Outfall Channel

Manning's Equation for Open Channel Flow for Rectangular, Triangular, or Trapezoidal Channels

Channel ID	B_w (ft)	SS_1 (z:1)	SS_2 (z:1)	S_o (ft/ft)	d (ft)	n	V (ft/s)	Q (cfs)	Notes
Outfall	7.0	1.66	2.81	0.007	1.9	0.035	4.24	90.0	Q100 = 90 cfs

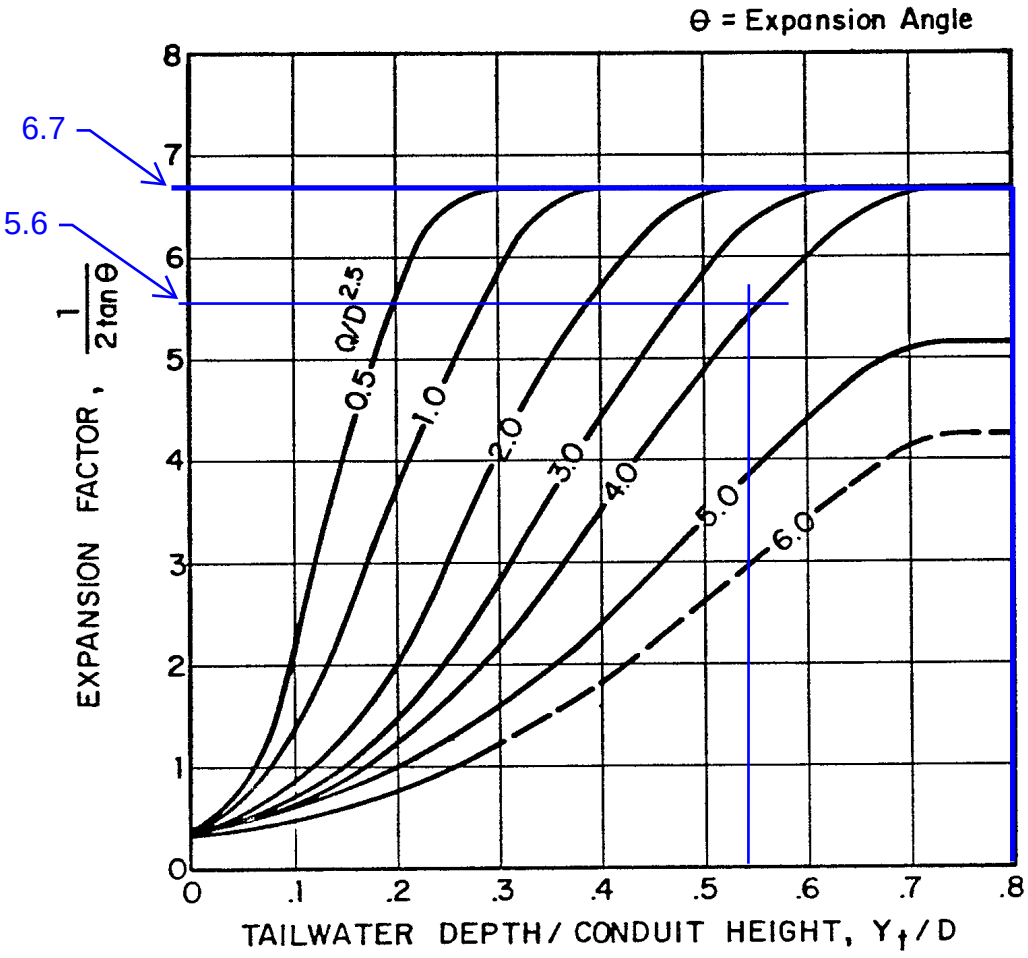


Figure 9-35. Expansion factor for circular conduits

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

D_c = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)

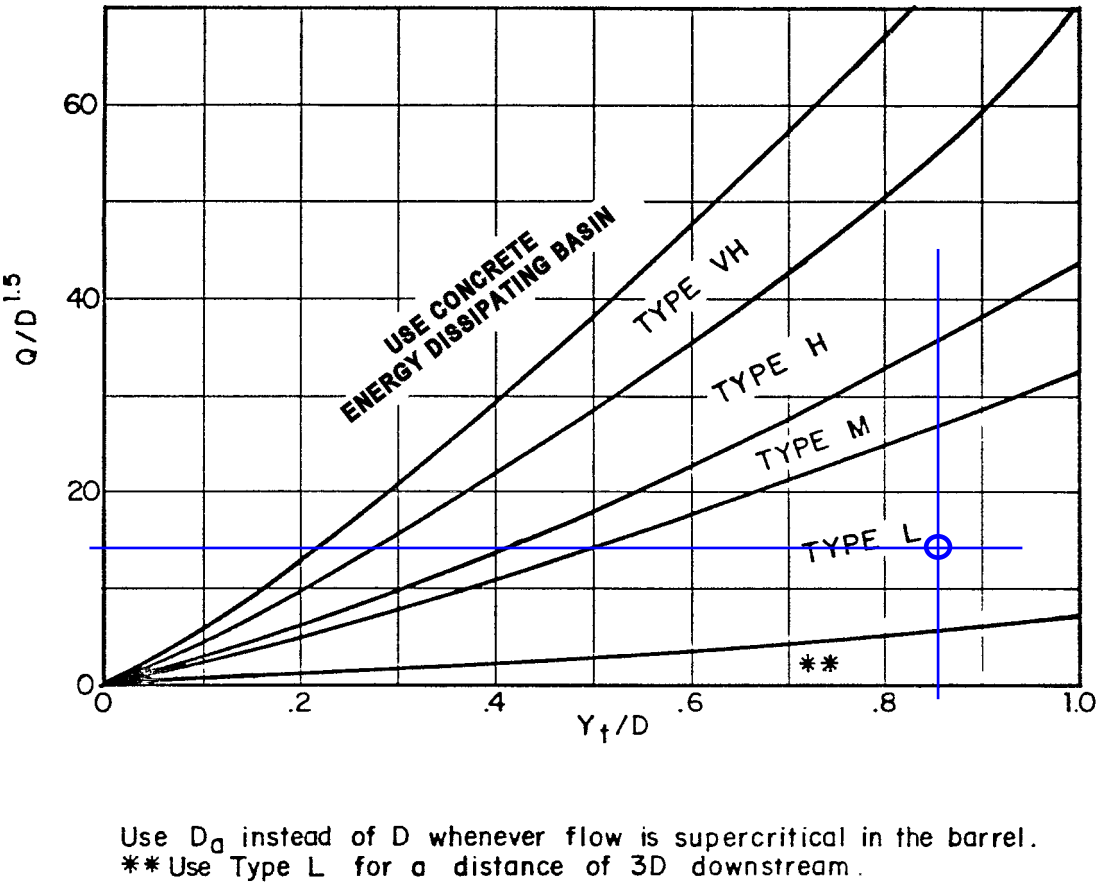


Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for $Q/D_c^{2.5} \leq 6.0$)

PROPOSED PWQ POND EMERGENCY
SPILLWAY PROTECTION CALCULATION

Figure 13-12c. Emergency Spillway Protection

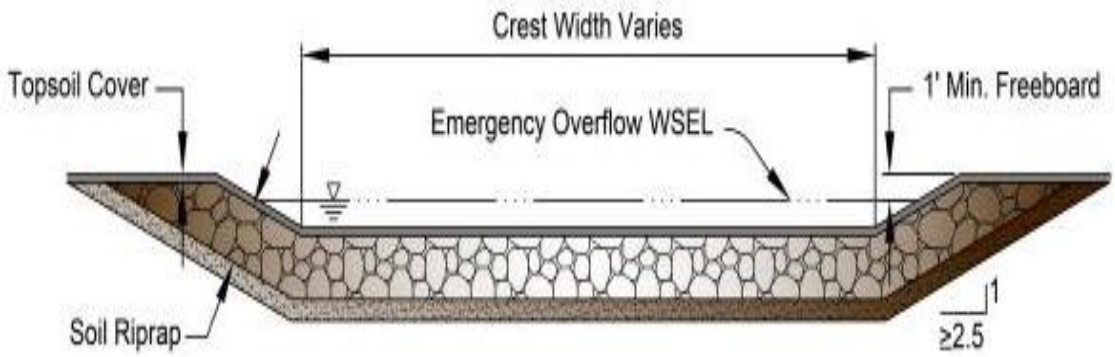
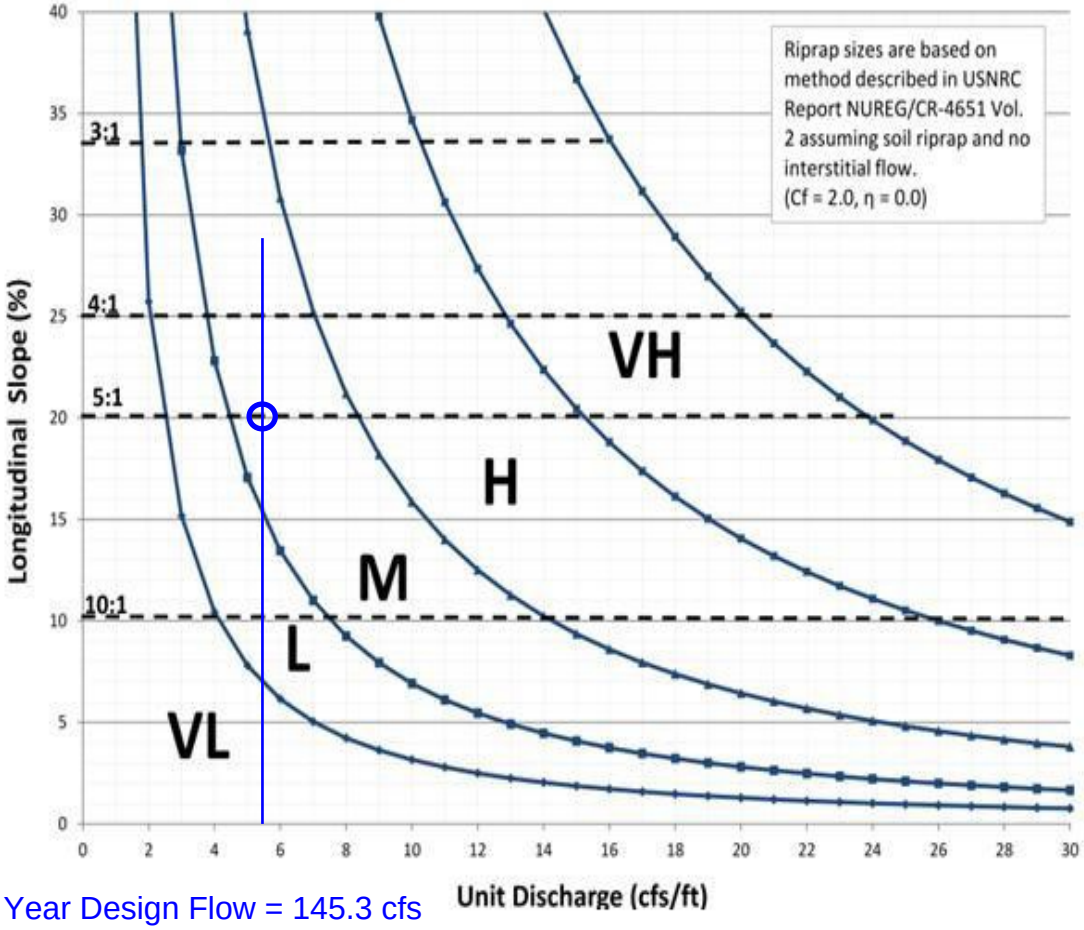


Figure 13-12d. Riprap Types for Emergency Spillway Protection



100 Year Design Flow = 145.3 cfs
Protection Used: Type M Soil Riprap
Spillway Slope = 5:1
Crest Width = 26 ft
Unit Discharge = 145.3/26 = 5.6 cfs/ft

Type M Riprap is sufficient for the Emergency Spillway protection

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Colorado Springs, CO 80919
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C.6
FOREBAY ANALYSIS

Project: Struthers PWQ Pond Task: Forebay Analysis

Designer: VSF Date: 8/1/24

Checker: DWD Date: 8/14/24

WILSON & COMPANY
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COLORADO SPRINGS, CO 80919
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www.wilsonco.com

Struthers PWQ Pond Forebay (FB)

100-Year WQCV = 1.198 ac-ft

Required Drain Time= 4 to 5 minutes = 240 to 300 seconds

Required FB Volume = 1% of WQCV = 0.01(1.198) = 0.012 ac-ft

FB Area = 1096 sq-ft; FB Depth = 1.5 ft ==> FB Vol. = (1096 x 1.5)/43560 = 0.038 ac-ft

Eqn 4-1 USDCM Vol 3

$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$ Solved for $t = (9.23\ A_{FB}) / (w\ h_{max}^{0.5})$

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

Proposed FB Primary Notch Width = w = 12 in FB depth for Primary Notch = 1.5 ft

Time to Empty = $t = [9.23(1096)] / [12(1.5^{0.5})] = 688$ sec = 11.5 min

Pond Trickle Channel Capacity

Project: Struthers WQP

Location: Pond Trickle Channel

Manning's Equation for Open Channel Flow for Rectangular, Triangular, or Trapezoidal Channels

Channel ID	B_w (ft)	SS_1 (z:1)	SS_2 (z:1)	S_o (ft/ft)	d (ft)	n	V (ft/s)	Q (cfs)	Notes
Trickle Ch.	7.0	0.00	0.00	0.005	0.67	0.017	4.21	19.7	

FB Notch Capacity at FB Full Depth

Weir Equation for Rectangular Weirs

$Q = CLH^{1.5}$

C = weir coefficient = 3.0 for simple applications

L = length of weir in ft

H = height of water above crest of weir in feet

C (ft)	L (ft)	H (ft)	Q (cfs)	
3.0	1.00	1.50	5.5	Primary Notch
3.0	6.00	1.00	18.0	Secondary Notch
			23.5	Total

The full-depth capacity of the Primary and Secondary notches will meet the full-depth capacity of the trickle channel.

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C.7
NORMAL DEPTH CALCULATIONS
DOWNSTREAM OF THE EMERGENCY SPILLWAY

PWQ Pond EM Spillway just upstream of Toe of Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.200 ft/ft
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	27.00 ft
Discharge	145.00 cfs

Results	
Normal Depth	0.5 ft
Flow Area	13.5 ft²
Wetted Perimeter	31.7 ft
Hydraulic Radius	0.4 ft
Top Width	31.61 ft
Critical Depth	0.9 ft
Critical Slope	0.019 ft/ft
Velocity	10.74 ft/s
Velocity Head	1.79 ft
Specific Energy	2.25 ft
Froude Number	2.897
Flow Type	Supercritical

GVF Input Data	
Upstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	10

GVF Output Data	
Downstream Depth	0.5 ft
Profile Description	N/A
Profile Headloss	7.04 ft
Downstream Velocity	9.83 ft/s
Upstream Velocity	10.74 ft/s
Normal Depth	0.5 ft
Critical Depth	0.9 ft
Channel Slope	0.200 ft/ft
Critical Slope	0.019 ft/ft

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

PWQ Pond EM Spillwqay - 10' Downstream of Toe of Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.005 ft/ft
Left Side Slope	0.010 H:V
Right Side Slope	0.010 H:V
Bottom Width	33.00 ft
Discharge	145.00 cfs

Results	
Normal Depth	1.3 ft
Flow Area	42.8 ft²
Wetted Perimeter	35.6 ft
Hydraulic Radius	1.2 ft
Top Width	33.03 ft
Critical Depth	0.8 ft
Critical Slope	0.020 ft/ft
Velocity	3.39 ft/s
Velocity Head	0.18 ft
Specific Energy	1.47 ft
Froude Number	0.526
Flow Type	Subcritical

GVF Input Data	
Upstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	10

GVF Output Data	
Downstream Depth	0.5 ft
Profile Description	N/A
Profile Headloss	7.04 ft
Downstream Velocity	9.83 ft/s
Upstream Velocity	10.74 ft/s
Normal Depth	1.3 ft
Critical Depth	0.8 ft
Channel Slope	0.005 ft/ft
Critical Slope	0.020 ft/ft

PWQ Pond EM Spillway - 25' Downstream of Toe of Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035
Channel Slope	0.005 ft/ft
Left Side Slope	0.010 H:V
Right Side Slope	0.010 H:V
Bottom Width	43.00 ft
Discharge	145.00 cfs

Results

Normal Depth	1.1 ft
Flow Area	47.0 ft²
Wetted Perimeter	45.2 ft
Hydraulic Radius	1.0 ft
Top Width	43.02 ft
Critical Depth	0.7 ft
Critical Slope	0.021 ft/ft
Velocity	3.08 ft/s
Velocity Head	0.15 ft
Specific Energy	1.24 ft
Froude Number	0.520
Flow Type	Subcritical

GVF Input Data

Upstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	10

GVF Output Data

Downstream Depth	0.5 ft
Profile Description	N/A
Profile Headloss	7.04 ft
Downstream Velocity	9.83 ft/s
Upstream Velocity	10.74 ft/s
Normal Depth	1.1 ft
Critical Depth	0.7 ft
Channel Slope	0.005 ft/ft
Critical Slope	0.021 ft/ft

PWQ Pond EM Spillway - 35' Downstream of Toe of Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.035 ft/ft
Left Side Slope	0.010 H:V
Right Side Slope	0.010 H:V
Bottom Width	50.00 ft
Discharge	145.00 cfs

Results	
Normal Depth	0.6 ft
Flow Area	27.6 ft²
Wetted Perimeter	51.1 ft
Hydraulic Radius	0.5 ft
Top Width	50.01 ft
Critical Depth	0.6 ft
Critical Slope	0.021 ft/ft
Velocity	5.26 ft/s
Velocity Head	0.43 ft
Specific Energy	0.98 ft
Froude Number	1.250
Flow Type	Supercritical

GVF Input Data	
Upstream Depth	1.1 ft
Length	10.0 ft
Number Of Steps	1

GVF Output Data	
Downstream Depth	0.6 ft
Profile Description	N/A
Profile Headloss	0.44 ft
Downstream Velocity	4.54 ft/s
Upstream Velocity	5.26 ft/s
Normal Depth	0.6 ft
Critical Depth	0.6 ft
Channel Slope	0.035 ft/ft
Critical Slope	0.021 ft/ft

PWQ Pond EM Spillway - 50' Downstream of Toe of Slope

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.035
Channel Slope	0.035 ft/ft
Left Side Slope	0.010 H:V
Right Side Slope	0.010 H:V
Bottom Width	60.00 ft
Discharge	145.00 cfs

Results	
Normal Depth	0.5 ft
Flow Area	29.6 ft²
Wetted Perimeter	61.0 ft
Hydraulic Radius	0.5 ft
Top Width	60.01 ft
Critical Depth	0.6 ft
Critical Slope	0.022 ft/ft
Velocity	4.90 ft/s
Velocity Head	0.37 ft
Specific Energy	0.87 ft
Froude Number	1.232
Flow Type	Supercritical

GVF Input Data	
Upstream Depth	0.0 ft
Length	0.0 ft
Number Of Steps	10

GVF Output Data	
Downstream Depth	0.5 ft
Profile Description	N/A
Profile Headloss	7.04 ft
Downstream Velocity	9.83 ft/s
Upstream Velocity	10.74 ft/s
Normal Depth	0.5 ft
Critical Depth	0.6 ft
Channel Slope	0.035 ft/ft
Critical Slope	0.022 ft/ft

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APPENDIX D

GROUNDWATER INVESTIGATION REPORT

Groundwater Quality Assessment and Dewatering Services Report

Northgate/Struthers Stormwater Line and Permanent Water Quality Pond

Struthers Road and Northgate Boulevard

Colorado Springs, El Paso County, Colorado

July 10, 2023 | Report Number: 23195091

Prepared for:

Wilson and Company
5755 Mark Dabling Boulevard
Colorado Springs, Colorado 80919

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Colorado Springs, Colorado
P (719) 597-2006
F (719) 597-2007
Terracon.com

July 10, 2023

Wilson and Company
5755 Mark Dabling boulevard
Colorado Springs, Colorado 80919

Attn: Mr. Vance Fossinger
P (719) 302-6742
E vancel.Fossinger@wilconco.com

RE: Groundwater Quality Assessment and Dewatering Services Report
Northgate/Struthers Stormwater Line and Permanent Water Quality Pond
Struthers Road and Northgate Boulevard
Colorado Springs, El Paso County, Colorado 80919
Terracon Project No. 23195091

Dear Mr. Fossinger:

At your request, Terracon Consultants, Inc. (Terracon) has prepared the enclosed report of Groundwater Quality Assessment Services-Dewatering. The report presents data from recent field activities that included the collection of groundwater samples and laboratory analysis; in general accordance with Terracon proposal P25227112, dated March 15, 2022. Additionally, Terracon performed hydrogeologic assessment activities (slug tests) to assess potential dewatering considerations for issues at the site, in general accordance with Terracon proposal P23225013, dated August 8, 2022 and the client's subsequent notice to proceed on September 28, 2022.

Terracon appreciates this opportunity to provide you environmental consulting services. Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,
Terracon Consultants, Inc.

Jared C. Geissler, P.E., MBA, PMP, CHMM
Environmental Department Manager

Stewart A. Dixon, P.G.
Principal / Office Manager

Table of Contents

1.0 Site Description

Terracon understands that a proposed sewer line will be installed along portions of Struthers Road and North Gate Boulevard in Colorado Springs, Colorado. The sewer line will terminate in a proposed permanent water quality pond located in the center median of Interstate Highway 25 (I-25) which currently consists of undeveloped land. Groundwater sampling and slug test locations were located at the proposed location for the water quality pond, south of North Gate Boulevard, between the northbound and southbound lanes of I-25.

The site topographic map and site diagram area are provided on the attached Exhibit 1 and Exhibit 2 respectively.

2.0 Scope of Services

At the client's request and in general accordance with Terracon's proposals, proposed scope included the following:

- Collection of one groundwater sample for the Colorado Department of Public Health and Environment (CDPHE) Attachment 1 and Attachment 2 Dewatering Analyte List;
- Hydrogeologic Design Parameters Assessment (Slug Testing); and
- Preparation of a groundwater model to be used to provide a simulation of groundwater controls for the proposed pond.

2.1 Objective

The objective of this Groundwater Quality Assessment was to assess the presence of constituents commonly associated with dewatering activities at CDPHE regulatory discharge limits for Fountain Creek Basin as well as assess potential construction dewatering and possible long term groundwater infiltration concerns.

3.0 Field Activities

3.1 Health and Safety Plan Preparation

Terracon conducted the field work under a health and safety plan developed specifically for this project. Work was performed using Occupational Safety and Health Administration

Level D work attire consisting of hard hats, safety glasses, safety vests, protective gloves, and protective boots. In addition, Terracon contracted a private utility locating service to further clear the drilling locations from subsurface utilities.

3.2 Limited Site Groundwater Assessment

From December 19 through December 29, 2022, Terracon personnel mobilized to the site to install the proposed piezometers, collect depth to groundwater information, perform hydrogeologic assessment activities via slug testing, and collect groundwater samples. Details of these activities are provided below.

3.2.1 Soil Borings

Between December 15 and 19, 2022, Terracon advanced four borings (PZ-1 through PZ-4) across the site around the planed area of the water quality pond to approximately 30 feet bgs using hollow stem auger drilling methods. The borings were converted to 2 inch temporary piezometers. Groundwater was encountered while drilling each boring between 4 (PZ-2) and 16 (PZ-4) feet below ground surface (bgs).

Each soil boring was completed as a temporary piezometer. The piezometers were completed with 15 foot sections of 2 inch diameter, 0.010 inch slotted PVC well screen and 2 inch diameter solid PVC well casing to approximate 3 feet above the ground surface. A 10/20 graded silica sand filter pack was placed from the bottom of the wells to approximately 2 feet above the top of the well screen, followed by a hydrated bentonite chip annular seal to approximately 1 foot bgs. Soil boring logs are included in Appendix B.

3.2.2 Piezometer Development

Terracon personnel returned to the site on December 21, 2022, to develop the newly installed groundwater piezometers (PZ-1 through PZ-4). The groundwater piezometers were developed by surge blocking and bailing each well to remove fines and sediment. Approximately ten well volumes of groundwater were removed from each piezometer, except for piezometer PZ-4 which was bailed dry after approximately seven gallons of groundwater had been extracted.

3.3 Groundwater Sampling

Terracon personnel collected one groundwater sample from piezometer PZ-1 for laboratory analysis on December 29, 2022. Terracon personnel collected groundwater samples using low-flow sampling techniques via peristaltic pump. Groundwater samples collected for laboratory analysis were placed into labeled laboratory provided bottles. The samples were placed on ice for storage and transport to the laboratory accompanied by a completed

chain of custody. The samples were analyzed by Pace Analytical of Mt. Juliet, Tennessee in accordance with the methods below.

Analytical Analysis

Analysis	Sample Media	Number of Samples	USEPA / Laboratory Method
CDPHE Attachment 1&2	Groundwater	1	See Appendix C

Non-dedicated sampling equipment was decontaminated prior to project commencement and before beginning work with a mixture of non-potable water and Alconox detergent and rinsed with non-potable water.

3.3.1 Hydrogeologic Assessment Activities

Between December 27 and 29, 2022, Terracon personnel performed slug testing at the site to estimate groundwater hydraulic conductivity (K) in the vicinity of the proposed water quality pond. Additional details of the slug test results are discussed in Section 6.2 and Appendix D.

4.0 Results of Field Investigation

4.1 Geology/Hydrogeology

The lithology of the borings consisted of sandy fill material with varying amounts of silt between the ground surface to between 5 to 8 feet bgs. Native sands of fine to coarse grained composition with varying amounts of silt was observed between 5 to approximately 20 to 22 feet bgs. The sand ranged from loose to very dense. Native sands overlaid hard to very hard sandstone bedrock from 20 to 23 feet bgs to terminal depth of borings. Siltstone bedrock was observed in piezometer PZ-1 from approximately 22 feet bgs to 29.1 feet bgs the terminal depth of the boring. Additional details of the observed lithology are presented below in Section 6.0 Table 2.

To assess potential variability in groundwater depths, Terracon personnel conducted multiple groundwater measurement events. Depth to groundwater was encountered at 4 feet bgs (PZ-2); 7 feet bgs (PZ-3); 8 feet bgs (PZ-1) and 16 feet bgs (PZ-4) during drilling in each of the piezometer borings. Post drilling groundwater levels measured on December 21, 2022, were: 13.01 feet bgs (PZ-1), 4.94 feet bgs (PZ-2), 8.57 feet bgs (PZ-3) and 8.45 feet bgs (PZ-4). Groundwater levels measured on January 12, 2022, were: 12.92 feet bgs (PZ-1), 4.49 feet bgs (PZ-2), 8.60 feet bgs (PZ-3) and 8.47 feet bgs (PZ-4). As

depicted on Exhibit 3, the groundwater flow direction is estimated to flow south to southwest across the investigation area towards Smith Creek.

5.0 Summary of Analytical Results

5.1 Groundwater Analytical Results

Groundwater analytical results, which are summarized in Table 1 of Appendix A, were compared to the June 2020, Colorado Groundwater Quality Standards (CGWQS) and CDPHE discharge standards for the Fountain Creek Basin. The laboratory reports are provided in Appendix C. The following is a narrative of the laboratory analytical results:

- Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were not detected above laboratory reporting limits in the groundwater sample collected from piezometer PZ-1.

Discharge permit requirements for water quality are based on the CDPHE's review of representative groundwater analytical data, and the water quality standards applicable to the receiving body of water. The groundwater results are summarized on Table 1, along with the water quality standard likely to be applied to the site, based on a discharge to Smith Creek. This stream segment is located within the Colorado Groundwater Quality Standards (CGWQS) and CDPHE discharge standards for the Fountain Creek Basin and regulatory standards are promulgated by CDPHE in Regulation No. 32 (Reg 32). The laboratory analytical data reports are provided in Appendix C. As summarized in Table 1 provided in Appendix A, reported parameter concentrations in the groundwater samples collected from groundwater piezometer PZ-1 are below the water quality standards except for the following parameters, which are above the Regulation No. 32 stream standard:

- Dissolved iron; and
- Total recoverable iron.

The dewatering assessment also included sampling for the Per- and Polyfluoroalkyl Substances (PFAS) compounds, per the CDPHE discharge analytical consideration testing suite. The PFAS compounds are considered an emerging environmental contamination issue. The human health and environment exposure risk has not been fully developed by regulatory agencies on a national or state level. Of the numerous PFAS compounds detected, none were reported above the USEPA's drinking water Lifetime Health Advisory of 70 ng/L. PFAS results are also presented in Table 1.

5.2 Permitting Requirements

As groundwater control (temporary dewatering and/or permanent groundwater flow barrier) is likely necessary for the pond construction, a discharge permit will be required to comply with the Clean Water Act, managed by the CDPHE-WQCD. Although both dissolved and total iron concentrations detected at the site are above Regulation 32 limits, treatment will not be necessary, based on our discussions with Mike Harris with CDPHE. Therefore, the permit that will apply to the site is COG080000 – Short-Term Construction dewatering permit without effluent limits for any pollutants of concern. There will be monitoring requirements established on the permit, but thresholds will not be likely, and the Permittee will only be held to reporting. Terracon can assist the client with applying for the permit and following up sampling when discharging occurs.

With respect to the long term permit requirements, a permit should not be necessary / required per CDPHE Implementation Policy Number CW-14. As, the long term dewatering system will include a gravity flow (e.g., not pumped) trench drain/pipe, it should meet the terms and conditions (not associated with commercia / industrial / residential / agricultural activities or large scale wastewater treatment facilities) of the Division's policy for gravity flow dewatering systems for select activities (CW-14), a discharge permit is not necessary.

6.0 Groundwater Control

Based on information provided by the Client, the project consists of constructing 2,700 lineal feet (LF) of storm sewer line and associated 3.5-acre permanent water quality pond. The storm sewer alignment will begin near the intersection of Struthers Road and Shepard Heights, continuing south along Struthers Road before turning west along North Gate Boulevard. The sewer diameter ranges from 24 inches to 48 inches and will be installed at depths approximately 5 to 15 feet below existing grades. There are several manhole structures planned along the alignment. The sewer will then enter a permanent water quality pond between the north and south bound lanes of I-25. There will be a sewer outlet pipe from the pond to tie into an existing storm sewer west of the project site. The pond will have a rip-rap spillway as well as a concrete outlet structure; the pond outlet elevation is anticipated to be at 6663 feet MSL. Up to 15 feet of cut will be required to develop final grade. The pond sides will generally be sloped 4H:1V (Horizontal: Vertical) or flatter.

Based a review of the pond design plans and the observed groundwater elevation data, groundwater control by either temporary dewatering during construction and/or installation of a permanent groundwater flow barrier to prevent groundwater flow to the pond will likely be necessary. Therefore, a groundwater flow model was constructed to simulate temporary construction dewatering using dewatering wells as well as the installation of a permanent groundwater flow barrier.

6.1 Conceptual Geologic Model and Input Parameters

A review of available geotechnical engineering data (Terracon Report No. 23195091, dated June 23, 2023) for the subject site was performed to collect available geologic and hydrogeologic information for input to the groundwater control evaluation along with the installation of the four temporary piezometers to collect groundwater level data as well as site-specific aquifer parameters. A series of rising and falling head slug tests were conducted within the newly installed piezometers to estimate formation hydraulic conductivity. The slug test data along with existing geotechnical data for the site was used develop a range of expected aquifer parameters. Data from the newly installed piezometers (groundwater level and slug test data) along with existing geotechnical data was used to develop the conceptual geologic model from which the evaluation was based.

6.1.1 Site Soil Conditions

A limited subsurface investigation was completed by Terracon in support of this dewatering evaluation which included the completion of four soil borings with conversion to temporary groundwater piezometers. Based on the results of the field exploration program for this project the subsurface conditions at the project site are relatively consistent. The typical soil profile at the subject site is presented in the table below (Table 2).

Table 2: Generalized Soil Profile

Soil Layer	Layer Name	General Description
1	Fill	Fill material consisting of silty sand with varying amounts of fine to coarse grained sand.
2	Native Sand	Native sand; fine to coarse grained with varying amounts of silt; loose to medium dense
3	Bedrock	Bedrock consisting of sandstone (Siltstone [PZ-1]); medium hard to very hard

The observed depth to water during drilling at project site ranged from 4 to 16 feet bgs and between 4.49 and 12.92 feet bgs following a stabilization period.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

6.2 Site Specific Hydraulic Parameters

The hydraulic parameters of the native soils were evaluated by conducting slug tests at the site as well as evaluating grain size data from the soil borings completed on-site.

6.2.1 Field Slug Test Analysis

Field slug test activities occurred between December 27 and 29, 2022 and were conducted at the newly installed piezometers (PZ-1, PZ-2, and PZ-4) to determine the hydraulic conductivity (K) of the surficial formation (see Appendix A, Exhibit 2). Each slug test was conducted by inserting a pressure transducer into the monitoring well to be tested and allowing the groundwater level and transducer readings to stabilize. Depth to groundwater was then measured and recorded (static water level/elevation) prior to introduction of the slug. Terracon performed the test by inserting a slug into the monitoring well to displace water into the surrounding formation. The potentiometric head was then measured over time as the water level returned to equilibrium (Falling Head Test). The slug was then removed allowing water from the surrounding formation to enter the well and the potentiometric head was measured over time as the well rebounded to equilibrium (Rising Head Test). A series of rising and falling head slug tests were conducted at each monitoring well.

Time and depth to water data from the slug tests was imported into the AQTESOLV™ aquifer software for analysis. Additional information input to the software included the well diameter, borehole diameter, total depth of the monitoring well, static water column height, initial displacement, and assumed gravel pack porosity. Based on site conditions, the aquifer was assumed to be unconfined in the model. Based on the slug test methodology and resulting data, the Bouwer and Rice (1976) method was utilized to determine the hydraulic conductivity (K) of the surrounding formation.

When the Bouwer and Rice method is used for slug test analysis, a single straight line is expected from the data. However, when the well is screened across the water table, the response data may give the appearance of two straight lines on a plot of log normalized head vs. time. As is the case with the slug tests conducted for this site, the initial, steeper straight line segment represents the drainage of water into the filter pack. The second, less steep straight line segment develops after the initial filter pack drainage and represents the response of the aquifer.

The resulting horizontal hydraulic conductivity (K) values for each slug test are presented below. Values are presented in feet per day (ft/day).

Table 3: Hydraulic conductivity data calculated from slug test data using Bouwer and Rice (1976) model

Monitoring Well	Hydraulic Conductivity (ft/day)						
	Test 1		Test 2		Test 3		Geometric Mean
	Falling Head	Rising Head	Falling Head	Rising Head	Falling Head	Rising Head	
PZ-1	3.01	3.01	4.06	3.69	1.97	4.43	3.25
PZ-2	8.45	10.86	17.33	8.94	7.90	8.11	9.85
PZ-4	1.48	1.82	1.02	--	1.30	1.31	1.36
						Average	3.52

Based on the results of the slug tests, the average hydraulic conductivity of the surficial aquifer at the project site should be approximately 3.52 ft/day (1.24 x 10^{-3} cm/sec). The average value is within the expected range of sand. Input and output from the AQTESOLV™ aquifer software, including graphs of Normalized Head vs. Time has been included in Appendix D.

6.2.2 Hydraulic Parameter Estimation from Grain Size Data

In addition to the field slug test evaluation, the grain size data from the on-site borings were analyzed to provide an estimate of hydraulic conductivity of the shallow aquifer at the site. Grain size analysis data for borings PZ-1, PZ-2, PZ-3, and PZ-4 was analyzed to estimate hydraulic conductivity, specific yield, and porosity of the shallow aquifer materials. Based on the review of the lithology and grain size data, a storage coefficient of 0.003, and a specific yield of 0.06 were assumed based on literature values (Johnson, 1967 and Freeze and Cherry, 1979).

The uniformity coefficient is defined as the ratio between the grain size of the filter pack at which 60 percent of the aquifer materials are finer (D_{60}) (percent passing equivalent sieve openings) and the 10 percent finer grain size (D_{10}) using the following equation:

$$C_u = D_{60}/D_{10}$$

Istomina (1957) and Vukovic and Soro (1992) have shown that porosity, *n*, can be estimated using grain size analysis by the following equation:

$$n = 0.255(1+0.83^{C_u})$$

Equations for estimating hydraulic conductivity (K) from grain size commonly use two metrics from a grain size distribution plot: D_{10}, the grain diameter for which 10% of the sample is

finer (90% is coarser), and D_{60}, the grain diameter for which 60% of the sample is finer (40% is coarser). D_{10} is frequently taken as the effective diameter of the sample.

The Hazen (1911), Beyer (1964), Kozeny-Carmen (Freeze and Cherry, 1979), and Wang et al. (2017) formulas were used to estimate hydraulic conductivity using the grain size data from selected borings (PZ-1, PZ-2, PZ-3, and PZ-4). The calculated values for each analytical method are presented in Appendix D. The boring logs and grain size plot for PZ-1, PZ-2, PZ-3, and PZ-4 are included in Appendix D. The average hydraulic conductivity values calculated from each boring is presented in the table below (Table 4).

Table 4: Data for computing Hydraulic Conductivity from Grain Size Distribution

Borings	PZ-1	PZ-2	PZ-2	PZ-3	PZ-3	PZ-4
Sample Depth	4 - 5 Ft	9 - 10.5 ft	19 - 20.5 ft	9 - 10.5 ft	19 - 20 ft	19 - 20 ft
D_{60}	1.323	0.635	0.448	1.86	1.22	2.316
D_{10}	0.112	0.09	0.006	0.076	0.118	0.196
C_u	11.81	7.06	74.67	24.47	10.34	11.82
n	0.28	0.32	0.26	0.26	0.29	0.28
Hydraulic Conductivity (K)						
Method	(cm/s)	(cm/s)	(cm/s)	(cm/s)	(cm/s)	(cm/s)
Hazen[1]	n/a	n/a	n/a	n/a	n/a	n/a
Kozeny-Carmen[2]	2.41E-03	2.60E-03	5.24E-06	8.41E-04	3.06E-03	7.38E-03
Beyer[3]	2.30E-02	1.69E-02	n/a	n/a	2.65E-02	7.05E-02
Wang et al.[4]	7.08E-03	5.92E-03	n/a	n/a	8.06E-03	1.85E-02
Average	1.08E-02	8.48E-03	5.24E-06	8.41E-04	1.25E-02	3.21E-02
Minimum	2.41E-03	2.60E-03	5.24E-06	8.41E-04	3.06E-03	7.38E-03
Maximum	2.30E-02	1.69E-02	5.24E-06	8.41E-04	2.65E-02	7.05E-02

Notes:
D_{10} = the grain diameter for which 10% of the sample is finer (90% is coarser)
D_{60} = the grain diameter for which 60% of the sample is finer (40% is coarser)
$C_U = D_{60}/D_{10}$ is known as the coefficient of uniformity
n = total porosity, $n = 0.255(1+0.83C_u)$
1 The Hazen Formula is assumed valid for $0.1\ mm \le D_{10} \le 3\ mm$; $C_U \le 5$
2 The Kozeny-Carmen formula is assumed valid for sediments and soils composed of silts, sands, and gravelly sands
3 The Beyer Formula is assumed valid for $0.06\ mm \le D_{10} \le 0.6\ mm$; $1 \le C_U \le 20$
4 The Wang et al. formula is developed from a dataset characterized by $0.05\ mm \le D_{10} \le 0.83\ mm$; $0.09\ mm \le D_{60} \le 4.29\ mm$; $1.3 \le C_U \le 18.3$

Based on the analysis of the grain size data, the average (geometric mean) hydraulic conductivity of the upper zone (4 to 10 ft below ground surface) of the surficial aquifer at the project site is approximately 12.06 ft/day (4.25×10^{-3} cm/sec). The hydraulic conductivity of the lower portion (19 to 20.5 ft bgs) of the surficial aquifer is approximately 3.63 ft/day (1.28

x 10^{-3} cm/sec). The calculated value for both zones is within the expected range of sand. The average hydraulic conductivity calculated from the slug test is comparable to the average value calculated from the grain size data from 19 to 20.5 ft bgs at the site.

6.2.3 Storativity and Porosity

A storage coefficient of 0.003, and a specific yield of 0.06 were assumed based on literature values for unconfined aquifer systems (Fetter, 1988; Johnson, 1967 and Freeze and Cherry, 1979). The porosity of the unconfined aquifer is estimated from published values based on the on-site soils to be 25 percent.

7.0 MODEL DEVELOPMENT

The model code used to simulate the project site was MODFLOW-2000 (Harbaugh et al, 2000). MODFLOW-2000 is a public domain computer code developed by the U.S. Geological Survey that numerically solves the groundwater flow equation for a porous medium using a finite difference method. MODFLOW-2000 is an enhanced version of the widely used MODFLOW code that has been updated several times (McDonald and Harbaugh 1988, and Harbaugh and McDonald 1996). Like its predecessors, MODFLOW 2000 simulates groundwater flow using a block-centered, finite-difference approach that is capable of a wide array of boundary conditions. The code can simulate aquifer conditions as unconfined, confined, or a combination of the two. MODFLOW-2000 also supports variable thickness layers (i.e., variable aquifer bottoms and tops). Documentation of all aspects of the MODFLOW-2000 code is provided in the user's manuals (Harbaugh et al 2000).

The pre/post-processor Groundwater Modeling System (GMS) Version 10.3.2 (Aquaveo LLC, 2018) was used to assist with input of model parameters and output of model results. GMS serves as a direct interface with MODFLOW-2000. GMS provides an extensive set of tools for developing, modifying, and calibrating numerical models and allows for ease of transition between the groundwater flow and particle tracking codes. A full description of the GMS program is provided in the GMS User Manual, Version 10.0 (Aquaveo LLC, 2017).

7.1 Model Domain and Grid

The model domain included north-south and east-west dimensions of approximately 1,100 ft and 1,180 ft, respectively. The water quality pond is in the approximately in the center of the model domain. The extent of the model domain is illustrated in Figure 4. The grid spacing is 10 feet x 10 feet.

7.2 Model Layers

The three layers of the model represent the lithologic variations between the near surface silty sands, sands with silt, and bedrock as shown in Table 4 in Section 2.1. Ground surface elevation layer corresponds to the top of the model, and the bottom of the on-site formations corresponds to the base of the model.

7.3 Boundary Conditions

Boundary conditions imposed on a numerical model define the external geometry of the groundwater flow system being studied as well as internal sources and sinks. Boundary conditions assigned in the model were determined from observed conditions. Descriptions of the types of boundary conditions that can be implemented with the MODFLOW code are found in McDonald and Harbaugh (1988). Boundary conditions used to represent hydrologic conditions at the project area included specified head boundary, area recharge, and barrier as illustrated in Figure 4. Smith Creek formed the southern model boundary and was modeled as using the MODFLOW River package.

7.4 Model Calibration

Groundwater flow model calibration is an integral component of groundwater modeling applications. Calibration of a numerical groundwater flow model is the process of adjusting model parameters to obtain a reasonable match between field measured values and model predicted values of heads and fluxes (Woessner and Anderson 1992). The calibration procedure is generally performed by varying estimates of model parameters (hydraulic properties) and/or boundary condition values from a set of initial estimates until an acceptable match of simulated and observed water levels and/or flux is achieved. Calibration can be accomplished using trial and error methods or automated techniques (often referred to as inverse modeling).

The focus of this model is on the response of the aquifer to hydraulic stresses imposed on the surrounding area by the proposed subsurface excavation and maintained water quality pond. The model was initially calibrated to current static (pre-development) conditions. The variables that were used to calibrate the model to the representative steady state conditions included recharge, horizontal hydraulic conductivity, and specific storage. The calibration targets were the water level data collected December 2022 in on-site piezometers (PZ-1 through PZ-4).

The adequacy of model calibration is judged by examining model residuals. A residual, as defined for use in this modeling report, is the difference between the observed change in groundwater elevation and the change in groundwater elevation predicted by the model. The objective of model calibration should be the minimization of the residual mean, residual standard deviation, and residual sum of squares (RSS) (Duffield et al, 1990). The mean

residual is the arithmetic average of all the differences between observed and computed water levels. A positive sign indicates that the model has underpredicted the observed drawdown level and a negative sign indicates overprediction. The residual standard deviation quantifies the spread of the differences between observed and predicted drawdown around the mean residual. The ratio of residual standard deviation to the total head change across the model domain should be small, indicating the residual errors are only a small part of the overall model response (Woessner and Anderson 1992). The RSS is computed by adding the square of each residual and is another measure of overall variability. The overall objective during the calibration process is to minimize the residuals and the statistics based on the residual while maintaining aquifer properties within the range of reasonably expected values.

Calibration was achieved by comparing field-measured (observed) water levels in the on-site temporary wells with heads predicted by MODFLOW for the same wells under simulated steady state conditions. As an initial estimate for the model calibration, horizontal hydraulic conductivity values were estimated using the slug test data collected from the site. Specific yield was estimated based on the presumed aquifer conditions (unconfined) and soil type. An inverse model called PEST (Parameter ESTimation) was used to automate the parameter estimation process and thus the calibration of the model by systematically adjusting hydraulic conductivity, recharge, and specific yield parameters to minimize the residual error between the computed and observed head values is minimized.

7.5 Steady State Calibration Results

The modeled steady-state simulation for static groundwater conditions is shown on Figure 5 in Appendix A. Graphs of the computed vs. observed heads and residual vs. observed heads are presented in Appendix A as Figure 6 and Figure 7, respectively. The computed values were within their respective calibration error target. The relative difference between observed and simulated groundwater elevations across the modeled area was 0.87 feet or less as shown in Table 7 below.

Table 7: Observed groundwater elevations and calibrated model residuals

Well	Groundwater Elevation (Ft)		
	Observed	Computed	Residual
PZ-1	6663.58	6664.77	-1.191
PZ-2	6671.84	6671.13	0.713
PZ-3	6659.25	6659.42	-0.167
PZ-4	6658.43	6658.49	-0.059
B-5	6675.50	6674.49	1.01

8.0 NUMERICAL MODELING SIMULATIONS

The USGS MODFLOW Model was used to simulate the behavior of groundwater flow in the saturated deposits in the vicinity of the proposed water quality pond. The model simulates three-dimensional groundwater flow by using finite-difference techniques. The model was used to evaluate how the construction of the pond would influence the shallow aquifer groundwater level response at the site. Terracon understands the pond will have a rip-rap spillway as well as a concrete outlet structure; the pond outlet elevation is anticipated to be at 6663 feet MSL. Up to 15 feet of cut will be required to develop final grade. The pond sides will generally be sloped 4H:1V (Horizontal: Vertical) or flatter. The proposed pond grading plan is presented as Exhibit 9. The groundwater flow model was calibrated without the proposed pond in place; however, the model simulations were run as if with the pond was installed.

The groundwater cutoff wall was modeled as a horizontal flow barrier using the Horizontal Flow Barrier (HFB) package in GMS which is used to simulate the effect of sheet pile walls, slurry trenches or other objects which act as a barrier (or partial barrier) to horizontal flow (Hsleh and Freckleton, 1992). The depth of the flow barrier wall used in the model simulation was 6640 feet MSL, which is well within the bedrock unit encountered at the project site. The modeled flow barrier wall is assumed to be impermeable and a hydraulic characteristic of 1.0 x 10^{-6} was assigned to the wall unit.

Topographic data and soil boring logs completed as part of recent (2020 and 2022) investigations at the site were used to define the top and bottom of the layers for the modeled area. Initial hydraulic properties of the subsurface deposits were estimated by using aquifer testing (slug test) performed in the on-site monitoring wells, grain size date, regional literature references, and standard textbook values. The final values are based on the inverse modeling results discussed in the previous section. The model layers were based on the soil boring data collected at the site by Terracon.

8.1 Model Layers

In the model, the shallow surficial aquifer system is divided into three layers. The upper layer was modeled as unconfined. The three layers of the model represent the lithologic variations between the near sandy and silty sand stratification, the middle sandy clay zone, and the deeper silty sands Table 4 in Section 6.1.1. Ground surface elevation layer corresponds to the top of the model, and the bottom of the on-site formations corresponds to the base of the model.

8.2 Recharge

Average annual precipitation in the El Paso County, Colorado area is about 16.1 inches per year (1.34 feet per year) (NOAA, 2023). The recharge rate value calculated by multiplying 1.34 feet of rainfall a year by 5% and dividing by 365 days (0.000184 ft/day). The recharge occurs aerially over the region and groundwater flow is from upland zones towards local surface water features.

8.3 Hydraulic Conductivity

Pilot points were used as part of the inverse modeling procedure and can be thought of as a 2D scatter point set. Instead of creating a zone and having the inverse model estimate one value for the entire zone, the value of the parameter within the zone is interpolated from the pilot points. Then the inverse model estimates the values at the pilot points. Using pilot points will vary values from cell to cell. When the inverse model runs, the values at the pilot points are adjusted and re-interpolated to the grid cells until the objective function is minimized. The final values are generally within the same order of magnitude as the calculated values (1.7 to 20 ft/day) determined from on-site slug tests and/or are reasonable values for the on-site soils.

8.4 Model Simulations

Once the groundwater flow model was calibrated, multiple simulations were performed to evaluate temporary and permanent groundwater control strategies that could be used during the construction and beyond to limit groundwater from entering the water quality pond. The model simulations included the following dewatering scenarios:

- The use of a series of pumping wells to dewater the site as a temporary groundwater control measure during construction.
- The use of a groundwater flow barrier wall to prevent groundwater from entering the pond.
- The use of curtain drains as a permanent groundwater control measure. Four (4) different curtain drain configurations were modeled. The various configurations will be discussed in Section 8.7.

The water quality pond footprint and depth of the modeled flow barrier are based on the site plan provided to Terracon by the client as shown in Figures 9 and soil boring logs, respectively.

The simulated dewatering wells were based on the lithology encountered at the site. The simulated trench drain configuration was based on email correspondence with Wilson & Co. concerning layout of the drain.

8.5 Temporary Construction Dewatering Model Simulations and Results

Two model simulations were completed to evaluate the number of wells and pumping rate at required to lower the groundwater table to an elevation of at least 6,662 feet using the calibrated MODFLOW model discussed previously. The results of the simulations are presented as Exhibits 7 and 8 in Appendix A and indicate the required pumping rate necessary to lower the groundwater table to at least 6,662 feet ranges between 2 to 3 gallons per minute per well using twelve (12) dewatering wells with a well spacing of 50 to 75 feet. The total expected volume of groundwater from the dewatering system ranges from 24 to 36 gpm.

No historical dewatering rates from recent projects in the area were available to confirm the dewatering pumping rate estimates.

8.6 Groundwater Flow Barrier Model Results

The extent and depth of the proposed flow barrier wall was simulated as shown in Exhibit 10 with a bottom elevation of said wall as 6,640 feet MSL. The modeled flow barrier wall is assumed to be impermeable and a hydraulic characteristic of 1.0×10^{-6} was assigned to the wall unit. The flow barrier wall was modeled under steady state conditions. The results of the MODFLOW simulation indicates the flow barrier wall should prevent groundwater from entering the water quality pond.

8.7 Curtain Drain Model Results

Four separate model simulations were completed using different curtain drain configurations as shown in Exhibits 11, 12, 13, and 14. The different curtain drain configurations will be discussed below.

8.7.1 Curtain Drain Simulation 1

Curtain drain simulation 1 included one primary drain traversing in an east-west direction near northern extent of the water quality pond a drain set beneath the proposed storm sewer alignment. The eastern extent of the drain would begin near the interstate embankment with the western extent ending at the existing storm water sewer alignment and as shown in Exhibit 11. The modeled drain bottom elevations are shown in Exhibit 11 along with the predicted water levels. As shown in Exhibit 11, the modeled drain is not predicted to lower groundwater levels below the bottom of the water quality pond, which is 6,665 feet.

8.7.2 Curtain Drain Simulations 2, 3, and 4

Curtain drain simulations 2, 3, and 4 are variations of the same general configuration except the length of the easternmost drain is modified for each simulation as shown in Exhibits 12, 13, and 14. For simulations 2, 3, and 4; the curtain drain system includes one primary drain approximately along the 6,672 feet contour line on the east, north, and western portions of the pond and a drain set beneath the proposed storm sewer alignment. The elevation of the beginning of drain in each simulation is 6663.5 feet with an ending elevation of 6661.75 feet. The end of the drain was set to intersect with the existing stormwater line traversing the site. The drain should slope at approximately 0.3 percent toward the existing stormwater sewer line on the western side of the pond.

For Simulations 2, 3, and 4; only the length of the eastern portion of the curtain drain line around the pond was varied as shown in Exhibits 12, 13, and 14. The eastern drain length was 300 feet for Simulation 2, 220 feet for Simulation 3, and 125 feet for Simulation 4.

Exhibits 12, 13, and 14 in Appendix A represent the modeled contours for Simulations 2, 3, and 4, respectively. Simulation 2 and 3 are predicted to lower the groundwater below the bottom of the water quality pond at estimated flow rates ranging from 50 to 150 gallons per minute (gpm) at the discharge point located at the existing stormwater line. However, the drain configuration modeled as Simulation 4 will not lower groundwater levels below the bottom of the pond. Surface water infiltration into the trench could increase the volume of water.

9.0 SUMMARY OF GROUNDWATER MODEL RESULTS

The calibrated groundwater flow model for the subject site resulted in groundwater elevations across the site with less than 1.2 feet difference between the modeled and observed groundwater elevations. Therefore, the Site Model appears to be an appropriate tool for evaluating changes in the magnitude and extent of groundwater elevation changes across the site related to the construction of the water quality pond.

Based on assumed hydraulic input parameters, a three-dimensional groundwater flow model was used to simulate several steady-state dewatering scenarios for the subject site throughout the range of calculated hydraulic conductivity values.

- Temporary Dewatering Wells: For temporary construction dewatering, the results of the model simulations using wells are presented as Exhibits 7 and 8. The expected discharge rates from a twelve well dewatering system should range between 2 to 3

GPM. Higher inflows could be realized initially at the site prior to water levels stabilizing and reaching steady state.

Once the desired depth to water level has been reached and steady state conditions are reached, the extraction rates could theoretically be reduced. Given the dependency of results on assumed model input parameters (hydraulic conductivity, storativity, specific yield, and aquifer thickness), the modeled results are an estimate of expected aquifer behavior under the pumping/dewatering conditions at the site.

- Groundwater Flow Barrier: A groundwater flow barrier was simulated to evaluate a long term strategy for preventing groundwater flow into the water quality pond. As shown in Exhibit 10, a groundwater flow barrier with a bottom elevation of at least 6,640 ft MSL and a hydraulic characteristic of 1.0 x 10^{-6} units ?(impermeable) should prevent groundwater from entering the water quality pond under similar groundwater regimes as observed in December 2022.

- Curtain Drain: The model simulation included four curtain drain configurations as shown in Exhibits 11, 12, 13, and 14. However, only Simulation 2 and 3 are predicted to lower the groundwater below the bottom of the water quality pond. Both Simulation 2 and 3 are configured with a drain system that includes one primary drain approximately along the 6,672 feet contour line on the east, north, and western portions of the pond and a line set beneath the proposed storm sewer alignment as shown in Exhibits 12 and 13. The elevation of the beginning of the drain is 6663.5 feet with an ending elevation of 6661.75 feet.

  The only difference in the simulations (2 and 3) are the length of the eastern drain. The length of the eastern portion of the drain line in Simulation 2 is 300 feet and for Simulation 3 the length is 220 feet. The drain should slope at approximately 0.3 percent toward the existing stormwater sewer line on the western side of the pond. It is estimated the drain flow rates would ranging from 50 to 150 gpm at the discharge point.

  We recommend the permanent drain lines be composed of Contech A2000 or equivalent slotted pipe and have a minimum diameter of 6 inches. Filter fabric should be used to line the drain trench; a filter sock around the pipe is not recommended. We recommend the backfill over the slotted drainpipes consist of clean, free-draining granular material graded to prevent the intrusion of soil fines into the granular material or the intrusion of the granular material into the drainpipe perforations.

  Terracon recommends the graded free-draining granular material be #67 fine aggregate. A minimum, 18-inch thick section of free-draining granular fill is recommended for above the drain lines. At least 4-inches of free-draining granular fill is recommended for backfill below the drain lines and at least 6-inches of free-draining granular fill is recommended for backfill on each side of the drain lines.

We recommend the drain system be protected after installation during subsequent construction activities. We strongly recommend that long radius wyes and clean-outs be installed on both ends of each of the drain lines to facilitate maintenance of the drain systems.

The groundwater flow model is based on estimates of hydraulic parameters from a limited set of soil data and limited field testing. The estimated aquifer parameters and theoretical drawdowns listed are subject to uncertainties. Variations in well efficiency, aquifer transmissivities and storage coefficients from those assumed in the analysis will result in discrepancies between theoretical drawdowns and those which actually occur. Below is a summary of model limitations.

- The model assumes a constant groundwater gradient across the area in question due to a lack of data on seasonal fluctuations in gradient.
- The model assumes saturated groundwater flow in porous media and does not account for any preferential flow pathways such as coarse gravels, pipes, or other conduits.

The analysis and opinions expressed in this report are based upon data obtained from desktop calculations, available records, wells installed and logged at the indicated locations, and from any other information discussed in this report. This report does not reflect any variations in subsurface stratigraphy, hydrogeology, or aquifer parameters which may occur between dewatering wells or across the site. Actual subsurface conditions may vary and may not become evident without further exploration. Therefore, no warranties, either express or implied, are intended or made. In the event any changes in nature of the project or other surface or subsurface conditions as outlined in this report are observed, the conclusions and recommendations contained in this report cannot be considered valid unless the changes are reviewed, and the opinions of this report are modified or verified in writing by Terracon.

Hydraulic heads can vary in response to precipitation, snowmelt, nearby groundwater extraction, surface water fluctuations and other phenomena. Terracon cannot forecast future groundwater levels and significant changes in hydraulic head or the assumed aquifer parameters can lead to variations in groundwater flow rates and directions estimated in the preliminary evaluation.

9.1 Dewatering Issues

Settlement and contaminant mobilization are two of the more significant and common impacts from construction dewatering drawdown. Withdrawal of groundwater, even for a short duration, has the potential to cause surface settlement with some soils. For existing structures (i.e., buildings or utilities at or below ground surface), the potential for settlement within the radius of influence may exist. As an analysis of settlement impacts related to dewatering activities at the project was beyond the scope of this work, no such work was

completed. Although, there is no known groundwater contamination in the area it should be noted that an evaluation of off-site contaminant migration into this area is outside the scope of this work.

10.0 Conclusions

Based on the scope of services described in this report and subject to the limitations described herein, Terracon concludes the following:

- In general, the lithology encountered during drilling consisted of sandy fill material from below the surface to approximately 5 to 8 feet bgs, followed by varying layers of native sand with varying amounts of silt from 5 to 20 feet bgs overlying sandstone bedrock at approximately 20 feet, except for PZ-1 in which siltstone bedrock was encountered at approximately 22 feet bgs to termination depth of the soil boring at approximately 29 feet bgs.
- Groundwater depth in the area of the proposed permanent water quality pond was measured ranging between 4.49 and 13.01 feet bgs post drilling in the four groundwater piezometers and appear to be generally stable between the December 21, 2022, and January 12, 2023 groundwater level gauging events.
- Based on site topography groundwater is estimated to flow to the south and southwest across the site investigation area towards Smith Creek.
- As summarized in Section 5.1, laboratory analysis of groundwater samples collected during this investigation did not indicate concentrations of VOCs/SVOCs above the CGWQS. Concentrations of dissolved iron and total iron in the groundwater sample collected were above local stream discharge standards but would not likely require treatment prior to discharge based on initial discussions with CDPHE.
- Based on the results of the slug tests, the average (geometric mean) hydraulic conductivity of the surficial aquifer at the project site is approximately 3.52 ft/day (1.24×10^{-3} cm/sec). The average value is within the expected range of sand.
- Dewatering simulations using wells / well points indicate, the expected discharge rates from a 12 well dewatering system ranges from 2 to 3 gallons per minute (24 to 36 gpm total). Higher inflows could be realized initially at the site prior to water levels stabilizing.
- A simulated groundwater flow barrier with a bottom elevation of at least 6,640 ft MSL and a hydraulic characteristic of 1.0×10^{-6} units? (impermeable) should prevent groundwater from entering the water quality pond under similar groundwater regimes as observed in December 2022.

- A simulated curtain drain (Simulation 3) with the configuration and bottom elevations shown in Exhibit 13 would lower the groundwater below the level of the pond with an estimated discharge of about 50 to 150 gallons of gpm. The drain should slope at approximately 0.3 percent toward the existing stormwater sewer line on the western side of the pond.

11.0 Recommendations

Based on the scope of services, limitations, and conclusions of this assessment, Terracon recommends the following and can assist the client upon request.

- Initiate discussions with CDPHE for application of construction dewatering permit. Though unlikely based on initial discussions, CDPHE may require a remediation permit based on observed metals concentrations, however the client must submit available data for CDPHE to make such a determination. Terracon can assist with this at the Client's request.

12.0 Additional Standard of Care and Reliance

12.1 Standard of Care

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Terracon makes no warranties, either express or implied, regarding the findings, conclusions, or recommendations. Please note that Terracon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report. These assessment services were performed in accordance with the scope of work agreed with you, our client, as reflected in our proposal.

12.2 Additional Scope and Limitations

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable, or not present during these services. We cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this investigation. Subsurface conditions may vary from those encountered at specific sampling locations, tests, assessments, investigations, or exploratory services. The data,

interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

12.3 Reliance

This Groundwater Quality Assessment and Dewatering Services Report (report) was prepared for the exclusive use and reliance of Wilson and Company (client). Reliance by any other party is prohibited without the written authorization of the client and Terracon. Any third-party access to this report is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

13.0 REFERENCES

Batu, V., 1998, Aquifer Hydraulics: A comprehensive Guide to Hydrogeologic Data Analysis, Wiley and Sons, Inc., New York, 727 p.

Driscoll, F.G., 1986, Groundwater and Wells. Johnson Filtration Systems Inc., St. Paul, Mn, 1089 p.

Fetter, C.W., 1994, Applied Hydrogeology. Prentice Hall, New Jersey, 691 p.

Kruseman, G.P., and de Ridder, N.A., 1994, Analysis and Evaluation of Pumping Test Data, International Institute for Land Reclamation and Improvement Publication 47, 377 p.

Harbaugh, A. W., and M.G. McDonald. 1996. User's documents for MODFLOW 96, an update to the U.S. Geological Survey modular finite difference groundwater flow model. Open File Report 96-485. U.S. Geological Survey.

Harbaugh, A.W, E.R. Banta, M.C. Hill, and M. G. McDonald. 2000. MODFLOW 2000, The U.S. Geological Survey Modular Ground-Water Model-User Guide to Modularization Concepts and the Ground-Water Flow Process. Open File Report 00-92l U.S. Geological Survey, Reston, VA.

McDonald, M.G., and A.W. Harbaugh, 1988. MODFLOW, A Modular Three-Dimensional Finite Difference Flow Model. Techniques of Water-Resources Investigations, Book 6, Chapter A1. U.S. Geological Survey.

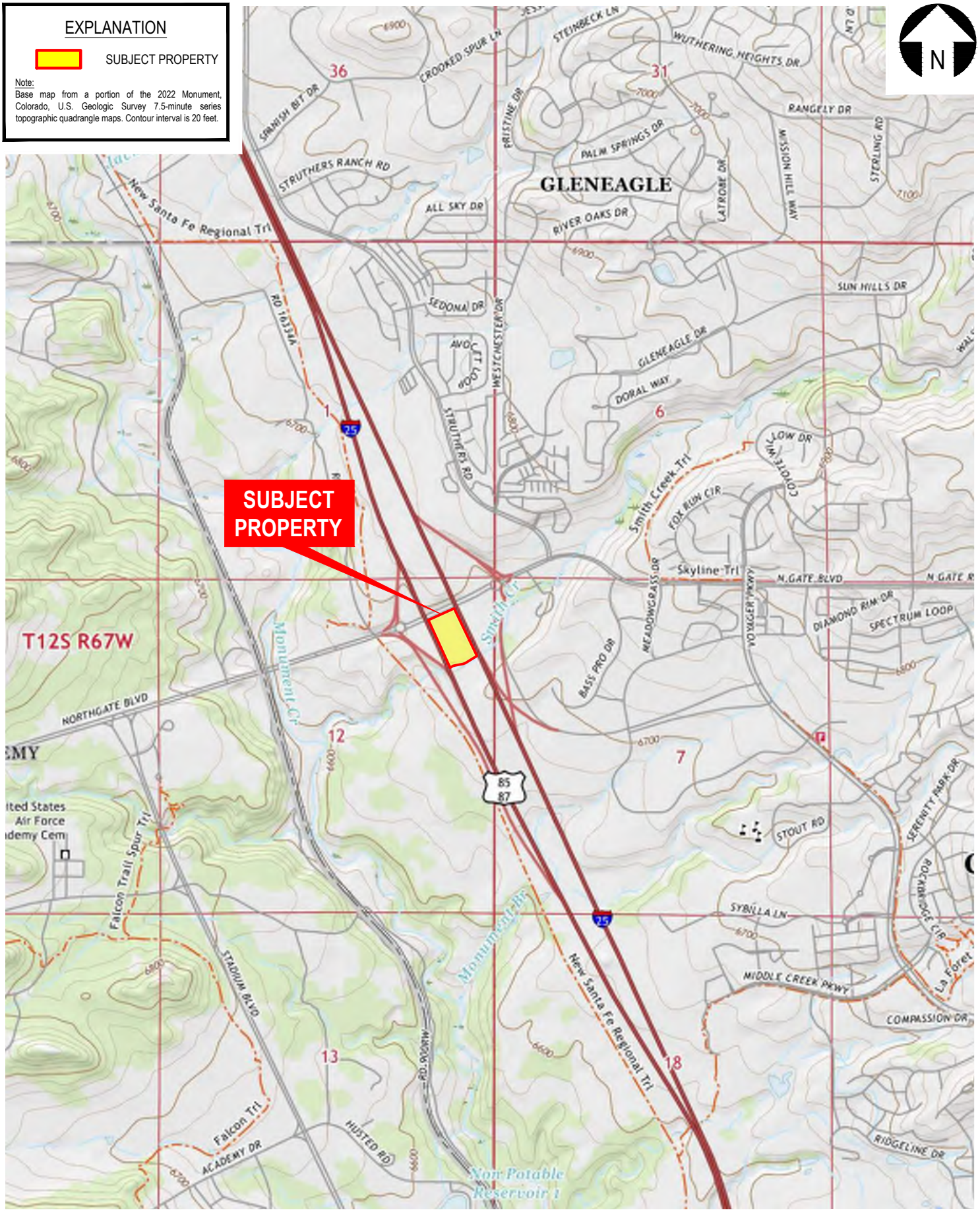
NOAA National Centers for Environmental information, Climate at a Glance: County Time Series, 2023, from https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series

Woessner, W.W. and M.P. Anderson, 1992. Selecting Calibration Values and Formulating Calibration Targets for Ground-Water Flow Simulations, proceedings of the NWWA Conference on Solving Ground-Water Models.

Appendix A

Exhibits

Tables



0 1,000' 2,000'

1" = 2,000'
SCALE IN FEET

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

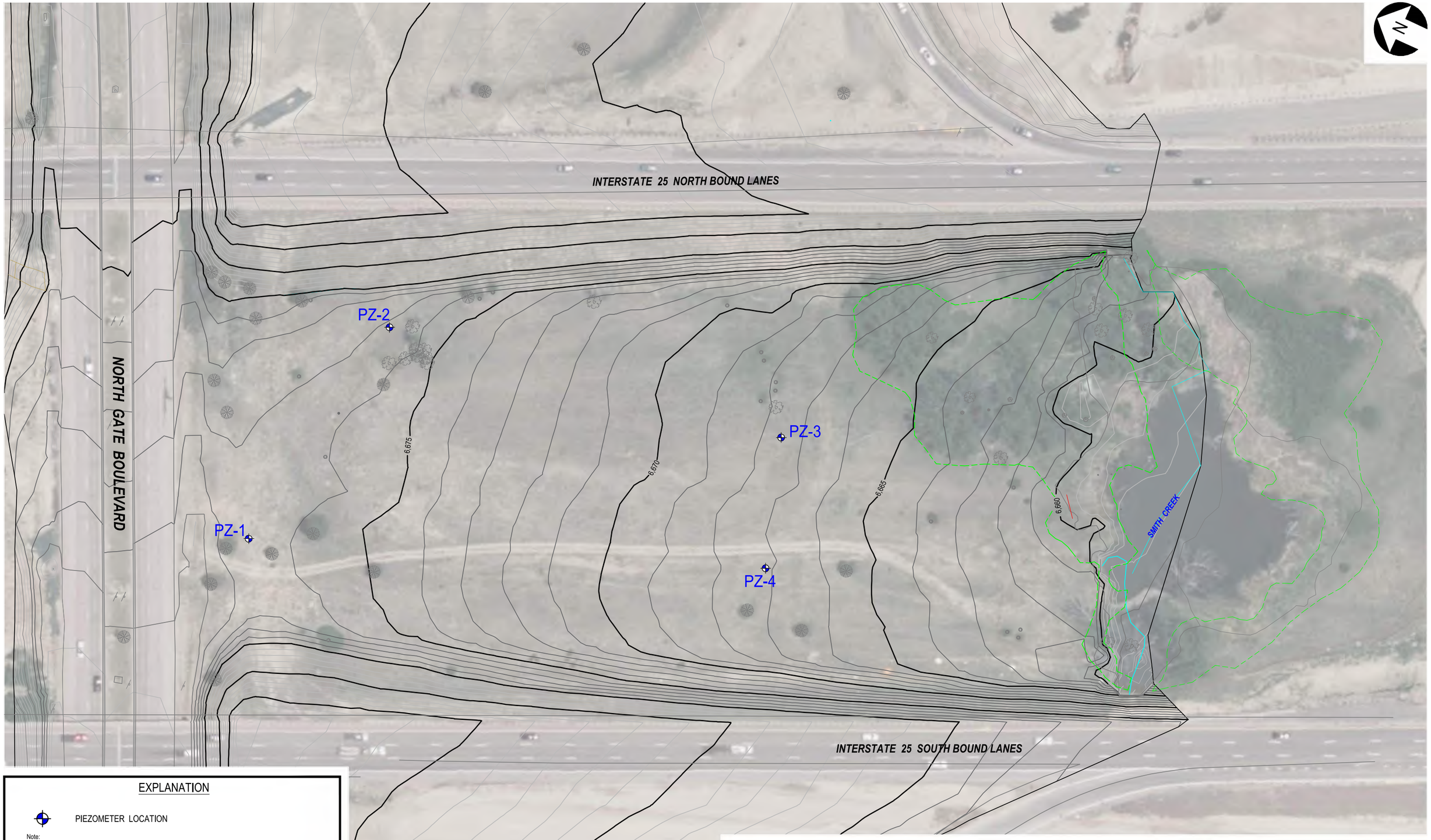
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	March 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

TOPOGRAPHIC / SITE LOCATION MAP

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
1



EXPLANATION

PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 20' 40'
1" = 40'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	March 2023

Terracon
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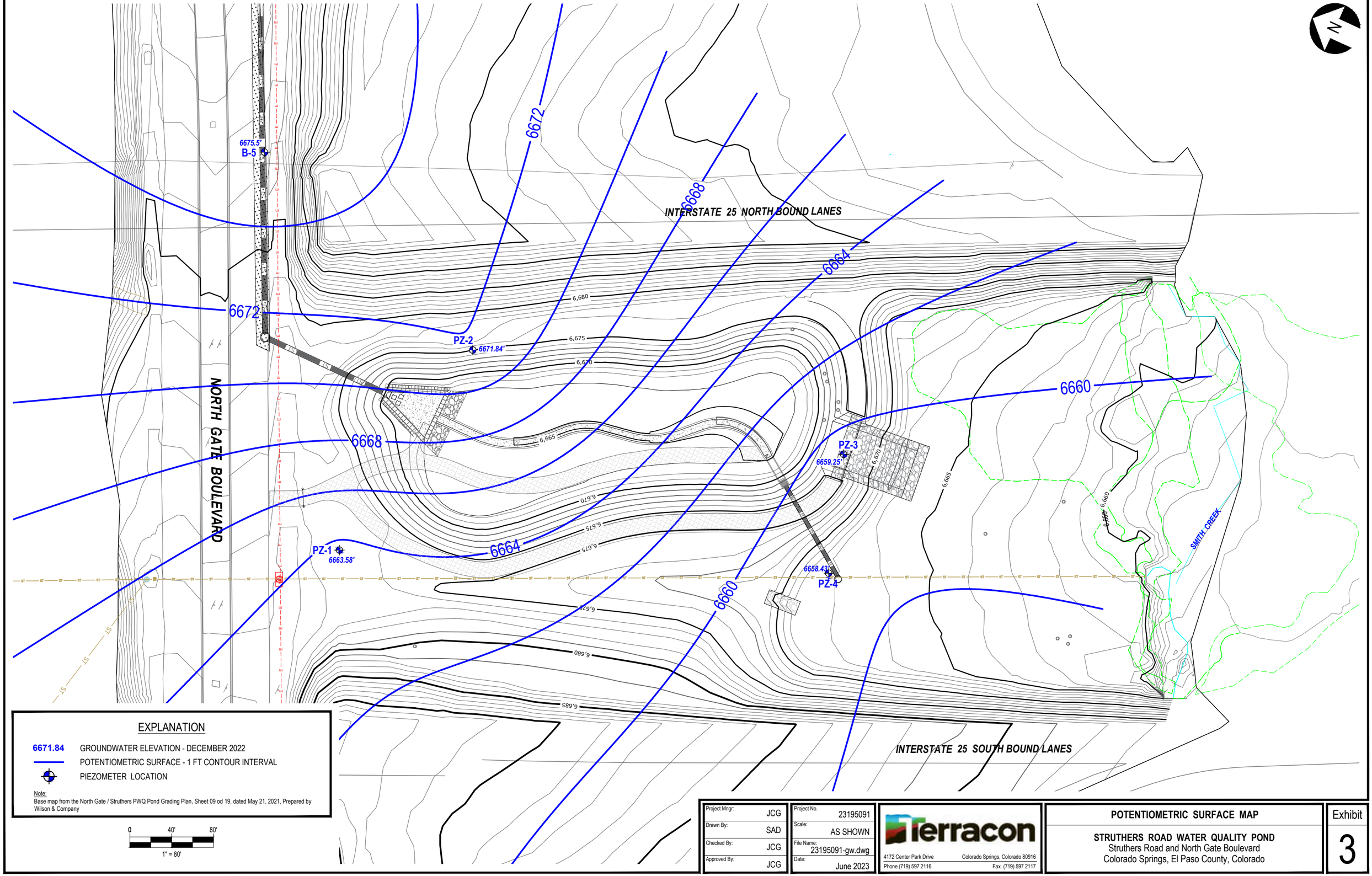
Phone (719) 597 2116 Fax. (719) 597 2117

SITE DIAGRAM

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
2



EXPLANATION

6671.84 GROUNDWATER ELEVATION - DECEMBER 2022

POTENTIOMETRIC SURFACE - 1 FT CONTOUR INTERVAL

PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

Terracon
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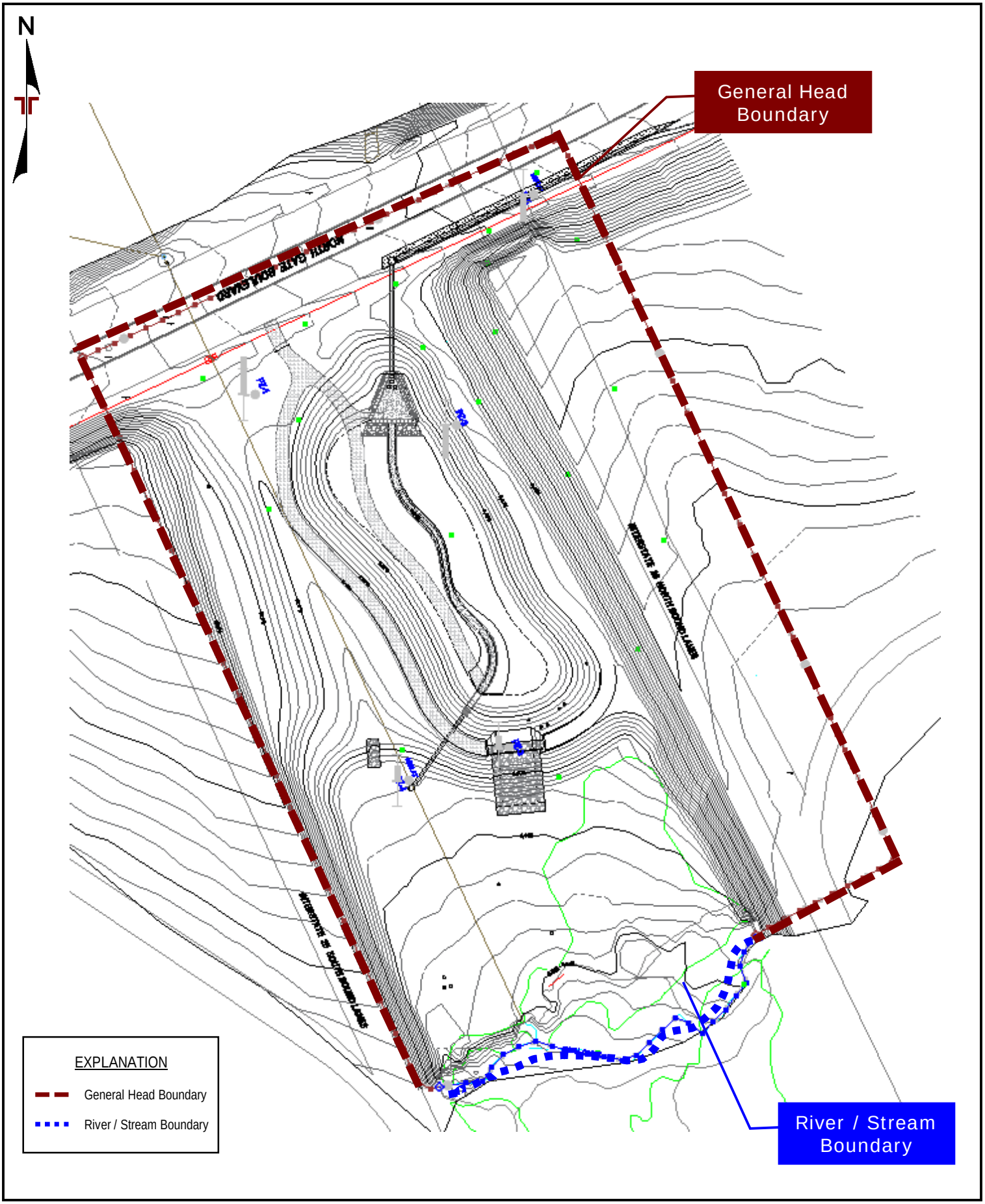
Phone (719) 597 2116 Fax. (719) 597 2117

POTENTIOMETRIC SURFACE MAP

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
3



Project Manager:	JCG
Drawn by:	SAD
Checked by:	JCG
Approved by:	JCG

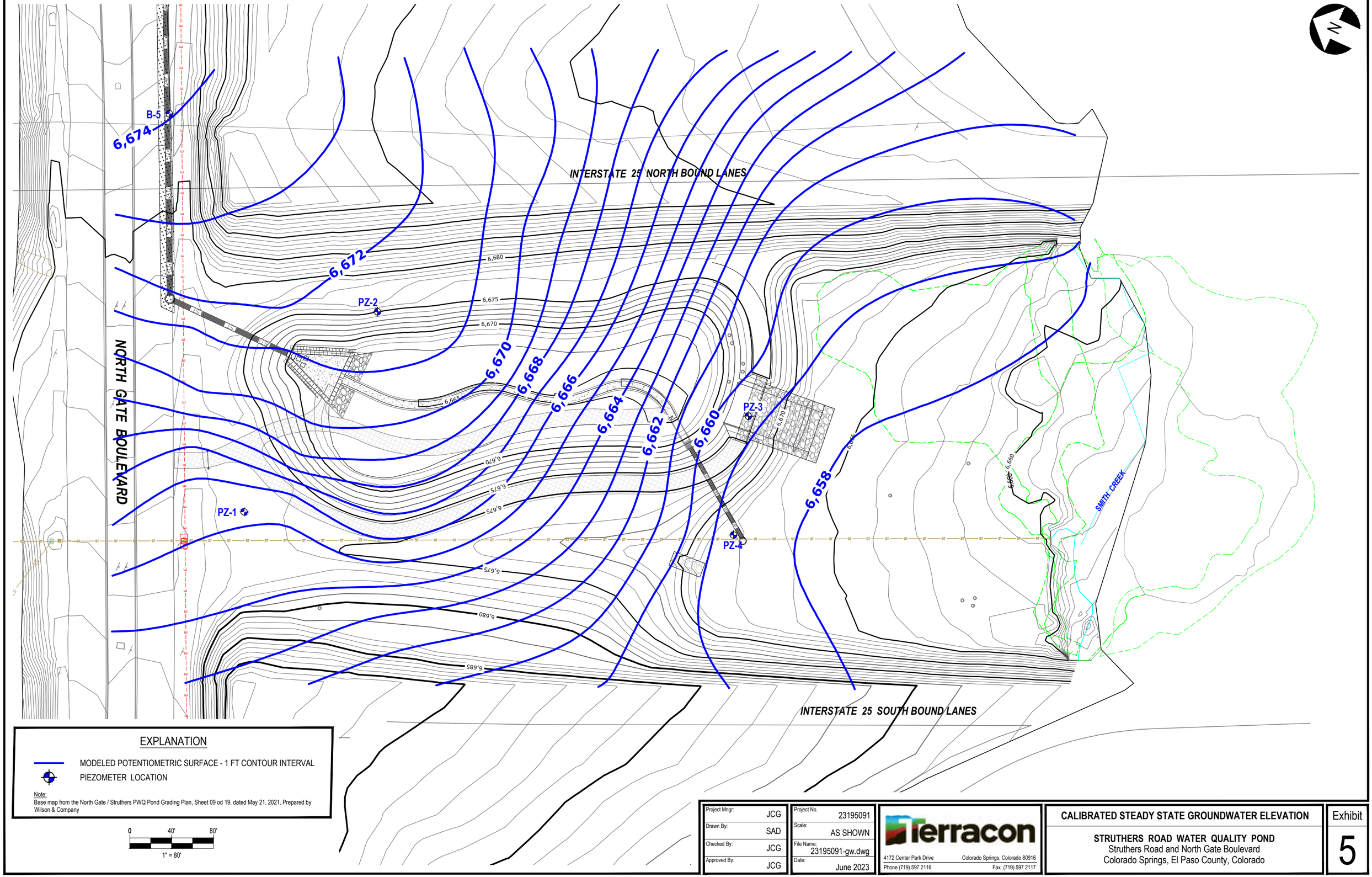
Project No.	23195091
Scale:	Not To Scale
File Name:	23195091-PPT
Date:	June 2023

Terracon
Explore with us
4172 Center Park Drive Colorado Springs, Colorado 80916
PH. (719) 597 2116 FAX. (719) 597 2117

MODEL EXTENT AND BOUNDARIES

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit: 4



EXPLANATION

MODELED POTENTIOMETRIC SURFACE - 1 FT CONTOUR INTERVAL

PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

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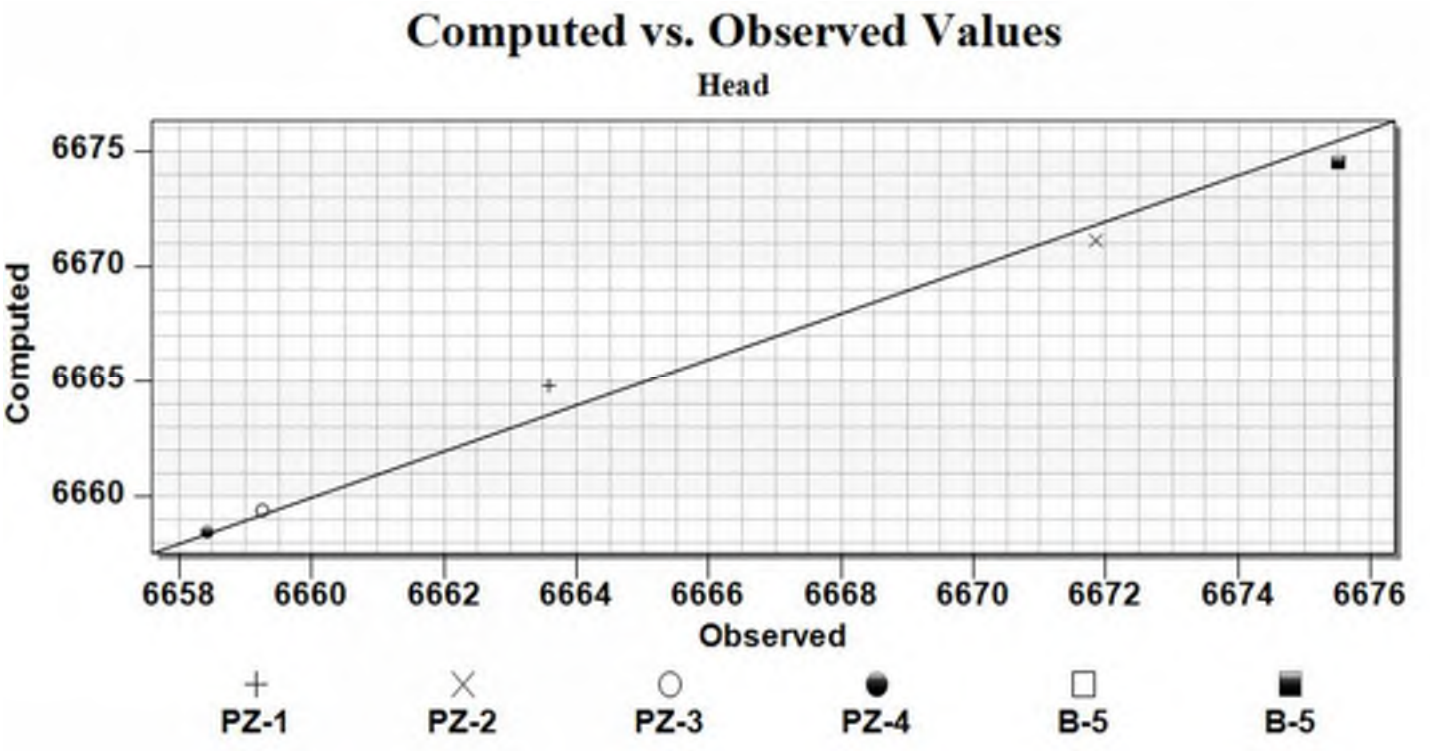
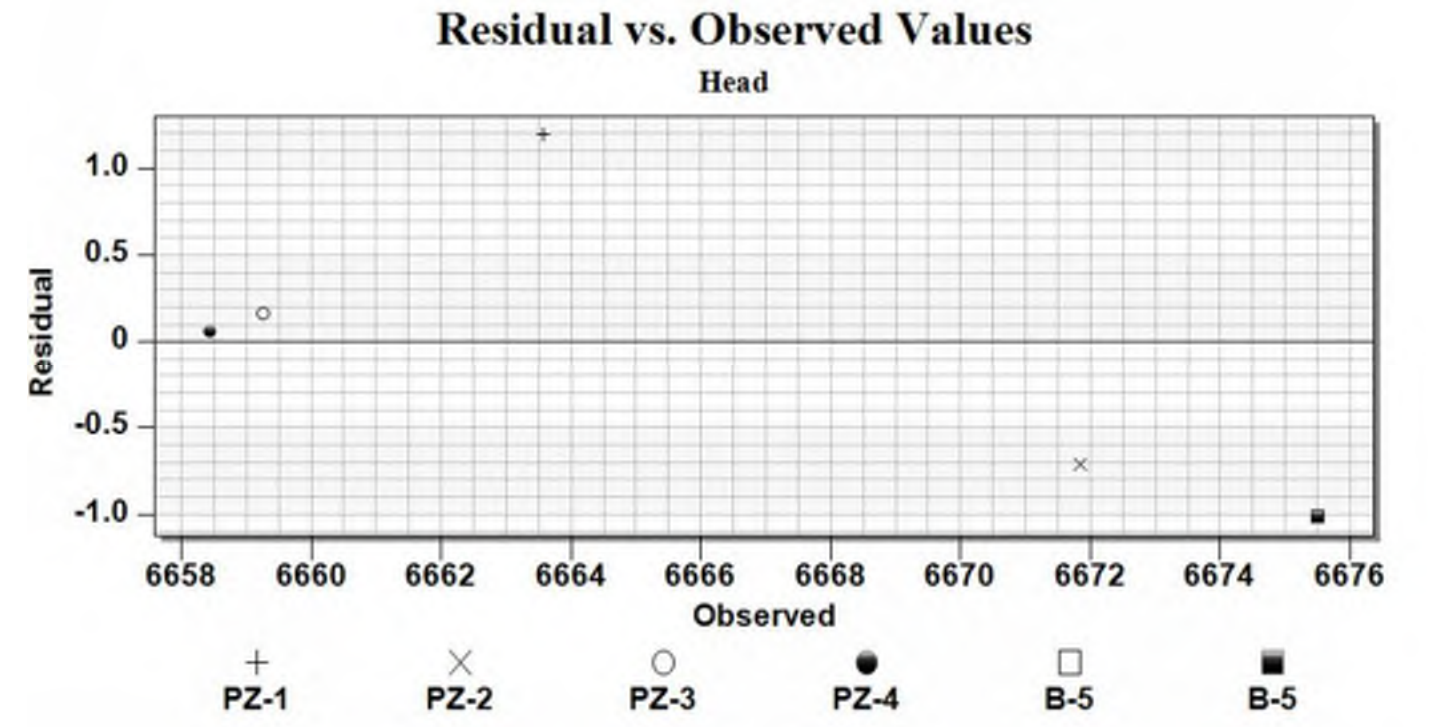
CALIBRATED STEADY STATE GROUNDWATER ELEVATION

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
5





Project Manager:	JCG
Drawn by:	SAD
Checked by:	JCG
Approved by:	JCG

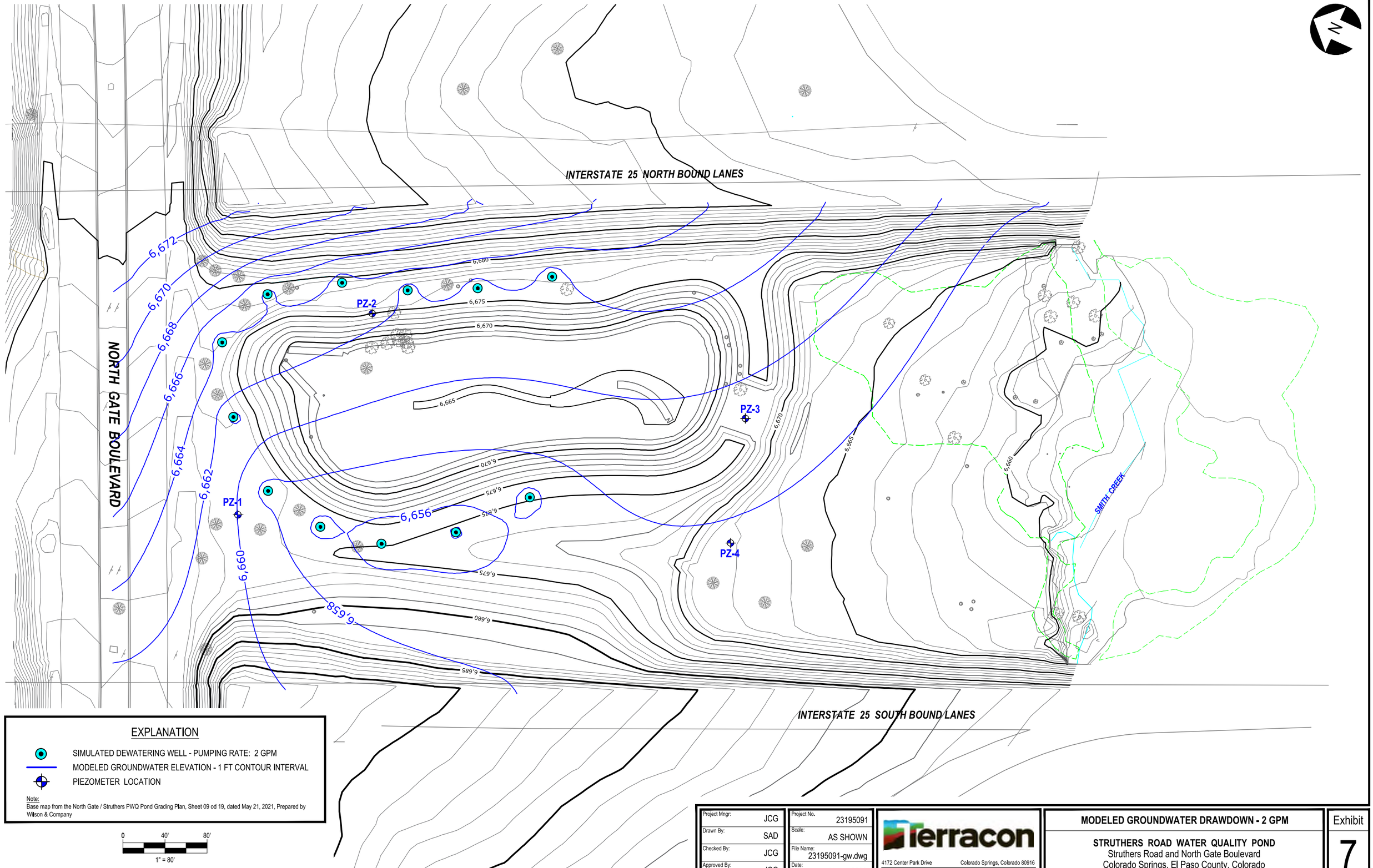
Project No.	23195091
Scale:	Not To Scale
File Name:	23195091-PPT
Date:	March 2023

Terracon
Explore with us
4172 Center Park Drive Colorado Springs, Colorado 80916
PH. (719) 597 2116 FAX. (719) 597 2117

COMPUTED, OBSERVED, AND RESIDUAL HEAD VALUES

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit: 6



EXPLANATION

- SIMULATED DEWATERING WELL - PUMPING RATE: 2 GPM
- MODELED GROUNDWATER ELEVATION - 1 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

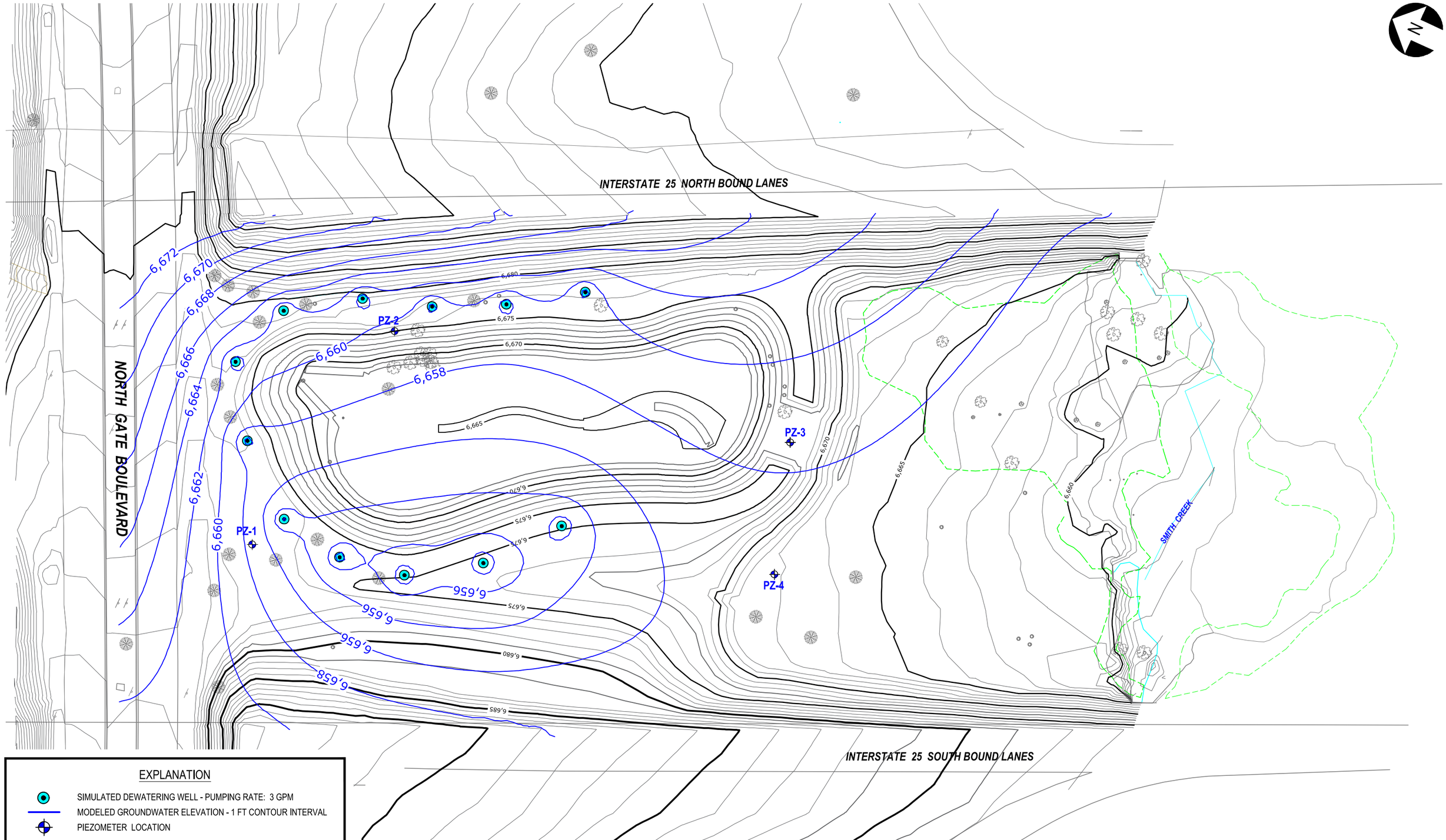
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	March 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER DRAWDOWN - 2 GPM

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit 7



EXPLANATION

- SIMULATED DEWATERING WELL - PUMPING RATE: 3 GPM
- MODELED GROUNDWATER ELEVATION - 1 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

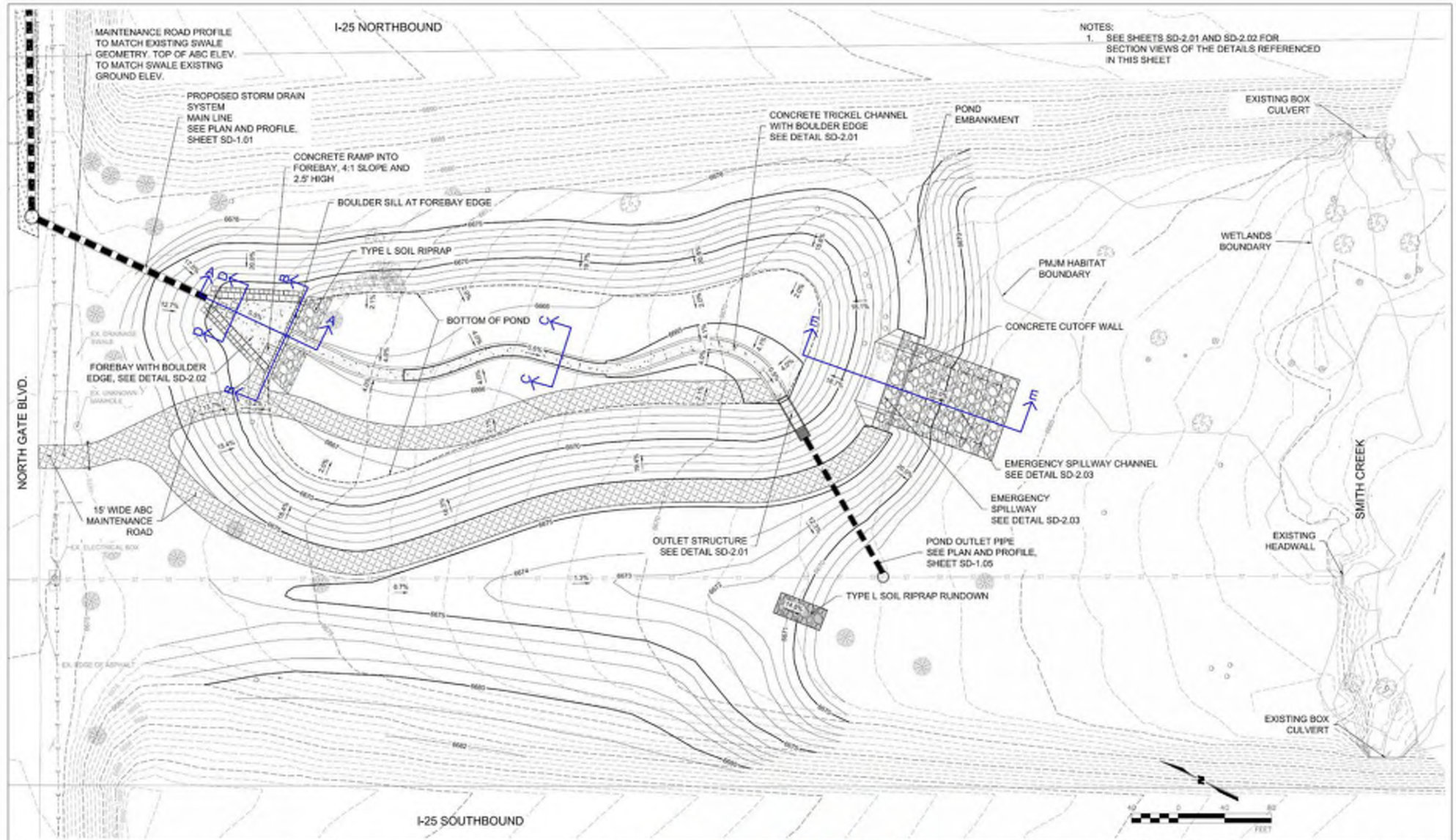
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	March 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER DRAWDOWN - 3 GPM

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
8



Print Date: MAY 21, 2021	Sheet Revisions	As Constructed	NORTH GATE / STRUTHERS PWQ POND GRADING PLAN
File Name: DTN – PLAN & PROFILE.DWG	Date: Comments Init.	No Revisions:	Project No./Code: 176103
Horiz. Scale: Vert. Scale:		Revised:	Designer: NAB; Detailer: KDL; Sheet Subset: GRADING; Structure Numbers; Subset Sheets: GR-1.01
Unit Information: Unit Leader		Void:	Sheet Number: 09 OF 19

Know what's below. Call before you dig.

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

5/21/2021 c:\wcipw\d0398843\DTN – PLAN & PROFILE.dwg

5/21/2021 c:\wcipw\d0398843\DTN – PLAN & PROFILE.dwg

Project Mngr: JCG	Project No. 23195091	Terracon	WATER QUALITY POND DESIGN
Drawn By: SAD	Scale: AS SHOWN	4172 Center Park Drive, Colorado Springs, Colorado 80916	STRUTHERS ROAD WATER QUALITY POND Struthers Road and North Gate Boulevard Colorado Springs, El Paso County, Colorado
Checked By: JCG	File Name: 23195091-gw.dwg	Phone (719) 597 2116, Fax. (719) 597 2117	Exhibit 9
Approved By: JCG	Date: March 2023		

B-5

INTERSTATE 25 NORTH BOUND LANES

NORTH GATE BOULEVARD

PZ-1

PZ-3

PZ-4

SMITH CREEK

INTERSTATE 25 SOUTH BOUND LANES

EXPLANATION

- SIMULATED GROUNDWATER FLOW BARRIER
- MODELED GROUNDWATER ELEVATION - 1 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	March 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER CONTOURS - GROUNDWATER FLOW BARRIER

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
10

Drain Bottom - 6665.0 Ft

Drain Bottom - 6663.5 Ft

Drain Bottom - 6662.5 Ft

Drain Bottom - 6661.75 Ft

B-5

6672.0'

6671.0'

6669.0'

6667.0'

6665.0'

6663.0'

6661.0'

6659.0'

PZ-1

PZ-2

PZ-3

PZ-4

INTERSTATE 25 NORTH BOUND LANES

INTERSTATE 25 SOUTH BOUND LANES

NORTH GATE BOULEVARD

SMITH CREEK

6,680

6,675

6,670

6,665

6,660

6,685

EXPLANATION

- SIMULATED CURTAIN DRAIN
- MODELED GROUNDWATER ELEVATION - 2 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

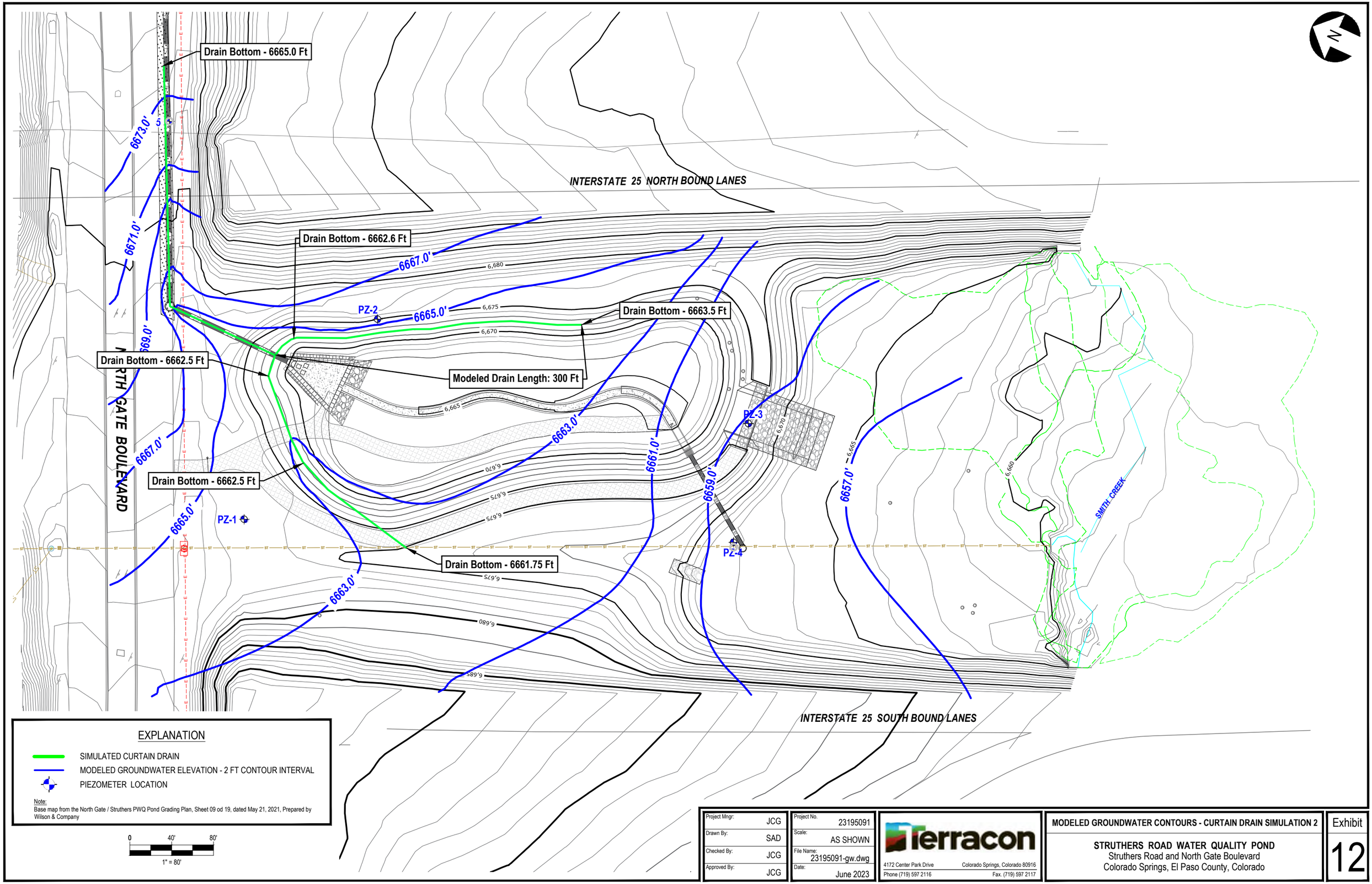
Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER CONTOURS - CURTAIN DRAIN SIMULATION 1

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit 11



Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER CONTOURS - CURTAIN DRAIN SIMULATION 2

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
12

Drain Bottom - 6665.0 Ft

B-5

6673.0'

6671.0'

INTERSTATE 25 NORTH BOUND LANES

Drain Bottom - 6662.6 Ft

Drain Bottom - 6663.5 Ft

6667.0'

PZ-2

6665.0'

6669.0'

Drain Bottom - 6662.5 Ft

Modeled Drain Length: 220 Ft

NORTH GATE BOULEVARD

6667.0'

6665.0'

PZ-3

6659.0'

Drain Bottom - 6662.5 Ft

PZ-1

Drain Bottom - 6661.75 Ft

6663.0'

6661.0'

PZ-4

6663.0'

SMITH CREEK

INTERSTATE 25 SOUTH BOUND LANES

EXPLANATION

- SIMULATED CURTAIN DRAIN
- MODELED GROUNDWATER ELEVATION - 2 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'

1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG

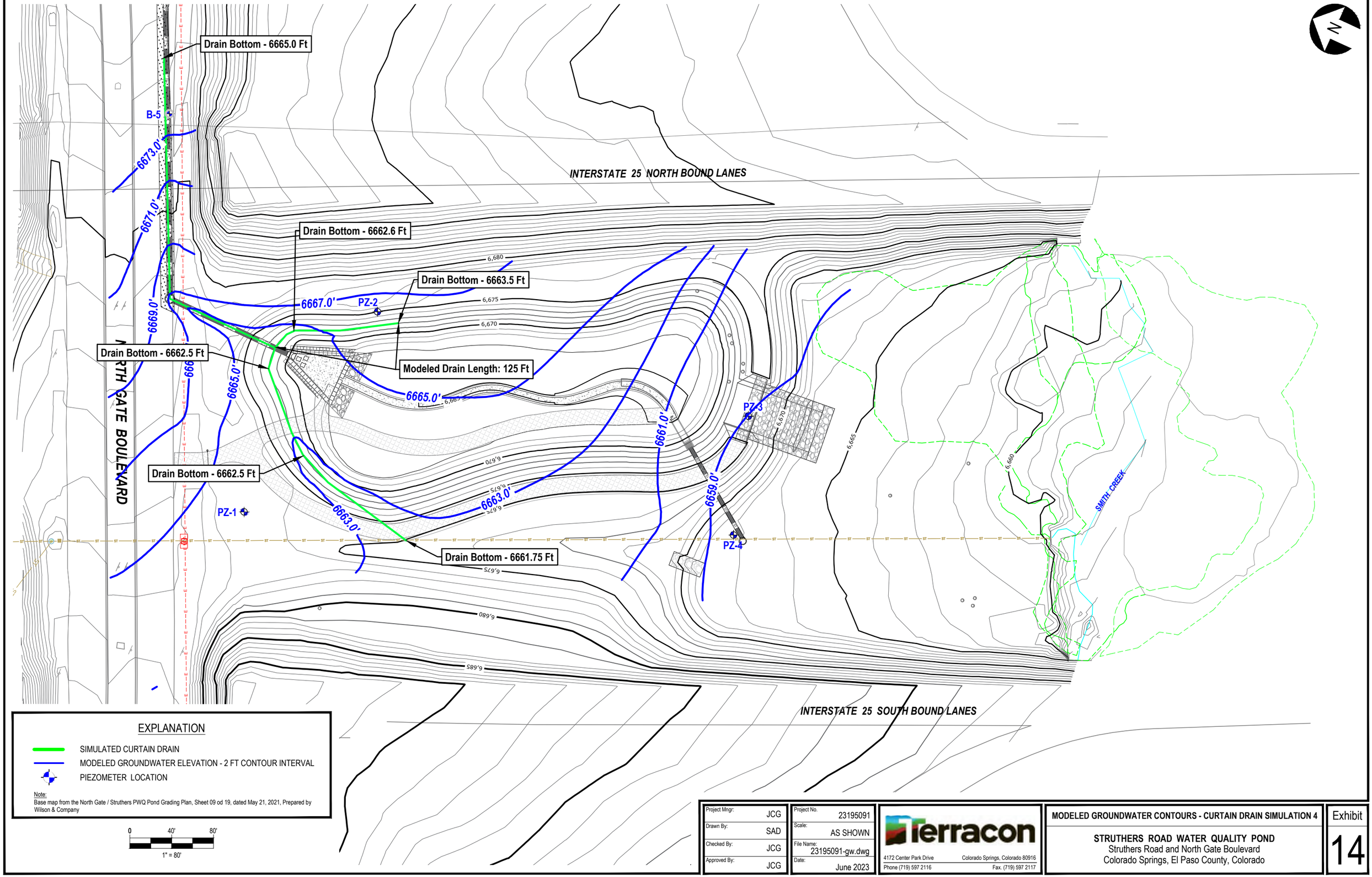
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER CONTOURS - CURTAIN DRAIN SIMULATION 3

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
13



EXPLANATION

- SIMULATED CURTAIN DRAIN
- MODELED GROUNDWATER ELEVATION - 2 FT CONTOUR INTERVAL
- PIEZOMETER LOCATION

Note:
Base map from the North Gate / Struthers PWQ Pond Grading Plan, Sheet 09 od 19, dated May 21, 2021, Prepared by Wilson & Company

0 40' 80'
1" = 80'

Project Mngr:	JCG
Drawn By:	SAD
Checked By:	JCG
Approved By:	JCG
Project No.	23195091
Scale:	AS SHOWN
File Name:	23195091-gw.dwg
Date:	June 2023

Terracon
4172 Center Park Drive Colorado Springs, Colorado 80916
Phone (719) 597 2116 Fax. (719) 597 2117

MODELED GROUNDWATER CONTOURS - CURTAIN DRAIN SIMULATION 4

STRUTHERS ROAD WATER QUALITY POND
Struthers Road and North Gate Boulevard
Colorado Springs, El Paso County, Colorado

Exhibit
14

Appendix B

Soil Boring Logs

Struthers Road Water Quality Pond
Struthers Road and North Gate Boulevard | Colorado Springs, Colorado
Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. PZ-1

Location: See Exploration Plan

Latitude: 39.0257° Longitude: -104.8341°

Depth (Ft.) Elevation: 6676 (Ft.) +/-

Depth (Ft.)	Graphic Log	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	SWELL (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
					FILL - WELL GRADED SAND WITH SILT (SW-SM), fine to coarse grained, nonplastic, light to dark brown to brown, moist, loose to medium dense					
				6	11-14		5.2	115		
				6	5-6		5.3		NP	9
5										
6.0	6670									
					SILTY SAND (SM), fine to coarse grained, nonplastic, light brown to brown, moist to wet, loose to very dense					
		▽		6	7-11					
				0	6-10					
10										
					4-4-4 N=8					
15										
					9-30-30 N=60					
20										
22.0	6654									
					SILTSTONE, gray with oxidation laminations, moist to wet, hard to very hard					
				5	28-50/4"				NP	67
25										
29.1	6646									
				0	50/1"					
					Boring Terminated at 29.08 Feet					

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Site Services

Notes
Elevation Reference: Elevations obtained from Google Earth

Advancement Method
Hollow Stem Auger

Abandonment Method
A temporary piezometer was constructed in the boring.

Logged by
MAM

Boring Started
12-15-2022

Boring Completed
12-15-2022

Struthers Road Water Quality Pond
Struthers Road and North Gate Boulevard | Colorado Springs, Colorado
Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. PZ-2

Location: See Exploration Plan

Latitude: 39.0256° Longitude: -104.8333°

Depth (Ft.) Elevation: 6676 (Ft.) +/-

Depth (Ft.)	Material Description	Sample Type	Recovery (In.)	Field Test Results	Atterberg Limits LL-PL-PI	Percent Fines
0	**FILL - SILTY SAND (SM)**, fine to coarse grained, nonplastic, gray, moist to wet, loose to medium dense					
			0	10-11		
5.0	6671					
5	**WELL GRADED SAND WITH SILT (SW-SM)**, fine to medium grained, nonplastic, tan to brown, moist to wet, medium dense		18	7-8-9 N=17		
			6	7-8-9 N=17		
10			18	5-5-6 N=11	NP	9
15			18	3-4-6 N=10		
20.0	6656					
20	**SANDSTONE**, gray, moist to wet, hard		18	11-16-22 N=38	NP	39
25			18	10-25-50/4"		
30				19-38-35 N=73	NP	
30.5	6645.5					
	Boring Terminated at 30.5 Feet					

Water Level Observations: ▽ While drilling

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes
Elevation Reference: Elevations obtained from Google Earth

Advancement Method
Hollow Stem Auger

Abandonment Method
A temporary piezometer was constructed in the boring.

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon - Fort Collins

Logged by
WAM

Boring Started
12-19-2022

Boring Completed
12-19-2022

Struthers Road Water Quality Pond
Struthers Road and North Gate Boulevard | Colorado Springs, Colorado
Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. PZ-3

Location: See Exploration Plan

Latitude: 39.0246° Longitude: -104.8331°

Depth (Ft.) Elevation: 6667 (Ft.) +/-

Depth (Ft.)	Material Description	Elevation	Sample Type	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	FILL - SILTY SAND (SM), fine to coarse grained, nonplastic, brown, moist, medium dense							
				12	9-7-7 N=14	4.1		
5				15	3-3-9 N=12	11.8	NP	14
	6.0	6661						
	POORLY GRADED SAND WITH SILT (SP-SM), medium to coarse grained, nonplastic, light brown to brown, moist to wet, loose to medium dense							
				12	2-1-4 N=5	27.2		
10				12	2-4-6 N=10		NP	10
15				12	4-6-4 N=10			
	17.0	6650						
	WELL GRADED SAND WITH SILT (SW-SM), fine to coarse grained, nonplastic, light brown to brown, moist to wet, medium dense							
20				6	8-12		NP	8
	22.0	6645						
	SANDSTONE, gray, moist to wet, hard to very hard							
25				5	50/5"		NP	5
	29.3	6637.75						
	Boring Terminated at 29.25 Feet			0	50/3"			

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
While drilling

Drill Rig
CME 75

Hammer Type
Automatic

Driller
Terracon - Fort Collins

Logged by
WAM

Boring Started
12-19-2022

Boring Completed
12-19-2022

Notes
Elevation Reference: Elevations obtained from Google Earth

Advancement Method
Hollow Stem Auger

Abandonment Method
A temporary piezometer was constructed in the boring.

Struthers Road Water Quality Pond
Struthers Road and North Gate Boulevard | Colorado Springs, Colorado
Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Log No. PZ-4

Location: See Exploration Plan

Latitude: 39.0245° Longitude: -104.8335°

Depth (Ft.) Elevation: 6667 (Ft.) +/-

Depth (Ft.)	Graphic Log	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	SWELL (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
					FILL - SILTY SAND (SM), fine to coarse grained, nonplastic, brown to black to light gray, moist, loose to medium dense					
			X	6	10-12		5.4	116		
5			X	5	15-21		5.2	122		
8.0			X	5	2-9		18.0	97	NP	14
					POORLY GRADED SAND WITH SILT (SP-SM), fine to coarse grained, nonplastic, brown to black to light gray, moist to wet, loose to medium dense					
10			X	6	7-9					
15		▽	X	1	9-15		12.6			
20			X		4-8				NP	6
23.0										
					SANDSTONE, gray, moist to wet, very hard					
25			X		35-50/2"					
29.0										
					Boring Terminated at 29 Feet					

6659 6644 6638

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME 55

Hammer Type
Automatic

Driller
Site Services

Logged by
MAM

Boring Started
12-15-2022

Boring Completed
12-15-2022

Notes
Elevation Reference: Elevations obtained from Google Earth

Advancement Method
Hollow Stem Auger

Abandonment Method
A temporary piezometer was constructed in the boring.

Appendix C

Analytical Laboratory Report

ANALYTICAL REPORT

January 06, 2023

Terracon - Colorado Springs, CO

Sample Delivery Group:	L1571609
Samples Received:	12/30/2022
Project Number:	23195091
Description:	Struthers Pond

Report To: Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Entire Report Reviewed By: Chris Ward

Chris Ward
Project Manager

Pace Analytical National
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PZ-1 L1571609-01 GW

Collected by: John F. O' Kane
Collected date/time: 12/29/22 12:02
Received date/time: 12/30/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1981569	1	01/03/23 15:20	01/03/23 15:20	ARD	Mt. Juliet, TN
Wet Chemistry by Method 7199	WG1981941	1	01/03/23 15:20	01/03/23 15:20	ARD	Mt. Juliet, TN
Mercury by Method 7470A	WG1981268	1	12/30/22 15:19	01/03/23 09:39	SRT	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG1981562	1	12/31/22 10:18	01/03/23 20:12	LD	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG1981569	1	12/30/22 16:55	01/02/23 11:46	SJM	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1984364	1	01/06/23 12:57	01/06/23 12:57	JHH	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C	WG1981578	1	12/30/22 15:47	12/31/22 20:16	AGW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270E	WG1981580	1	12/31/22 05:26	01/01/23 00:25	AGW	Mt. Juliet, TN

PZ-1 L1571609-02 GW

Collected by: John F. O' Kane
Collected date/time: 12/29/22 12:02
Received date/time: 12/30/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1981569	1	01/03/23 15:43	01/03/23 15:43	ARD	Mt. Juliet, TN
Wet Chemistry by Method 7199	WG1982585	1	01/03/23 15:43	01/03/23 15:43	ARD	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG1981569	1	12/30/22 16:55	01/02/23 11:50	SJM	Mt. Juliet, TN

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris Ward
Project Manager

Calculated Results

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Chromium,Trivalent	ND		0.500	1	01/03/2023 15:20	WG1981569

Wet Chemistry by Method 7199

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Hexavalent Chromium	ND		0.500	1	01/03/2023 15:20	WG1981941

Mercury by Method 7470A

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Mercury	ND		0.200	1	01/03/2023 09:39	WG1981268

Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Aluminum	329		100	1	01/02/2023 11:46	WG1981569
Antimony	ND		4.00	1	01/02/2023 11:46	WG1981569
Arsenic	ND		2.00	1	01/02/2023 11:46	WG1981569
Barium	552		2.00	1	01/02/2023 11:46	WG1981569
Beryllium	ND		2.00	1	01/02/2023 11:46	WG1981569
Cadmium	ND		1.00	1	01/02/2023 11:46	WG1981569
Chromium	ND		2.00	1	01/02/2023 11:46	WG1981569
Copper	ND		5.00	1	01/02/2023 11:46	WG1981569
Iron	770		100	1	01/02/2023 11:46	WG1981569
Iron,Dissolved	339		100	1	01/03/2023 20:12	WG1981562
Lead	ND		2.00	1	01/02/2023 11:46	WG1981569
Manganese,Dissolved	49.1		5.00	1	01/03/2023 20:12	WG1981562
Molybdenum	ND		5.00	1	01/02/2023 11:46	WG1981569
Nickel	ND		2.00	1	01/02/2023 11:46	WG1981569
Selenium	ND		2.00	1	01/02/2023 11:46	WG1981569
Silver	ND		2.00	1	01/02/2023 11:46	WG1981569
Thallium	ND		2.00	1	01/02/2023 11:46	WG1981569
Uranium	ND		1.00	1	01/02/2023 11:46	WG1981569
Zinc	ND		25.0	1	01/02/2023 11:46	WG1981569

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Acrolein	ND		50.0	1	01/06/2023 12:57	WG1984364
Benzene	ND		1.00	1	01/06/2023 12:57	WG1984364
Bromoform	ND		1.00	1	01/06/2023 12:57	WG1984364
Carbon tetrachloride	ND		1.00	1	01/06/2023 12:57	WG1984364
Chlorobenzene	ND		1.00	1	01/06/2023 12:57	WG1984364
Chlorodibromomethane	ND		1.00	1	01/06/2023 12:57	WG1984364
2-Chloroethyl vinyl ether	ND		50.0	1	01/06/2023 12:57	WG1984364
Chloroform	ND		5.00	1	01/06/2023 12:57	WG1984364
1,2-Dichloroethane	ND		1.00	1	01/06/2023 12:57	WG1984364
1,1-Dichloroethene	ND		1.00	1	01/06/2023 12:57	WG1984364
1,2-Dichloropropane	ND		1.00	1	01/06/2023 12:57	WG1984364
cis-1,3-Dichloropropene	ND		1.00	1	01/06/2023 12:57	WG1984364
trans-1,3-Dichloropropene	ND		1.00	1	01/06/2023 12:57	WG1984364
Ethylbenzene	ND		1.00	1	01/06/2023 12:57	WG1984364
Bromomethane	ND		5.00	1	01/06/2023 12:57	WG1984364
Chloromethane	ND		2.50	1	01/06/2023 12:57	WG1984364

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
1,1,2,2-Tetrachloroethane	ND		1.00	1	01/06/2023 12:57	WG1984364
Tetrachloroethene	ND		1.00	1	01/06/2023 12:57	WG1984364
Toluene	ND		1.00	1	01/06/2023 12:57	WG1984364
trans-1,2-Dichloroethene	ND		1.00	1	01/06/2023 12:57	WG1984364
1,1,1-Trichloroethane	ND		1.00	1	01/06/2023 12:57	WG1984364
1,1,2-Trichloroethane	ND		1.00	1	01/06/2023 12:57	WG1984364
Trichloroethene	ND		1.00	1	01/06/2023 12:57	WG1984364
Vinyl chloride	ND		1.00	1	01/06/2023 12:57	WG1984364
Xylenes, Total	ND		3.00	1	01/06/2023 12:57	WG1984364
(S) Toluene-d8	*107*		*80.0-120*		*01/06/2023 12:57*	WG1984364
(S) 4-Bromofluorobenzene	*103*		*77.0-126*		*01/06/2023 12:57*	WG1984364

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Acenaphthene	ND		1.00	1	12/31/2022 20:16	WG1981578
Acenaphthylene	ND		1.00	1	12/31/2022 20:16	WG1981578
Anthracene	ND		1.00	1	12/31/2022 20:16	WG1981578
Benzidine	ND	J4	10.0	1	12/31/2022 20:16	WG1981578
Benzo(a)anthracene	ND		1.00	1	12/31/2022 20:16	WG1981578
Benzo(a)pyrene	ND		1.00	1	12/31/2022 20:16	WG1981578
Benzo(b)fluoranthene	ND		1.00	1	12/31/2022 20:16	WG1981578
Benzo(g,h,i)perylene	ND		1.00	1	12/31/2022 20:16	WG1981578
Benzo(k)fluoranthene	ND		1.00	1	12/31/2022 20:16	WG1981578
Bis(2-chloroethyl)ether	ND		10.0	1	12/31/2022 20:16	WG1981578
2,2-Oxybis(1-Chloropropane)	ND		10.0	1	12/31/2022 20:16	WG1981578
Bis(2-ethylhexyl)phthalate	ND		3.00	1	12/31/2022 20:16	WG1981578
Benzylbutyl phthalate	ND		3.00	1	12/31/2022 20:16	WG1981578
2-Chloronaphthalene	ND		1.00	1	12/31/2022 20:16	WG1981578
Chrysene	ND		1.00	1	12/31/2022 20:16	WG1981578
Dibenz(a,h)anthracene	ND		1.00	1	12/31/2022 20:16	WG1981578
3,3-Dichlorobenzidine	ND		10.0	1	12/31/2022 20:16	WG1981578
Diethyl phthalate	ND		3.00	1	12/31/2022 20:16	WG1981578
Dimethyl phthalate	ND		3.00	1	12/31/2022 20:16	WG1981578
Di-n-butyl phthalate	ND		3.00	1	12/31/2022 20:16	WG1981578
2,4-Dinitrotoluene	ND		10.0	1	12/31/2022 20:16	WG1981578
2,6-Dinitrotoluene	ND		10.0	1	12/31/2022 20:16	WG1981578
1,2-Diphenylhydrazine	ND	N2	10.0	1	12/31/2022 20:16	WG1981578
Fluorene	ND		1.00	1	12/31/2022 20:16	WG1981578
Fluoranthene	ND		1.00	1	12/31/2022 20:16	WG1981578
Hexachlorobenzene	ND		1.00	1	12/31/2022 20:16	WG1981578
Hexachloro-1,3-butadiene	ND		10.0	1	12/31/2022 20:16	WG1981578
Hexachlorocyclopentadiene	ND		10.0	1	12/31/2022 20:16	WG1981578
Hexachloroethane	ND		10.0	1	12/31/2022 20:16	WG1981578
Indeno(1,2,3-cd)pyrene	ND		1.00	1	12/31/2022 20:16	WG1981578
Isophorone	ND		10.0	1	12/31/2022 20:16	WG1981578
Naphthalene	ND		1.00	1	12/31/2022 20:16	WG1981578
Nitrobenzene	ND		10.0	1	12/31/2022 20:16	WG1981578
n-Nitrosodimethylamine	ND		10.0	1	12/31/2022 20:16	WG1981578
n-Nitrosodi-n-propylamine	ND		10.0	1	12/31/2022 20:16	WG1981578
n-Nitrosodiphenylamine	ND		10.0	1	12/31/2022 20:16	WG1981578
Pyrene	ND		1.00	1	12/31/2022 20:16	WG1981578
1,2,4-Trichlorobenzene	ND		10.0	1	12/31/2022 20:16	WG1981578
2-Chlorophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
2,4-Dichlorophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
2,4-Dimethylphenol	ND		10.0	1	12/31/2022 20:16	WG1981578

Semi Volatile Organic Compounds (GC/MS) by Method 8270C

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
4,6-Dinitro-2-methylphenol	ND		10.0	1	12/31/2022 20:16	WG1981578
2,4-Dinitrophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
4-Nitrophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
Pentachlorophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
Phenol	ND		10.0	1	12/31/2022 20:16	WG1981578
2,4,6-Trichlorophenol	ND		10.0	1	12/31/2022 20:16	WG1981578
1,2-Dichlorobenzene	ND		10.0	1	12/31/2022 20:16	WG1981578
1,3-Dichlorobenzene	ND		10.0	1	12/31/2022 20:16	WG1981578
1,4-Dichlorobenzene	ND		10.0	1	12/31/2022 20:16	WG1981578
(S) 2-Fluorophenol	*37.0*		*10.0-120*		*12/31/2022 20:16*	WG1981578
(S) Phenol-d5	*23.8*		*10.0-120*		*12/31/2022 20:16*	WG1981578
(S) Nitrobenzene-d5	*62.7*		*10.0-127*		*12/31/2022 20:16*	WG1981578
(S) 2-Fluorobiphenyl	*59.0*		*10.0-130*		*12/31/2022 20:16*	WG1981578
(S) 2,4,6-Tribromophenol	*49.6*		*10.0-155*		*12/31/2022 20:16*	WG1981578
(S) p-Terphenyl-d14	*60.2*		*10.0-128*		*12/31/2022 20:16*	WG1981578

Semi Volatile Organic Compounds (GC/MS) by Method 8270E

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
1,4-Dioxane	ND		0.250	1	01/01/2023 00:25	WG1981580
(S) Nitrobenzene-d5	*52.2*		*10.0-120*		*01/01/2023 00:25*	WG1981580

Calculated Results

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Trivalent Chromium, Potential Dissolved	ND		0.500	1	01/03/2023 15:43	WG1981569

Wet Chemistry by Method 7199

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Hexavalent Chromium, Potential Dissolved	ND		0.500	1	01/03/2023 15:43	WG1982585

Metals (ICPMS) by Method 6020

Analyte	Result ug/l	Qualifier	RDL ug/l	Dilution	Analysis date / time	Batch
Arsenic, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Cadmium, Potentially Dissolved	ND		1.00	1	01/02/2023 11:50	WG1981569
Chromium, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Copper, Potentially Dissolved	ND		5.00	1	01/02/2023 11:50	WG1981569
Lead, Potentially Dissolved	ND		5.00	1	01/02/2023 11:50	WG1981569
Manganese, Potentially Dissolved	53.1		5.00	1	01/02/2023 11:50	WG1981569
Nickel, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Selenium, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Silver, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Thallium, Potentially Dissolved	ND		2.00	1	01/02/2023 11:50	WG1981569
Uranium, Potentially Dissolved	ND		20.0	1	01/02/2023 11:50	WG1981569
Zinc, Potentially Dissolved	ND		25.0	1	01/02/2023 11:50	WG1981569

Method Blank (MB)

(MB) R3877600-1 01/03/23 14:08

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Hexavalent Chromium	U		0.150	0.500

L1571581-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1571581-01 01/03/23 15:05 • (DUP) R3877600-5 01/03/23 15:12

Analyte	Original Result ug/l	DUP Result ug/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hexavalent Chromium	ND	ND	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3877600-2 01/03/23 14:18

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hexavalent Chromium	2.00	2.15	108	90.0-110	

L1571481-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571481-01 01/03/23 14:41 • (MS) R3877600-3 01/03/23 14:49 • (MSD) R3877600-4 01/03/23 14:57

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Hexavalent Chromium	50.0	ND	50.8	50.2	102	100	1	90.0-110			1.15	20

Method Blank (MB)

(MB) R3877601-1 01/03/23 14:08

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Hexavalent Chromium, Potential Dissolved	U		0.150	0.500

Laboratory Control Sample (LCS)

(LCS) R3877601-2 01/03/23 14:18

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hexavalent Chromium, Potential Dissolved	2.00	2.15	108	90.0-110	

Method Blank (MB)

(MB) R3877346-1 01/03/23 09:02

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Mercury	U		0.100	0.200

Laboratory Control Sample (LCS)

(LCS) R3877346-2 01/03/23 09:04

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Mercury	3.00	3.10	103	80.0-120	

L1571505-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571505-04 01/03/23 09:10 • (MS) R3877346-3 01/03/23 09:13 • (MSD) R3877346-4 01/03/23 09:15

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	3.00	ND	2.52	2.49	84.1	83.0	1	75.0-125			1.38	20

Method Blank (MB)

(MB) R3877669-1 01/03/23 20:06

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Iron,Dissolved	U		28.1	100
Manganese,Dissolved	0.713	J	0.704	5.00

Laboratory Control Sample (LCS)

(LCS) R3877669-2 01/03/23 20:09

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Iron,Dissolved	5000	5100	102	80.0-120	
Manganese,Dissolved	50.0	50.5	101	80.0-120	

L1571609-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571609-01 01/03/23 20:12 • (MS) R3877669-4 01/03/23 20:19 • (MSD) R3877669-5 01/03/23 20:22

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Iron,Dissolved	5000	339	5180	5220	96.7	97.6	1	75.0-125			0.808	20
Manganese,Dissolved	50.0	49.1	97.7	98.6	97.1	98.9	1	75.0-125			0.939	20

Method Blank (MB)

(MB) R3877157-1 01/02/23 10:52

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Aluminum	U		55.4	100
Antimony	U		1.03	4.00
Arsenic	U		0.180	2.00
Barium	0.814	J	0.381	2.00
Beryllium	U		0.454	2.00
Cadmium	U		0.478	1.00
Chromium	U		1.24	2.00
Copper	U		1.51	5.00
Iron	U		28.1	100
Lead	U		0.849	2.00
Manganese	U		0.704	5.00
Molybdenum	U		0.348	5.00
Nickel	U		0.816	2.00
Selenium	U		0.657	2.00
Silver	U		0.0700	2.00
Thallium	U		0.121	2.00
Uranium	U		0.0789	1.00
Zinc	U		3.02	25.0

Laboratory Control Sample (LCS)

(LCS) R3877157-2 01/02/23 10:55

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Aluminum	5000	4910	98.1	80.0-120	
Antimony	50.0	48.2	96.3	80.0-120	
Arsenic	50.0	49.5	99.0	80.0-120	
Barium	50.0	49.7	99.3	80.0-120	
Beryllium	50.0	47.7	95.4	80.0-120	
Cadmium	50.0	52.3	105	80.0-120	
Chromium	50.0	50.8	102	80.0-120	
Copper	50.0	51.9	104	80.0-120	
Iron	5000	5000	100	80.0-120	
Lead	50.0	50.1	100	80.0-120	
Manganese	50.0	50.5	101	80.0-120	
Molybdenum	50.0	49.8	99.6	80.0-120	
Nickel	50.0	50.1	100	80.0-120	
Selenium	50.0	50.5	101	80.0-120	
Silver	50.0	48.4	96.8	80.0-120	

Laboratory Control Sample (LCS)

(LCS) R3877157-2 01/02/23 10:55

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Thallium	50.0	50.7	101	80.0-120	
Uranium	50.0	49.1	98.2	80.0-120	
Zinc	500	478	95.6	80.0-120	

L1571572-16 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571572-16 01/02/23 14:11 • (MS) R3877157-7 01/02/23 14:18 • (MSD) R3877157-8 01/02/23 14:21

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Aluminum	5000	ND	4930	4900	98.5	98.0	1	75.0-125			0.515	20
Antimony	50.0	ND	50.0	78.2	100	156	1	75.0-125		J3 J5	43.9	20
Arsenic	50.0	15.0	70.7	112	111	194	1	75.0-125		J3 J5	45.2	20
Beryllium	50.0	ND	47.3	46.5	94.6	93.1	1	75.0-125			1.65	20
Cadmium	50.0	ND	54.5	54.2	109	108	1	75.0-125			0.500	20
Chromium	50.0	ND	52.9	56.8	106	114	1	75.0-125			7.16	20
Copper	50.0	ND	52.5	52.5	102	102	1	75.0-125			0.149	20
Iron	5000	28800	34700	34500	117	113	1	75.0-125			0.570	20
Lead	50.0	ND	51.1	49.7	102	99.5	1	75.0-125			2.65	20
Manganese	50.0	3060	3160	3140	195	157	1	75.0-125	V	V	0.618	20
Molybdenum	50.0	ND	54.6	63.7	106	124	1	75.0-125			15.3	20
Selenium	50.0	ND	52.5	56.7	105	113	1	75.0-125			7.65	20
Silver	50.0	ND	50.4	50.4	100	100	1	75.0-125			0.00899	20
Thallium	50.0	ND	51.6	50.9	103	102	1	75.0-125			1.35	20
Uranium	50.0	ND	50.9	49.5	102	99.0	1	75.0-125			2.65	20
Zinc	500	ND	497	487	99.4	97.4	1	75.0-125			1.98	20

Method Blank (MB)

(MB) R3878706-2 01/06/23 08:18

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acrolein	U		2.54	50.0
Benzene	U		0.0941	1.00
Bromoform	U		0.129	1.00
Carbon tetrachloride	U		0.128	1.00
Chlorobenzene	U		0.116	1.00
Chlorodibromomethane	U		0.140	1.00
2-Chloroethyl vinyl ether	U		0.575	50.0
Chloroform	U		0.111	5.00
1,2-Dichloroethane	U		0.0819	1.00
1,1-Dichloroethene	U		0.188	1.00
1,2-Dichloropropane	U		0.149	1.00
cis-1,3-Dichloropropene	U		0.111	1.00
trans-1,3-Dichloropropene	U		0.118	1.00
Ethylbenzene	0.191	J	0.137	1.00
Bromomethane	U		0.605	5.00
Chloromethane	U		0.960	2.50
1,1,2,2-Tetrachloroethane	U		0.133	1.00
Tetrachloroethene	U		0.300	1.00
Toluene	U		0.278	1.00
trans-1,2-Dichloroethene	U		0.149	1.00
1,1,1-Trichloroethane	U		0.149	1.00
1,1,2-Trichloroethane	U		0.158	1.00
Trichloroethene	U		0.190	1.00
Vinyl chloride	U		0.234	1.00
Xylenes, Total	U		0.174	3.00
(S) Toluene-d8	*108*			*80.0-120*
(S) 4-Bromofluorobenzene	*105*			*77.0-126*

Laboratory Control Sample (LCS)

(LCS) R3878706-1 01/06/23 07:37

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acrolein	25.0	13.5	54.0	10.0-160	
Benzene	5.00	4.44	88.8	70.0-123	
Bromoform	5.00	3.69	73.8	68.0-132	
Carbon tetrachloride	5.00	4.56	91.2	68.0-126	
Chlorobenzene	5.00	5.00	100	80.0-121	
Chlorodibromomethane	5.00	4.66	93.2	77.0-125	

Laboratory Control Sample (LCS)

(LCS) R3878706-1 01/06/23 07:37

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
2-Chloroethyl vinyl ether	25.0	23.3	93.2	51.0-160	
Chloroform	5.00	4.32	86.4	73.0-120	
1,2-Dichloroethane	5.00	4.28	85.6	70.0-128	
1,1-Dichloroethene	5.00	4.63	92.6	71.0-124	
1,2-Dichloropropane	5.00	4.27	85.4	77.0-125	
cis-1,3-Dichloropropene	5.00	4.45	89.0	80.0-123	
trans-1,3-Dichloropropene	5.00	4.53	90.6	78.0-124	
Ethylbenzene	5.00	5.10	102	79.0-123	
Bromomethane	5.00	4.36	87.2	10.0-160	
Chloromethane	5.00	4.20	84.0	41.0-142	
1,1,2,2-Tetrachloroethane	5.00	4.09	81.8	65.0-130	
Tetrachloroethene	5.00	5.13	103	72.0-132	
Toluene	5.00	4.66	93.2	79.0-120	
trans-1,2-Dichloroethene	5.00	4.67	93.4	73.0-120	
1,1,1-Trichloroethane	5.00	4.61	92.2	73.0-124	
1,1,2-Trichloroethane	5.00	4.86	97.2	80.0-120	
Trichloroethene	5.00	5.01	100	78.0-124	
Vinyl chloride	5.00	4.58	91.6	67.0-131	
Xylenes, Total	15.0	14.4	96.0	79.0-123	
(S) Toluene-d8			*106*	*80.0-120*	
(S) 4-Bromofluorobenzene			*106*	*77.0-126*	

Method Blank (MB)

(MB) R3877287-2 12/31/22 14:30

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acenaphthene	0.109	J	0.0886	1.00
Acenaphthylene	U		0.0921	1.00
Anthracene	U		0.0804	1.00
Benzidine	U		3.74	10.0
Benzo(a)anthracene	U		0.199	1.00
Benzo(a)pyrene	U		0.0381	1.00
Benzo(b)fluoranthene	U		0.130	1.00
Benzo(g,h,i)perylene	U		0.121	1.00
Benzo(k)fluoranthene	U		0.120	1.00
Bis(2-chloroethyl)ether	U		0.137	10.0
2,2-Oxybis(1-Chloropropane)	U		0.210	10.0
Bis(2-ethylhexyl)phthalate	U		0.895	3.00
Benzylbutyl phthalate	U		0.765	3.00
2-Chloronaphthalene	U		0.0648	1.00
Chrysene	U		0.130	1.00
Dibenz(a,h)anthracene	U		0.0644	1.00
3,3-Dichlorobenzidine	U		0.212	10.0
Diethyl phthalate	U		0.287	3.00
Dimethyl phthalate	U		0.260	3.00
Di-n-butyl phthalate	U		0.453	3.00
2,4-Dinitrotoluene	U		0.0983	10.0
2,6-Dinitrotoluene	U		0.250	10.0
1,2-Diphenylhydrazine	U	N2	0.105	10.0
Fluorene	U		0.0844	1.00
Fluoranthene	U		0.102	1.00
Hexachlorobenzene	U		0.0755	1.00
Hexachloro-1,3-butadiene	U		0.0968	10.0
Hexachlorocyclopentadiene	U		0.0598	10.0
Hexachloroethane	U		0.127	10.0
Indeno(1,2,3-cd)pyrene	U		0.279	1.00
Isophorone	U		0.143	10.0
Naphthalene	1.56		0.159	1.00
Nitrobenzene	U		0.297	10.0
n-Nitrosodimethylamine	U		0.998	10.0
n-Nitrosodi-n-propylamine	U		0.261	10.0
n-Nitrosodiphenylamine	U		2.37	10.0
Pyrene	U		0.107	1.00
1,2,4-Trichlorobenzene	U		0.0698	10.0
2-Chlorophenol	U		0.133	10.0
2,4-Dichlorophenol	U		0.102	10.0

Method Blank (MB)

(MB) R3877287-2 12/31/22 14:30

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
2,4-Dimethylphenol	0.695	J	0.0636	10.0
4,6-Dinitro-2-methylphenol	U		1.12	10.0
2,4-Dinitrophenol	U		5.93	10.0
4-Nitrophenol	U		0.143	10.0
Pentachlorophenol	U		0.313	10.0
Phenol	U		4.33	10.0
2,4,6-Trichlorophenol	U		0.100	10.0
1,2-Dichlorobenzene	U		0.0713	10.0
1,3-Dichlorobenzene	U		0.132	10.0
1,4-Dichlorobenzene	U		0.0942	10.0
(S) 2-Fluorophenol	*35.1*			*10.0-120*
(S) Phenol-d5	*21.3*			*10.0-120*
(S) Nitrobenzene-d5	*55.5*			*10.0-127*
(S) 2-Fluorobiphenyl	*54.2*			*10.0-130*
(S) 2,4,6-Tribromophenol	*48.7*			*10.0-155*
(S) p-Terphenyl-d14	*63.7*			*10.0-128*

Laboratory Control Sample (LCS)

(LCS) R3877287-1 12/31/22 14:09

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acenaphthene	50.0	29.4	58.8	41.0-120	
Acenaphthylene	50.0	30.6	61.2	43.0-120	
Anthracene	50.0	29.7	59.4	45.0-120	
Benzidine	100	7.24	7.24	10.0-120	J4
Benzo(a)anthracene	50.0	34.5	69.0	47.0-120	
Benzo(a)pyrene	50.0	32.6	65.2	47.0-120	
Benzo(b)fluoranthene	50.0	32.2	64.4	46.0-120	
Benzo(g,h,i)perylene	50.0	29.8	59.6	48.0-121	
Benzo(k)fluoranthene	50.0	31.2	62.4	46.0-120	
Bis(2-chloroethyl)ether	50.0	28.1	56.2	23.0-120	
2,2-Oxybis(1-Chloropropane)	50.0	26.1	52.2	28.0-120	
Bis(2-ethylhexyl)phthalate	50.0	30.7	61.4	43.0-122	
Benzylbutyl phthalate	50.0	32.9	65.8	43.0-121	
2-Chloronaphthalene	50.0	27.8	55.6	37.0-120	
Chrysene	50.0	32.6	65.2	48.0-120	
Dibenz(a,h)anthracene	50.0	31.1	62.2	47.0-120	
3,3-Dichlorobenzidine	100	44.5	44.5	44.0-120	

Laboratory Control Sample (LCS)

(LCS) R3877287-1 12/31/22 14:09

Analyte	Spike Amount ug/l	LCS Result ug/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Diethyl phthalate	50.0	36.7	73.4	48.0-122	
Dimethyl phthalate	50.0	31.5	63.0	48.0-120	
Di-n-butyl phthalate	50.0	36.8	73.6	49.0-121	
2,4-Dinitrotoluene	50.0	33.0	66.0	49.0-124	
2,6-Dinitrotoluene	50.0	30.7	61.4	46.0-120	
1,2-Diphenylhydrazine	50.0	35.4	70.8	41.0-126	N2
Fluorene	50.0	31.6	63.2	47.0-120	
Fluoranthene	50.0	34.5	69.0	51.0-120	
Hexachlorobenzene	50.0	28.3	56.6	44.0-120	
Hexachloro-1,3-butadiene	50.0	22.1	44.2	19.0-120	
Hexachlorocyclopentadiene	50.0	12.7	25.4	15.0-120	
Hexachloroethane	50.0	25.6	51.2	15.0-120	
Indeno(1,2,3-cd)pyrene	50.0	28.7	57.4	49.0-122	
Isophorone	50.0	25.4	50.8	36.0-120	
Naphthalene	50.0	24.8	49.6	27.0-120	
Nitrobenzene	50.0	25.4	50.8	27.0-120	
n-Nitrosodimethylamine	50.0	20.1	40.2	10.0-120	
n-Nitrosodi-n-propylamine	50.0	30.8	61.6	31.0-120	
n-Nitrosodiphenylamine	50.0	25.4	50.8	47.0-120	
Pyrene	50.0	32.7	65.4	47.0-120	
1,2,4-Trichlorobenzene	50.0	22.5	45.0	24.0-120	
2-Chlorophenol	50.0	23.4	46.8	25.0-120	
2,4-Dichlorophenol	50.0	22.9	45.8	36.0-120	
2,4-Dimethylphenol	50.0	22.3	44.6	33.0-120	
4,6-Dinitro-2-methylphenol	50.0	41.6	83.2	38.0-138	
2,4-Dinitrophenol	50.0	38.9	77.8	10.0-120	
4-Nitrophenol	50.0	14.8	29.6	10.0-120	
Pentachlorophenol	50.0	25.8	51.6	23.0-120	
Phenol	50.0	10.7	21.4	10.0-120	
2,4,6-Trichlorophenol	50.0	28.2	56.4	42.0-120	
1,2-Dichlorobenzene	50.0	24.3	48.6	20.0-120	
1,3-Dichlorobenzene	50.0	23.6	47.2	17.0-120	
1,4-Dichlorobenzene	50.0	24.1	48.2	18.0-120	
(S) 2-Fluorophenol			*30.6*	*10.0-120*	
(S) Phenol-d5			*20.2*	*10.0-120*	
(S) Nitrobenzene-d5			*50.0*	*10.0-127*	
(S) 2-Fluorobiphenyl			*51.5*	*10.0-130*	
(S) 2,4,6-Tribromophenol			*55.5*	*10.0-155*	
(S) p-Terphenyl-d14			*60.0*	*10.0-128*	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

L1571621-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571621-01 12/31/22 21:42 • (MS) R3877287-3 12/31/22 22:04 • (MSD) R3877287-4 12/31/22 22:25

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Acenaphthene	50.0	ND	35.2	34.9	70.4	69.8	1	28.0-120			0.856	25
Acenaphthylene	50.0	ND	36.7	36.4	73.4	72.8	1	31.0-121			0.821	25
Anthracene	50.0	ND	31.1	30.6	62.2	61.2	1	36.0-120			1.62	23
Benzidine	100	ND	ND	ND	7.15	7.15	1	10.0-120	J6	J6	0.000	37
Benzo(a)anthracene	50.0	ND	37.3	36.1	74.6	72.2	1	39.0-120			3.27	23
Benzo(a)pyrene	50.0	ND	35.5	34.6	71.0	69.2	1	37.0-120			2.57	24
Benzo(b)fluoranthene	50.0	ND	35.9	35.1	71.8	70.2	1	37.0-120			2.25	23
Benzo(g,h,i)perylene	50.0	ND	30.3	29.1	60.6	58.2	1	37.0-123			4.04	25
Benzo(k)fluoranthene	50.0	ND	34.9	34.0	69.8	68.0	1	37.0-120			2.61	26
Bis(2-chloroethyl)ether	50.0	ND	36.1	35.4	72.2	70.8	1	14.0-120			1.96	33
2,2-Oxybis(1-Chloropropane)	50.0	ND	33.4	33.4	66.8	66.8	1	18.0-120			0.000	34
Bis(2-ethylhexyl)phthalate	50.0	ND	35.7	34.2	71.4	68.4	1	33.0-126			4.29	25
Benzylbutyl phthalate	50.0	ND	39.6	38.3	79.2	76.6	1	34.0-126			3.34	24
2-Chloronaphthalene	50.0	ND	33.3	33.2	66.6	66.4	1	29.0-120			0.301	28
Chrysene	50.0	ND	35.0	34.2	70.0	68.4	1	38.0-120			2.31	23
Dibenz(a,h)anthracene	50.0	ND	32.3	30.9	64.6	61.8	1	36.0-121			4.43	24
3,3-Dichlorobenzidine	100	ND	11.7	14.7	11.7	14.7	1	10.0-134			22.7	30
Diethyl phthalate	50.0	ND	42.9	42.5	85.8	85.0	1	39.0-125			0.937	24
Dimethyl phthalate	50.0	ND	35.7	35.3	71.4	70.6	1	37.0-120			1.13	24
Di-n-butyl phthalate	50.0	ND	41.7	40.6	82.3	80.1	1	35.0-128			2.67	23
2,4-Dinitrotoluene	50.0	ND	36.8	36.5	73.6	73.0	1	39.0-125			0.819	25
2,6-Dinitrotoluene	50.0	ND	35.3	35.0	70.6	70.0	1	36.0-120			0.853	27
1,2-Diphenylhydrazine	50.0	ND	41.1	40.5	82.2	81.0	1	28.0-129	N2	N2	1.47	25
Fluorene	50.0	ND	37.3	37.0	74.6	74.0	1	37.0-120			0.808	24
Fluoranthene	50.0	ND	37.3	36.1	74.6	72.2	1	41.0-121			3.27	22
Hexachlorobenzene	50.0	ND	32.3	31.4	64.6	62.8	1	35.0-122			2.83	24
Hexachloro-1,3-butadiene	50.0	ND	26.2	26.7	52.4	53.4	1	12.0-120			1.89	34
Hexachlorocyclopentadiene	50.0	ND	18.5	18.6	37.0	37.2	1	10.0-120			0.539	33
Hexachloroethane	50.0	ND	32.1	32.5	64.2	65.0	1	10.0-120			1.24	40
Indeno(1,2,3-cd)pyrene	50.0	ND	29.8	28.7	59.6	57.4	1	38.0-125			3.76	24
Isophorone	50.0	ND	30.4	30.4	60.8	60.8	1	21.0-120			0.000	27
Naphthalene	50.0	ND	29.6	29.3	58.3	57.7	1	10.0-120			1.02	31
Nitrobenzene	50.0	ND	32.6	32.6	65.2	65.2	1	12.0-120			0.000	30
n-Nitrosodimethylamine	50.0	ND	24.4	23.7	48.8	47.4	1	10.0-120			2.91	40
n-Nitrosodi-n-propylamine	50.0	ND	40.1	40.0	80.2	80.0	1	16.0-120			0.250	30
n-Nitrosodiphenylamine	50.0	ND	28.4	28.0	56.8	56.0	1	37.0-120			1.42	24
Pyrene	50.0	ND	39.0	37.6	78.0	75.2	1	39.0-120			3.66	22
1,2,4-Trichlorobenzene	50.0	ND	26.4	27.0	52.8	54.0	1	15.0-120			2.25	31
2-Chlorophenol	50.0	ND	30.0	29.6	60.0	59.2	1	18.0-120			1.34	34
2,4-Dichlorophenol	50.0	ND	27.8	27.0	55.6	54.0	1	19.0-120			2.92	27

L1571621-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1571621-01 12/31/22 21:42 • (MS) R3877287-3 12/31/22 22:04 • (MSD) R3877287-4 12/31/22 22:25

Analyte	Spike Amount ug/l	Original Result ug/l	MS Result ug/l	MSD Result ug/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
2,4-Dimethylphenol	50.0	ND	22.8	21.1	45.2	41.8	1	15.0-120			7.74	28
4,6-Dinitro-2-methylphenol	50.0	ND	44.3	42.6	88.6	85.2	1	10.0-144			3.91	39
2,4-Dinitrophenol	50.0	ND	45.5	43.7	91.0	87.4	1	10.0-120			4.04	40
4-Nitrophenol	50.0	ND	17.1	16.4	34.2	32.8	1	10.0-120			4.18	40
Pentachlorophenol	50.0	ND	31.7	30.2	63.4	60.4	1	10.0-128			4.85	37
Phenol	50.0	ND	14.0	13.9	28.0	27.8	1	10.0-120			0.717	40
2,4,6-Trichlorophenol	50.0	ND	33.4	32.6	66.8	65.2	1	26.0-120			2.42	31
1,2-Dichlorobenzene	50.0	ND	30.5	30.6	61.0	61.2	1	18.0-120			0.327	40
1,3-Dichlorobenzene	50.0	ND	29.9	29.8	59.8	59.6	1	15.0-120			0.335	40
1,4-Dichlorobenzene	50.0	ND	30.2	30.4	60.4	60.8	1	17.0-120			0.660	40
(S) 2-Fluorophenol					*38.9*	*38.6*		*10.0-120*				
(S) Phenol-d5					*26.7*	*26.8*		*10.0-120*				
(S) Nitrobenzene-d5					*60.8*	*62.1*		*10.0-127*				
(S) 2-Fluorobiphenyl					*60.9*	*60.9*		*10.0-130*				
(S) 2,4,6-Tribromophenol					*61.0*	*59.0*		*10.0-155*				
(S) p-Terphenyl-d14					*54.7*	*53.0*		*10.0-128*				

Method Blank (MB)

(MB) R3877350-3 12/31/22 20:55

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
1,4-Dioxane	U		0.0447	0.250
(S) Nitrobenzene-d5	*54.1*			*10.0-120*

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3877350-1 12/31/22 20:17 • (LCSD) R3877350-2 12/31/22 20:36

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1,4-Dioxane	50.0	48.5	48.9	97.0	97.8	73.0-146			0.821	20
(S) Nitrobenzene-d5				*58.4*	*67.0*	*10.0-120*				

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
N2	Analyte reported using a calibration and validation based on Azobenzene (CAS 103-33-3). 1,2-Diphenylhydrazine decomposes into Azobenzene during the analysis.
V	The sample concentration is too high to evaluate accurate spike recoveries.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
Terracon - Colorado Springs, CO
4172 Center Park Drive
Colorado Springs, CO 80916

Billing Information:
Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Report to: Jared Geissler

Email To: jared.geissler@terracon.com;rob.deal@terracon

Project Description: Struthers Pond

City/State Collected: Colorado Springs, Colorado

Please Circle: PT (MT) CT ET

Phone: 719-572-7705

Client Project # 23195091

Lab Project # TERRCSCO-23195091

Collected by (print): John F. O'Kane

Site/Facility ID #

P.O. #

Collected by (signature): John F. O'Kane

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day X Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed: Standard TAT

Pres Chk

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	8270 100ml Amb NoPres	8270DIOXANELL 100ml Amb-NoPres	CR3 250mlHDPE-NoPres	CR3PD Pot. Diss. 250mlHDPE-NoPres	CR6IC Pot. Diss. 50mlTube/plungerPres	Diss Fe, Mn - FF 250mlHDPE-HNO3	Diss. CR6 50mlTube/plungerPres	Pot. Diss Metals 250mlHDPE-HNO3	SUBPEAS 250mlHDPE-NoPres	Total Metals 250mlHDPE-HNO3	Remarks	Sample # (lab only)
PZ-1	G	GW		12-29-22	1202	13	X	X	X			X	X		X	X		-01
PZ-1	G	GW		12-29-22	1208	3				X	X			X				-02
		GW				13	X	X	X			X	X		X	X		
		GW				3				X	X			X				

Chain of Custody Page ___ of ___

Pace
PEOPLE ADVANCING SCIENCE

MT JULIET, TN
12065 Lebanon Rd Mount Juliet, TN 37122
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SDG # L970809
G189

Acctnum: TERRCSCO
Template: T221836
Prelogin: P970809
PM: 824 - Chris Ward
PB:
Shipped Via: FedEX Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other

Remarks:

pH ___ Temp ___
Flow ___ Other ___

Samples returned via: ___ UPS ___ FedEx ___ Courier

Tracking # 6904 5462 1162

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
RAD Screen <0.5 mR/hr: Y N

Relinquished by: (Signature) John F. O'Kane
Date: 12-29-22 Time: 1800
Received by: (Signature)

Relinquished by: (Signature)
Date: Time:
Received by: (Signature)

Relinquished by: (Signature)
Date: Time:
Received for lab by: (Signature)

Trip Blank Received: Yes / No HCL / MeoH TBR

Temp: 6.1/6.2 °C Bottles Received: 14

Date: 12-30-22 Time: 0901

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

Company Name/Address:
Terracon - Colorado Springs, CO
4172 Center Park Drive
Colorado Springs, CO 80916

Billing Information:
Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Pres Chk

Report to:
Jared Geissler

Email To:
jared.geissler@terracon.com;rob.deal@terracon

Project Description:
Struthers Pond

City/State Collected:

Please Circle: PT (MT) CT ET

Phone: **719-572-7705**

Client Project #
23195091

Lab Project #
TERRCSCO-23195091

Collected by (print):
John F. O'Kane

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	V8260 40mlAmb-HCl												Remarks	Sample # (lab only)
PZ-1	G	GW		12-29-22	1202	13	X													-01
PZ1	G	GW		12-29-22	1202	3														-02
		GW				13	X													
		GW				3														

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
___ UPS ___ FedEx ___ Courier

Tracking # 6894 3167 1162

Relinquished by : (Signature)
Date: 12-29-22 Time: 1800
Received by: (Signature)

Relinquished by : (Signature)
Date: Time:
Received by: (Signature)

Relinquished by : (Signature)
Date: Time:
Received for lab by: (Signature)
Date: 12.30.22 Time: 0800

Trip Blank Received: Yes / No
HCl / MeoH
TBR

Temp: 4.1°C Bottles Received: 18
6:30-12

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N
RAD Screen <0.5 mR/hr: Y N

Chain of Custody Page ___ of ___

Pace
ANALYTICAL SCIENCE

MT JULIET, TN

12065 Lebanon Rd Mount Juliet, TN 37122
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SDG # L1531609

Table #

Acctnum: **TERRCSCO**

Template: **T221836**

Prelogin: **P970809**

PM: **824 - Chris Ward**

PB:

Shipped Via: **FedEX Ground**

ANALYTICAL REPORT

January 16, 2023

Terracon - Colorado Springs, CO

Sample Delivery Group:	L1571611
Samples Received:	12/30/2022
Project Number:	23195091
Description:	Struthers Pond

Report To: Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Entire Report Reviewed By: Chris Ward

Chris Ward
Project Manager

Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

TABLE OF CONTENTS

SAMPLE SUMMARY

PZ-1 L1571611-01 GW

Collected by: John F. O' Kane
Collected date/time: 12/29/22 12:02
Received date/time: 12/30/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Subcontracted Analyses	WG1981455	1	01/13/23 00:00	01/13/23 00:00	-	Baton Rouge, LA 70820

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris Ward
Project Manager

Project Narrative

L1571611-01 contains subout data that is included after the chain of custody.

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

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Abbreviations and Definitions

SDG	Sample Delivery Group.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
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Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
	The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

Company Name/Address:
Terracon - Colorado Springs, CO

4172 Center Park Drive
Colorado Springs, CO 80916

Billing Information:
Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Pres Chk

Report to: Jared Geissler

Email To: jared.geissler@terracon.com;rob.deal@terracon

Project Description: Struthers Pond

City/State Collected: Colorado Springs Colorado

Please Circle: PT (MT) CT ET

Phone: 719-572-7705

Client Project # 23195091

Lab Project # TERRCSCO-23195091

Collected by (print): John F. O'Kane

Site/Facility ID #

P.O. #

Collected by (signature): John F. O'Kane

Immediately Packed on ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day X Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed: Standard TAT

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	8270 100ml Amb NoPres	8270DIOXANELL 100ml Amb-NoPres	CR3 250mlHDPE-NoPres	CR3PD Pot. Diss. 250mlHDPE-NoPres	CR6IC Pot. Diss. 50mlTube/plungerPres	Diss Fe, Mn - FF 250mlHDPE-HNO3	Diss. CR6 50mlTube/plungerPres	Pot. Diss Metals 250mlHDPE-HNO3	SUBPFAS 250mlHDPE-NoPres	Total Metals 250mlHDPE-HNO3	Remarks	Sample # (lab only)
PZ-1	G	GW		12-29-22	1202	13	X	X	X			X	X		X	X		-01
PZ-1	G	GW		12-29-22	1208	3				X	X			X				
		GW				13	X	X	X			X	X		X	X		
		GW				3				X	X			X				

Chain of Custody Page ___ of ___

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12065 Lebanon Rd Mount Juliet, TN 37122
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SDG # L971601
G189

Acctnum: TERRCSCO
Template: T221836
Prelogin: P970809
PM: 824 - Chris Ward
PB:
Shipped Via: FedEX Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking # 4094 5482 1162

Sample Receipt Checklist
COC Seal Present/Intact: __ NP __ Y __ N
COC Signed/Accurate: __ Y __ N
Bottles arrive intact: __ Y __ N
Correct bottles used: __ Y __ N
Sufficient volume sent: __ Y __ N
If Applicable
VOA Zero Headspace: __ Y __ N
Preservation Correct/Checked: __ Y __ N
RAD Screen <0.5 mR/hr: __ Y __ N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
John F. O'Kane	12-29-22	1800			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp 2.9 °C Bottles Received: 14	If preservation required by Login: Date/Time
				5-10-23	
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 12-30-22	Time: 0900	Hold:	Condition: NCF / OK

Company Name/Address:
Terracon - Colorado Springs, CO

4172 Center Park Drive
Colorado Springs, CO 80916

Billing Information:
Jared Geissler
4172 Center Park Drive
Colorado Springs, CO 80916

Pres Chk

Report to:
Jared Geissler

Email To:
jared.geissler@terracon.com;rob.deal@terracon

Project Description:
Struthers Pond

City/State Collected:

Please Circle: PT (MT) CT ET

Phone: 719-572-7705

Client Project #
23195091

Lab Project #
TERRCSCO-23195091

Collected by (print):
John F. O'Kane

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	V8260 40mlAmb-HCl										Remarks	Sample # (lab only)
PZ-1	G	GW		12-29-22	1203	13	X											-01
PZ1	G	GW		12-29-22	1208	3												
		GW				13	X											
		GW				3												

Chain of Custody Page ___ of ___

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12065 Lebanon Rd Mount Juliet, TN 37122
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SDG # L1611e1

Table #

Acctnum: TERRCSCO

Template: T221836

Prelogin: P970809

PM: 824 - Chris Ward

PB:

Shipped Via: FedEX Ground

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
___ UPS ___ FedEx ___ Courier _____

Tracking # 6094 5467 1162

Sample Receipt Checklist
COC Seal Present/Intact: ___NP ___Y ___N
COC Signed/Accurate: ___Y ___N
Bottles arrive intact: ___Y ___N
Correct bottles used: ___Y ___N
Sufficient volume sent: ___Y ___N
If Applicable
VOA Zero Headspace: ___Y ___N
Preservation Correct/Checked: ___Y ___N
RAD Screen <0.5 mR/hr: ___Y ___N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCl / MeoH TBR	If preservation required by Login: Date/Time
	12-29-22	1800			
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 4.1 °C Bottles Received: 13+0=13 16	
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 12-30-22 Time: 0820	Hold: / Condition: NCF / OK

Report of Analysis

Pace Analytical LLC
12065 Lebanon Rd.
Mt. Juliet, TN 37122
Attention: Jimmy Huckaba

Project Name: L1571611

Project Number: WG1981455

Lot Number:**YA04033**

Date Completed:01/11/2023

01/12/2023 6:55 PM
Approved and released by:
Project Coordinator 1: **Jenna S. Holliday**

Case Narrative
Pace Analytical LLC
Lot Number: YA04033

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report. Where sampling is conducted by the client, results relate to the accuracy of the information provided, and as the samples are received.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

Pace is a TNI accredited laboratory; however, the following analyses are currently not listed on our TNI scope of accreditation: Drinking Water: VOC (excluding BTEX, MTBE, Naphthalene, & 1,2-dichloroethane) EPA 524.2, E. coli and Total coliforms SM 9223 B-2004, Solid Chemical Material: TOC Walkley-Black, Biological Tissue: All, Non-Potable Water: SGT-HEM EPA 1664B, Silica EPA 200.7, Boron, Calcium, Silicon, Strontium EPA 200.8, Bicarbonate, Carbonate, and Hydroxide Alkalinity SM 2320 B-2011, SM 9221 C E-2006 & SM 9222D-2006, Strontium SW-846 6010D, VOC SM 6200 B-2011, Fecal Coliform Colilert-18.

If you have any questions regarding this report, please contact the Pace Project Manager listed on the cover page.

PFAS Analysis
Sample YA04033-001 was collected in client provided HDPE bottles. While this is method compliant, the sample bottles were not provided by the laboratory.

Sample Summary
Pace Analytical LLC
Lot Number: YA04033

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	PZ-1	Aqueous	12/29/2022 1202	01/04/2023

(1 sample)

Detection Summary
Pace Analytical LLC
Lot Number: YA04033

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	PZ-1	Aqueous	PFBS	PFAS by ID	22		ng/L	5
001	PZ-1	Aqueous	PFPeS	PFAS by ID	0.68	J	ng/L	5
001	PZ-1	Aqueous	PFHxS	PFAS by ID	2.9	J	ng/L	5
001	PZ-1	Aqueous	PFBA	PFAS by ID	3.7	J	ng/L	5
001	PZ-1	Aqueous	PFHpA	PFAS by ID	0.80	J	ng/L	6
001	PZ-1	Aqueous	PFHxA	PFAS by ID	1.2	J	ng/L	6
001	PZ-1	Aqueous	PFOA	PFAS by ID	2.4	J	ng/L	6
001	PZ-1	Aqueous	PFPeA	PFAS by ID	1.5	J	ng/L	6
001	PZ-1	Aqueous	PFOS	PFAS by ID	3.7	J	ng/L	6

(9 detections)

PFAS by LC/MS/MS

Client: **Pace Analytical LLC** Laboratory ID: **YA04033-001**

Description: **PZ-1** Matrix: **Aqueous**

Date Sampled: **12/29/2022 1202**

Date Received: **01/04/2023**

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	01/06/2023 2334	BWS	01/05/2023 1937	64256

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		7.9	0.48	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		7.9	0.66	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		7.9	1.6	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		7.9	2.0	ng/L	1
1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2 FTS)	120226-60-0	PFAS by ID SOP	ND		7.9	1.2	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		7.9	0.86	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		7.9	2.1	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		7.9	0.48	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	ND		7.9	1.3	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		7.9	0.74	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	ND		7.9	0.94	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	ND		16	1.2	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		7.9	0.92	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	ND		7.9	1.3	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	**375-73-5**	**PFAS by ID SOP**	**22**		**4.0**	**0.41**	**ng/L**	**1**
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		4.0	0.77	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		4.0	0.49	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		4.0	0.70	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		4.0	0.61	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	**2706-91-4**	**PFAS by ID SOP**	**0.68**	**J**	**4.0**	**0.59**	**ng/L**	**1**
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	ND		7.9	1.0	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	**355-46-4**	**PFAS by ID SOP**	**2.9**	**J**	**4.0**	**0.55**	**ng/L**	**1**
Perfluoro-n-butanoic acid (PFBA)	**375-22-4**	**PFAS by ID SOP**	**3.7**	**J**	**4.0**	**0.59**	**ng/L**	**1**
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		4.0	0.52	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		4.0	0.47	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	**375-85-9**	**PFAS by ID SOP**	**0.80**	**J**	**4.0**	**0.44**	**ng/L**	**1**
Perfluoro-n-hexadecanoic acid (PFHxDA)	67905-19-5	PFAS by ID SOP	ND		7.9	0.81	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	**307-24-4**	**PFAS by ID SOP**	**1.2**	**J**	**4.0**	**0.68**	**ng/L**	**1**
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		4.0	0.46	ng/L	1
Perfluoro-n-octadecanoic acid (PFODA)	16517-11-6	PFAS by ID SOP	ND		7.9	0.99	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	**335-67-1**	**PFAS by ID SOP**	**2.4**	**J**	**4.0**	**0.82**	**ng/L**	**1**
Perfluoro-n-pentanoic acid (PFPeA)	**2706-90-3**	**PFAS by ID SOP**	**1.5**	**J**	**4.0**	**0.54**	**ng/L**	**1**
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		4.0	0.59	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		4.0	0.52	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		4.0	0.62	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	**1763-23-1**	**PFAS by ID SOP**	**3.7**	**J**	**4.0**	**2.0**	**ng/L**	**1**

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		116	25-150
13C2_6:2FTS		95	25-150
13C2_8:2FTS		84	25-150
13C2_PFDoA		92	25-150
13C2_PFHxDA		119	25-150
13C2_PFTeDA		104	25-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
DL = Detection Limit
Q = Surrogate failure
ND = Not detected at or above the DL
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
J = Estimated result < LOQ and ≥ DL
L = LCS/LCSD failure
H = Out of holding time
W = Reported on wet weight basis
S = MS/MSD failure

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: **Pace Analytical LLC**
Laboratory ID: **YA04033-001**
Description: **PZ-1**
Matrix: **Aqueous**
Date Sampled: **12/29/2022 1202**
Date Received: **01/04/2023**

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C3_PFBS		98	25-150
13C3_PFHxS		102	25-150
13C3-HFPO-DA		91	25-150
13C4_PFBA		79	25-150
13C4_PFHpA		95	25-150
13C5_PFHxA		94	25-150
13C5_PFPeA		86	25-150
13C6_PFDA		91	25-150
13C7_PFUdA		88	25-150
13C8_PFOA		99	25-150
13C8_PFOS		94	25-150
13C8_PFOSA		81	10-150
13C9_PFNA		98	25-150
d-EtFOSA		79	10-150
d5-EtFOSAA		82	25-150
d9-EtFOSE		78	10-150
d-MeFOSA		79	10-150
d3-MeFOSAA		82	25-150
d7-MeFOSE		79	10-150

LOQ = Limit of Quantitation
ND = Not detected at or above the DL
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%
DL = Detection Limit
J = Estimated result < LOQ and ≥ DL
Q = Surrogate failure
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QC Summary

PFAS by LC/MS/MS - MB

Sample ID: YQ64256-001
Batch: 64256
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 01/05/2023 1937

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
9Cl-PF3ONS	ND		1	8.0	0.48	ng/L	01/06/2023 1919
11Cl-PF3OUdS	ND		1	8.0	0.66	ng/L	01/06/2023 1919
8:2 FTS	ND		1	8.0	1.6	ng/L	01/06/2023 1919
6:2 FTS	ND		1	8.0	2.0	ng/L	01/06/2023 1919
10:2 FTS	ND		1	8.0	1.2	ng/L	01/06/2023 1919
4:2 FTS	ND		1	8.0	0.87	ng/L	01/06/2023 1919
GenX	ND		1	8.0	2.1	ng/L	01/06/2023 1919
ADONA	ND		1	8.0	0.48	ng/L	01/06/2023 1919
EtFOSA	ND		1	8.0	1.4	ng/L	01/06/2023 1919
EtFOSAA	ND		1	8.0	0.75	ng/L	01/06/2023 1919
EtFOSE	ND		1	8.0	0.95	ng/L	01/06/2023 1919
MeFOSA	ND		1	16	1.3	ng/L	01/06/2023 1919
MeFOSAA	ND		1	8.0	0.93	ng/L	01/06/2023 1919
MeFOSE	ND		1	8.0	1.3	ng/L	01/06/2023 1919
PFBS	ND		1	4.0	0.41	ng/L	01/06/2023 1919
PFDS	ND		1	4.0	0.78	ng/L	01/06/2023 1919
PFHpS	ND		1	4.0	0.50	ng/L	01/06/2023 1919
PFNS	ND		1	4.0	0.71	ng/L	01/06/2023 1919
PFOSA	ND		1	4.0	0.61	ng/L	01/06/2023 1919
PFPeS	ND		1	4.0	0.59	ng/L	01/06/2023 1919
PFDOS	ND		1	8.0	1.0	ng/L	01/06/2023 1919
PFHxS	ND		1	4.0	0.55	ng/L	01/06/2023 1919
PFBA	ND		1	4.0	0.60	ng/L	01/06/2023 1919
PFDA	ND		1	4.0	0.52	ng/L	01/06/2023 1919
PFDoA	ND		1	4.0	0.47	ng/L	01/06/2023 1919
PFHpA	ND		1	4.0	0.45	ng/L	01/06/2023 1919
PFHxDA	ND		1	8.0	0.82	ng/L	01/06/2023 1919
PFHxA	ND		1	4.0	0.69	ng/L	01/06/2023 1919
PFNA	ND		1	4.0	0.46	ng/L	01/06/2023 1919
PFODA	ND		1	8.0	1.0	ng/L	01/06/2023 1919
PFOA	ND		1	4.0	0.83	ng/L	01/06/2023 1919
PFPeA	ND		1	4.0	0.54	ng/L	01/06/2023 1919
PFTeDA	ND		1	4.0	0.60	ng/L	01/06/2023 1919
PFTrDA	ND		1	4.0	0.53	ng/L	01/06/2023 1919
PFUdA	ND		1	4.0	0.63	ng/L	01/06/2023 1919
PFOS	ND		1	4.0	2.0	ng/L	01/06/2023 1919

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		95	25-150
13C2_6:2FTS		91	25-150
13C2_8:2FTS		92	25-150
13C2_PFDoA		88	25-150
13C2_PFHxDA		89	25-150

LOQ = Limit of Quantitation
DL = Detection Limit
ND = Not detected at or above the DL
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: YQ64256-001
Batch: 64256
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 01/05/2023 1937

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		87	25-150
13C3_PFBS		95	25-150
13C3_PFHxS		98	25-150
13C3-HFPO-DA		97	25-150
13C4_PFBA		92	25-150
13C4_PFHpA		96	25-150
13C5_PFHxA		96	25-150
13C5_PFPeA		98	25-150
13C6_PFDA		96	25-150
13C7_PFUdA		91	25-150
13C8_PFOA		97	25-150
13C8_PFOS		90	25-150
13C8_PFOSA		90	10-150
13C9_PFNA		96	25-150
d-EtFOSA		77	10-150
d5-EtFOSAA		87	25-150
d9-EtFOSE		75	10-150
d-MeFOSA		75	10-150
d3-MeFOSAA		90	25-150
d7-MeFOSE		79	10-150

LOQ = Limit of Quantitation
DL = Detection Limit
ND = Not detected at or above the DL
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: YQ64256-002
Batch: 64256
Analytical Method: PFAS by ID SOP
Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 01/05/2023 1937

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
9Cl-PF3ONS	15	16		1	109	50-150	01/06/2023 1932
11Cl-PF3OUdS	15	13		1	86	50-150	01/06/2023 1932
8:2 FTS	15	17		1	113	50-150	01/06/2023 1932
6:2 FTS	15	17		1	112	50-150	01/06/2023 1932
10:2 FTS	15	13		1	84	50-150	01/06/2023 1932
4:2 FTS	15	18		1	118	50-150	01/06/2023 1932
GenX	32	37		1	115	50-150	01/06/2023 1932
ADONA	15	17		1	112	50-150	01/06/2023 1932
EtFOSA	16	17		1	107	50-150	01/06/2023 1932
EtFOSAA	16	19		1	122	50-150	01/06/2023 1932
EtFOSE	16	18		1	113	50-150	01/06/2023 1932
MeFOSA	16	17		1	106	50-150	01/06/2023 1932
MeFOSAA	16	20		1	124	50-150	01/06/2023 1932
MeFOSE	16	17		1	104	50-150	01/06/2023 1932
PFBS	14	16		1	112	50-150	01/06/2023 1932
PFDS	15	14		1	89	50-150	01/06/2023 1932
PFHpS	15	17		1	111	50-150	01/06/2023 1932
PFNS	15	16		1	102	50-150	01/06/2023 1932
PFOSA	16	19		1	119	50-150	01/06/2023 1932
PFPeS	15	17		1	115	50-150	01/06/2023 1932
PFDOS	15	11		1	72	50-150	01/06/2023 1932
PFHxS	15	16		1	110	50-150	01/06/2023 1932
PFBA	16	18		1	113	50-150	01/06/2023 1932
PFDA	16	18		1	113	50-150	01/06/2023 1932
PFDoA	16	19		1	117	50-150	01/06/2023 1932
PFHpA	16	18		1	113	50-150	01/06/2023 1932
PFHxDA	16	20		1	122	50-150	01/06/2023 1932
PFHxA	16	18		1	112	50-150	01/06/2023 1932
PFNA	16	18		1	111	50-150	01/06/2023 1932
PFODA	16	18		1	111	50-150	01/06/2023 1932
PFOA	16	17		1	109	50-150	01/06/2023 1932
PFPeA	16	18		1	113	50-150	01/06/2023 1932
PFTeDA	16	18		1	111	50-150	01/06/2023 1932
PFTrDA	16	18		1	110	50-150	01/06/2023 1932
PFUdA	16	18		1	114	50-150	01/06/2023 1932
PFOS	15	16		1	108	50-150	01/06/2023 1932

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		79	25-150
13C2_6:2FTS		84	25-150
13C2_8:2FTS		83	25-150
13C2_PFDoA		68	25-150
13C2_PFHxDA		58	25-150

LOQ = Limit of Quantitation
DL = Detection Limit
ND = Not detected at or above the DL
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: YQ64256-002
Batch: 64256
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 01/05/2023 1937

Surrogate	Q	% Rec	Acceptance Limit
13C2_PFTeDA		66	25-150
13C3_PFBS		85	25-150
13C3_PFHxS		85	25-150
13C3-HFPO-DA		86	25-150
13C4_PFBA		84	25-150
13C4_PFHpA		85	25-150
13C5_PFHxA		83	25-150
13C5_PFPeA		86	25-150
13C6_PFDA		86	25-150
13C7_PFUdA		77	25-150
13C8_PFOA		90	25-150
13C8_PFOS		83	25-150
13C8_PFOSA		80	10-150
13C9_PFNA		86	25-150
d-EtFOSA		69	10-150
d5-EtFOSAA		70	25-150
d9-EtFOSE		68	10-150
d-MeFOSA		67	10-150
d3-MeFOSAA		74	25-150
d7-MeFOSE		70	10-150

LOQ = Limit of Quantitation
DL = Detection Limit
ND = Not detected at or above the DL
J = Estimated result < LOQ and ≥ DL
* = RSD is out of criteria
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Chain of Custody
and
Miscellaneous Documents

Sub-Contract Chain of Custody

Batch Date/Time: 12/06/22 11:37
Sub-Contract Lab: PACEBRLA
Address: 7979 Innovation Park Dr
City/State: Baton Rouge, LA 70820
Contact: RalfsWalsh@pacelabs.com
Owner Lab: PACEMTJL
Address: 11065 Lebanon Rd.
City/State: Mt. Juliet, TN 37122
Phone: (615) 773-6756
Fax: (615) 758-5859

WO: WC561403
Email: MTJLJobCoordTeam@pacelabs.com
Results Due Date: 01/05/23
ESC Purchase Order #: L1571611
Send Reports to: Angela Ford

Pace Analytical

13065 Lebanon Rd.
Mt. Juliet, TN 37122
Phone: (615) 773-6756
Fax: (615) 758-5859

Sample ID / Container ID	Matrix	State	Collect Date	Description	Sample Number Lab Use Only	Sample Comments Lab Use Only
PZ-1						
56[illegible]400	SW	DO	12/2/22 12:52	PFAS Isotope Dilution - ID16	L1571611-01	
56[illegible]401						

** = Container used for multiple Samples and/or Analyses

Relinquished by: _____ Date: 12/5/2022

Received by: _____ Date: _____

Relinquished by: FEDEX Date: 01/04/23

Received by: [illegible] Date: 01/04/23

YA04033

DCN_Title: ENV-FRM-WCOL-0260 v02_Samples Receipt Checklist (SRC)
Effective Date: 6/2/2022

Sample Receipt Checklist (SRC)

Client: PACE Cooler Inspected by/date: BRB / 6/30/23 Lot #: YA60015

Means of receipt: ☐ Pace ☐ Client ☐ UPS ☑ FedEx ☐ Other:

☐ Yes	☑ No		1. Were custody seals present on the cooler?
☐ Yes	☐ No	☑ NA	2. If custody seals were present, were they intact and unbroken?

pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA

Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Samp-Cup ID: NA

2.7 / 2.7 °C NA / NA °C NA / NA °C NA / NA °C

Method: ☑ Temperature Blank ☐ Moisture Bottles IR Gun ID: 8 IR Gun Correction Factor: 0 °C

Method of coolant: ☑ Wet Ice ☐ Ice Packs ☐ Dry Ice ☐ None

☑ Yes	☐ No	☐ NA	3. Were all coolers received at or below 6.0°C? If no, was Project Manager notified? PM was Notified by: phone / email / face-to-face (circle one).
☑ Yes	☐ No	☐ NA	4. Is the commercial courier's packing slip attached to this form?
☑ Yes	☐ No		5. Were proper custody procedures (relinquished/received) followed?
☑ Yes	☐ No		6. Were sample IDs listed on the COC and all sample containers?
☑ Yes	☐ No		7. Was collection date & time listed on the COC and all sample containers?
☑ Yes	☐ No		8. Did all container label information (ID, date, time) agree with the COC?
☑ Yes	☐ No		9. Were tests to be performed listed on the COC?
☑ Yes	☐ No		10. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
☑ Yes	☐ No		11. Was adequate sample volume available?
☑ Yes	☐ No		12. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
☑ Yes	☐ No		13. Were all samples containers accounted for? (No missing/excess)
☐ Yes	☐ No	☑ NA	14. Were VOA, 8015C and RSK-175 samples free of bubbles >"pea-size" (¼" or 6mm in diameter) in any of the VOA vials?
☐ Yes	☐ No	☑ NA	15. Were all DRO+metals/nutrient samples received at a pH of < 2?
☐ Yes	☐ No	☑ NA	16. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
☐ Yes	☐ No	☑ NA	17. Were all applicable NH_3/TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
☐ Yes	☑ No	☐ NA	18. Was the quote number listed on the container label? If yes, Quote #:

Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) NA were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H_2SO_4, HNO_3, HCl, NaOH using SR # NA / / ☐

Time of preservation: NA. If more than one preservative is needed, please note in the comments below.

Sample(s) NA were received with bubbles >6 mm in diameter.

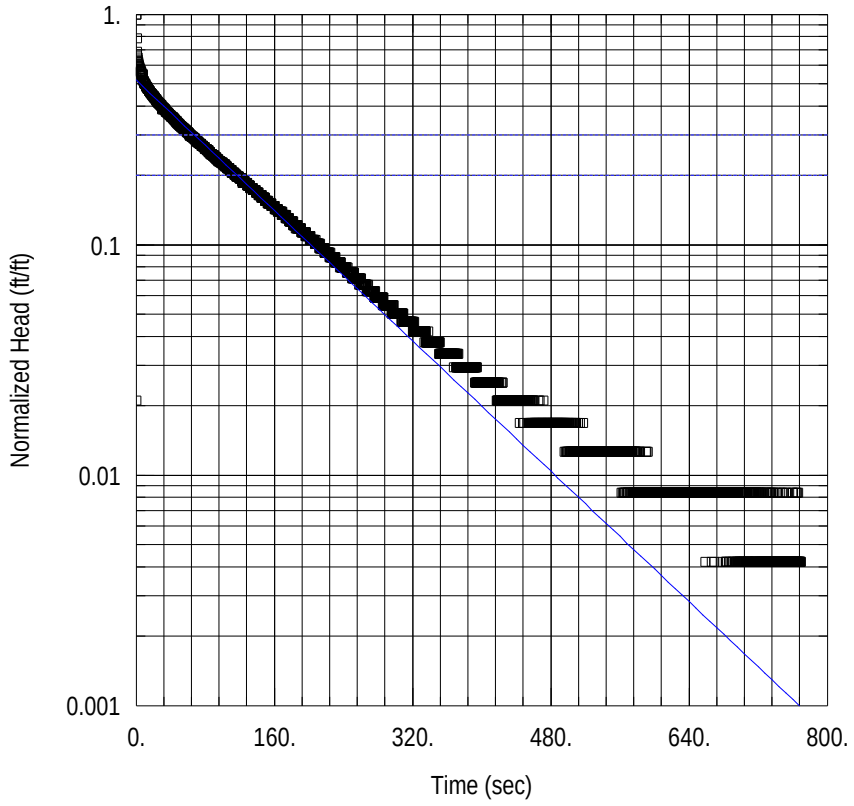
Sample(s) NA were received with TRC > 0.5 mg/L. (If 619 is **no**) and were adjusted accordingly in sample receiving with sodium thiosulfate ($Na_2S_2O_3$) with Unique ID: NA

Comments:

Qualtrax ID: 56360 Pace® Analytical Services, LLC Page 1 of 1

Appendix D

HYDRAULIC CONDUCTIVITY DATA AND ANALYSIS



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-4-RH2.aqt
Date: 07/10/23 Time: 11:59:34

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

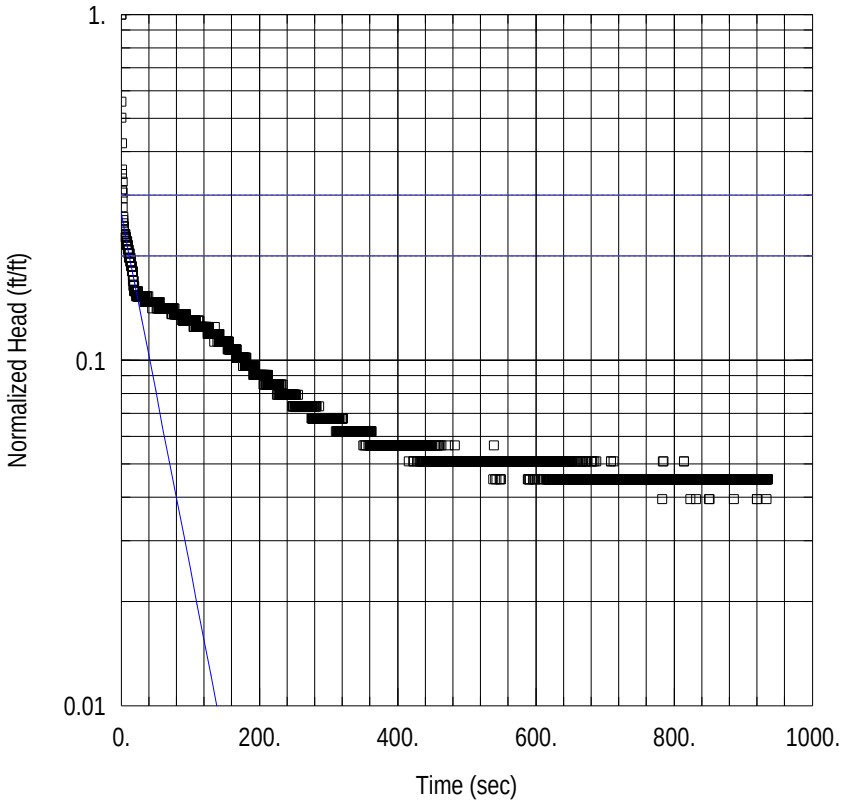
Saturated Thickness: 14.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-4)

Initial Displacement: 2.38 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.083 ft
Static Water Column Height: 10.9 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0004609 cm/sec
y0 = 1.234 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-11-FH2.aqt
Date: 07/10/23 Time: 12:22:52

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 0.1

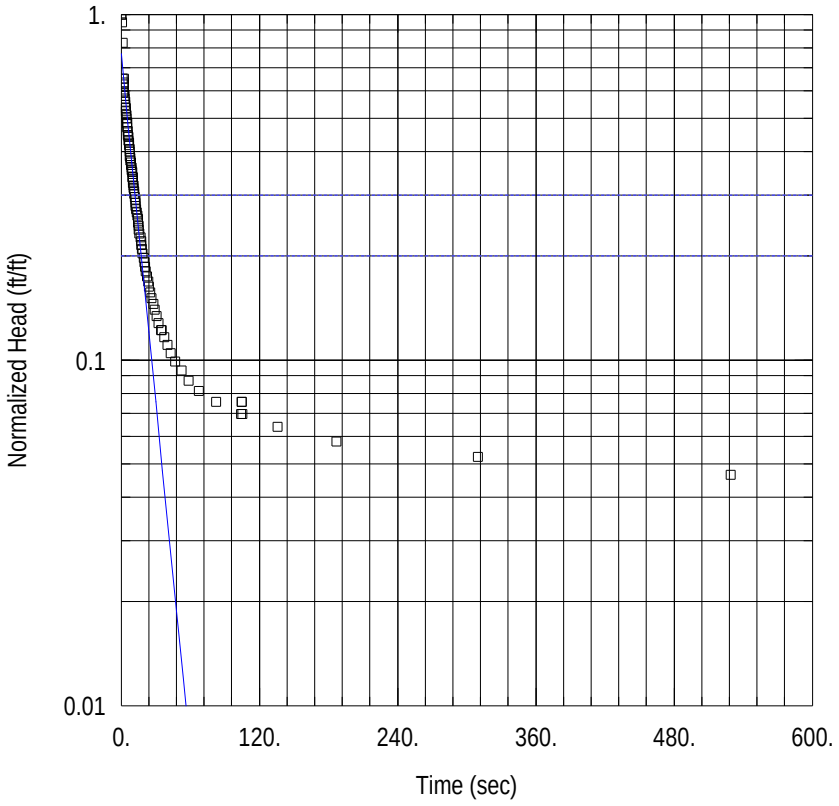
WELL DATA (PZ-1)

Initial Displacement: 1.77 ft Static Water Column Height: 15.59 ft
Total Well Penetration Depth: 25. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.001064 cm/sec y0 = 0.4705 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-11-FH1.aqt
Date: 07/10/23 Time: 12:22:19

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

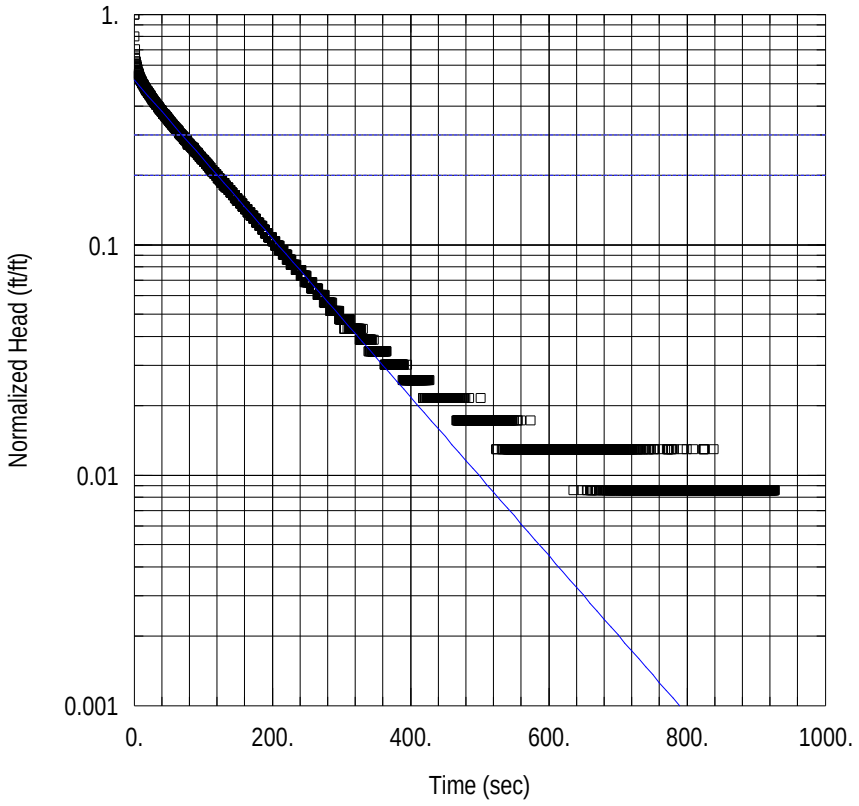
WELL DATA (PZ-1)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 24.62 ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.44 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004361 cm/sec y0 = 1.321 ft



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-4-RH3.aqt
Date: 07/10/23 Time: 12:14:26

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

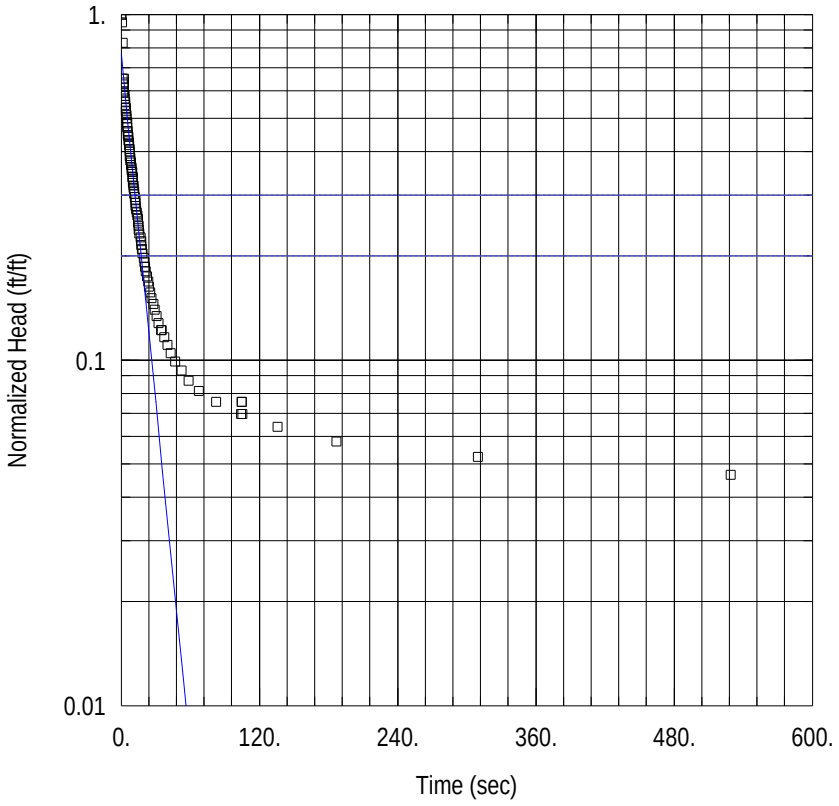
Saturated Thickness: 14.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-4)

Initial Displacement: 2.32 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.083 ft
Static Water Column Height: 10.89 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0004486 cm/sec
y0 = 1.206 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-2-FH1B.aqt
Date: 07/10/23 Time: 12:13:52

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 12. ft Anisotropy Ratio (Kz/Kr): 0.1

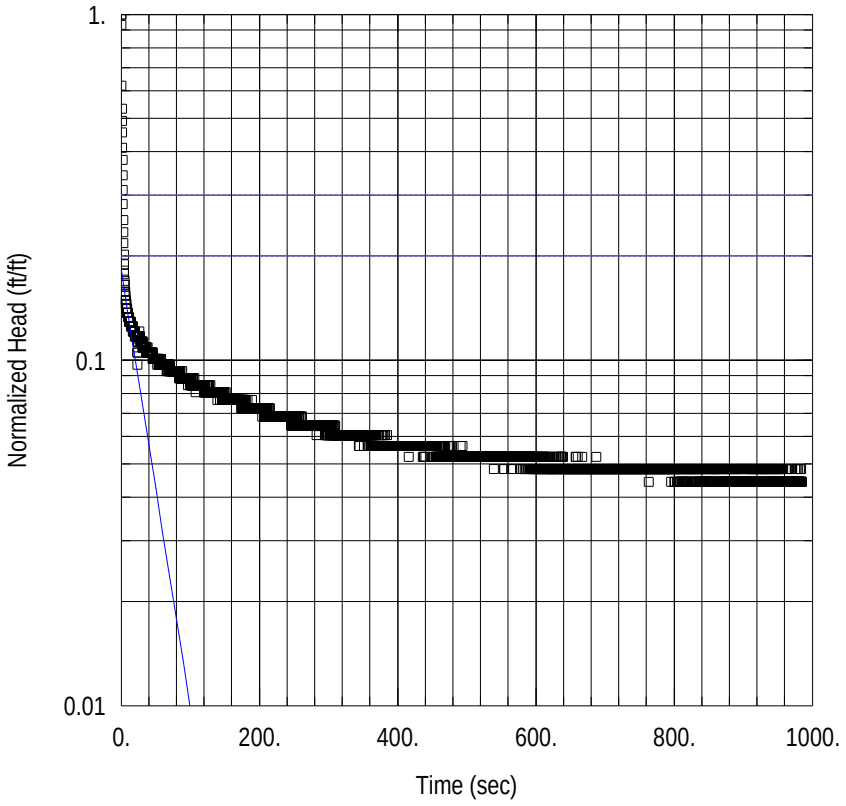
WELL DATA (PZ-2)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 24.62 ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.44 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004361 cm/sec y0 = 1.321 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-11-RH2.aqt
Date: 07/10/23 Time: 12:07:34

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 0.1

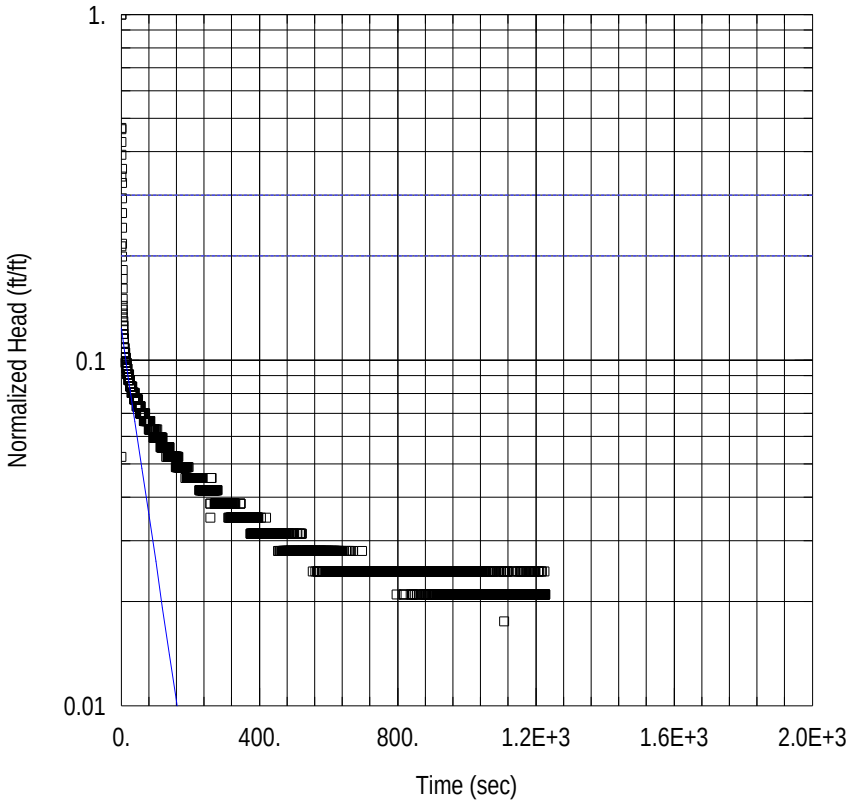
WELL DATA (PZ-1)

Initial Displacement: 2.48 ft Static Water Column Height: 15.47 ft
Total Well Penetration Depth: 25. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.001305 cm/sec y0 = 0.4514 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-11-RH3.aqt
Date: 07/10/23 Time: 12:06:57

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 10. ft Anisotropy Ratio (Kz/Kr): 0.1

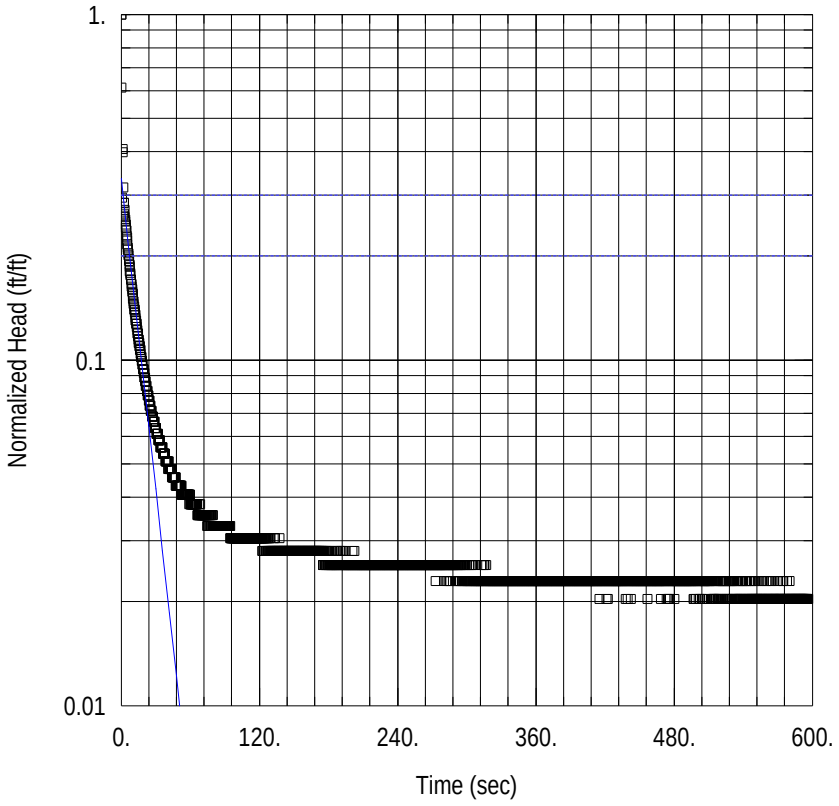
WELL DATA (PZ-1)

Initial Displacement: 2.86 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.083 ft
Static Water Column Height: 15.49 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0006964 cm/sec y0 = 0.3526 ft



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-2FH4.aqt
Date: 07/10/23 Time: 12:06:27

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

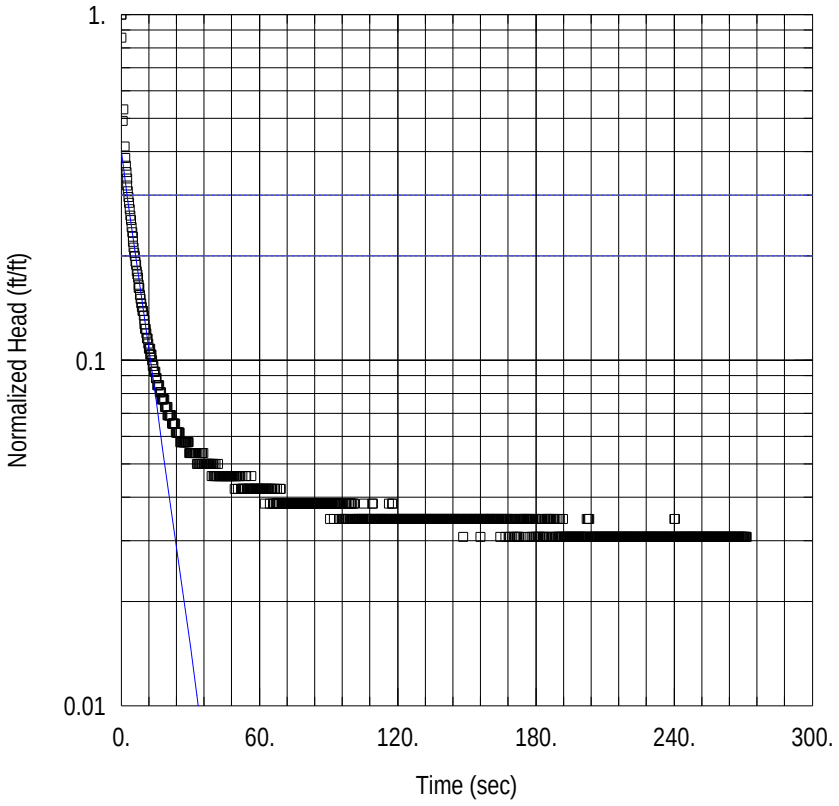
Saturated Thickness: 14.62 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-2)

Initial Displacement: 3.93 ft
Static Water Column Height: 7.43 ft
Total Well Penetration Depth: 22. ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003839 cm/sec
y0 = 1.315 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-2-RH1B.aqt
Date: 07/10/23 Time: 12:06:02

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 14.62 ft Anisotropy Ratio (Kz/Kr): 0.1

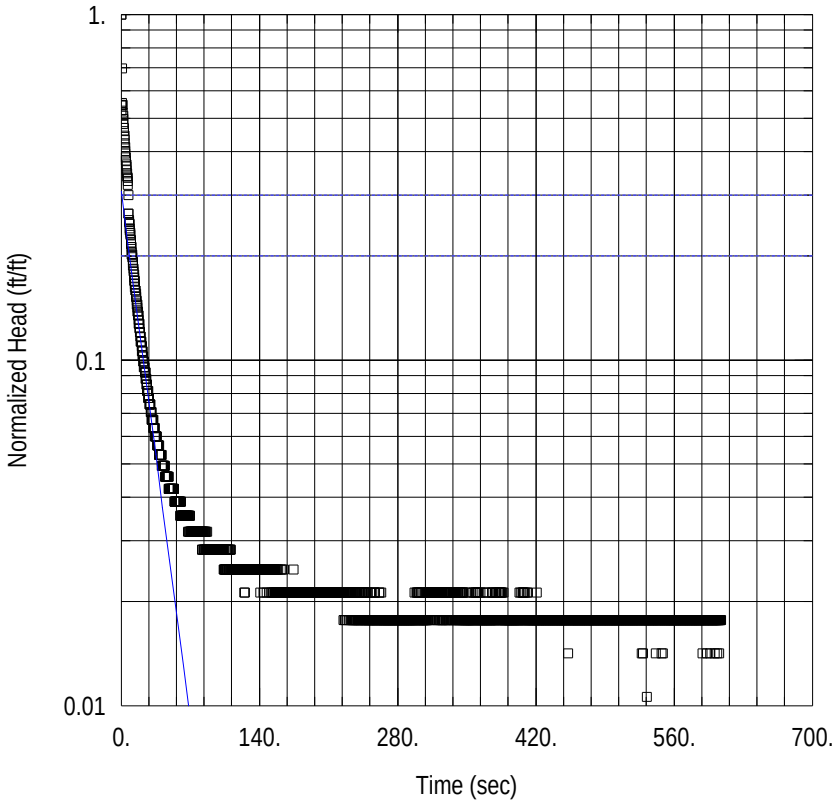
WELL DATA (PZ-2)

Initial Displacement: 2.6 ft
Total Well Penetration Depth: 22. ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.33 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.006122 cm/sec y0 = 1.045 ft



WELL TEST ANALYSIS

Data Set: C:\...\PZ-2-RH2B.aqt
Date: 07/10/23 Time: 12:05:36

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 14.62 ft Anisotropy Ratio (Kz/Kr): 0.1

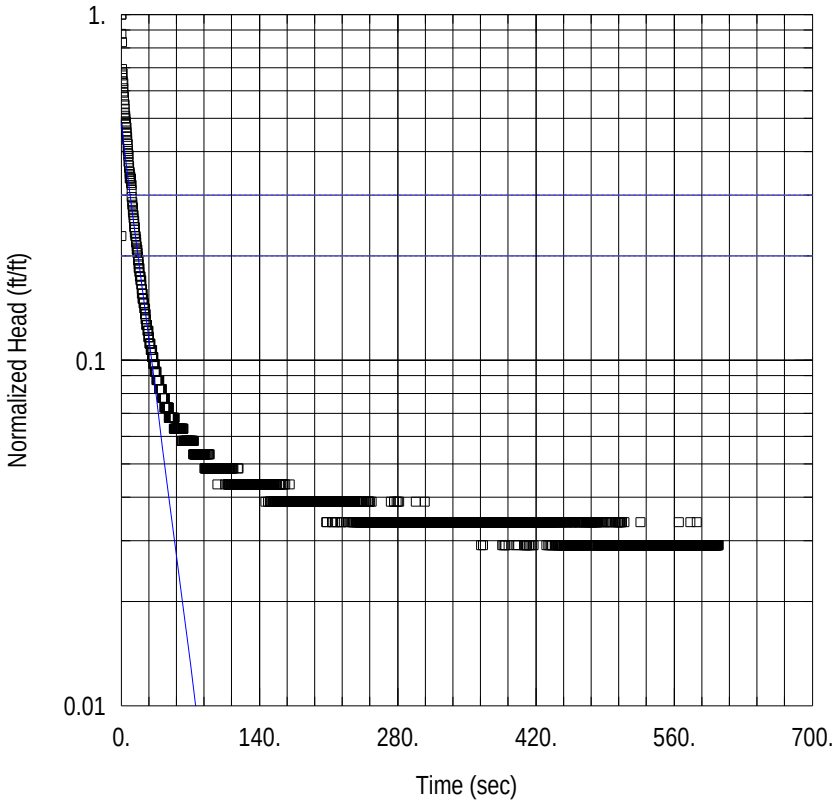
WELL DATA (PZ-2)

Initial Displacement: 2.83 ft Static Water Column Height: 7.37 ft
Total Well Penetration Depth: 22. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00279 cm/sec y0 = 0.8698 ft



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-2-RH3.aqt
Date: 07/10/23 Time: 12:04:13

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

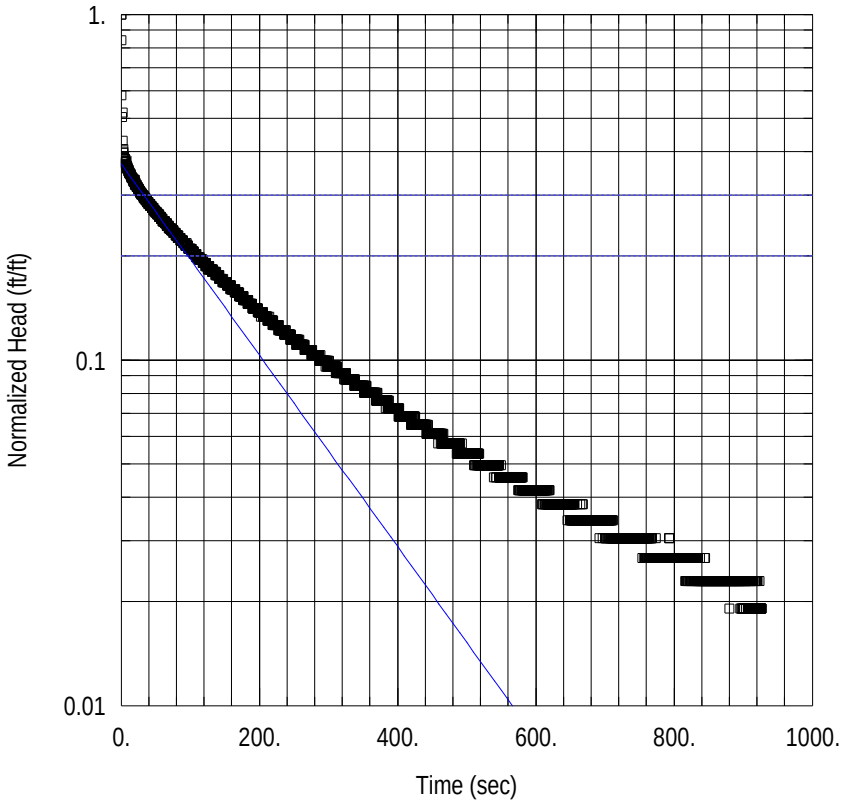
Saturated Thickness: 14.62 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-2)

Initial Displacement: 2.06 ft
Total Well Penetration Depth: 22. ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.38 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.002864 cm/sec
y0 = 0.9972 ft



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-4-FH3.aqt
Date: 07/10/23 Time: 12:03:40

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

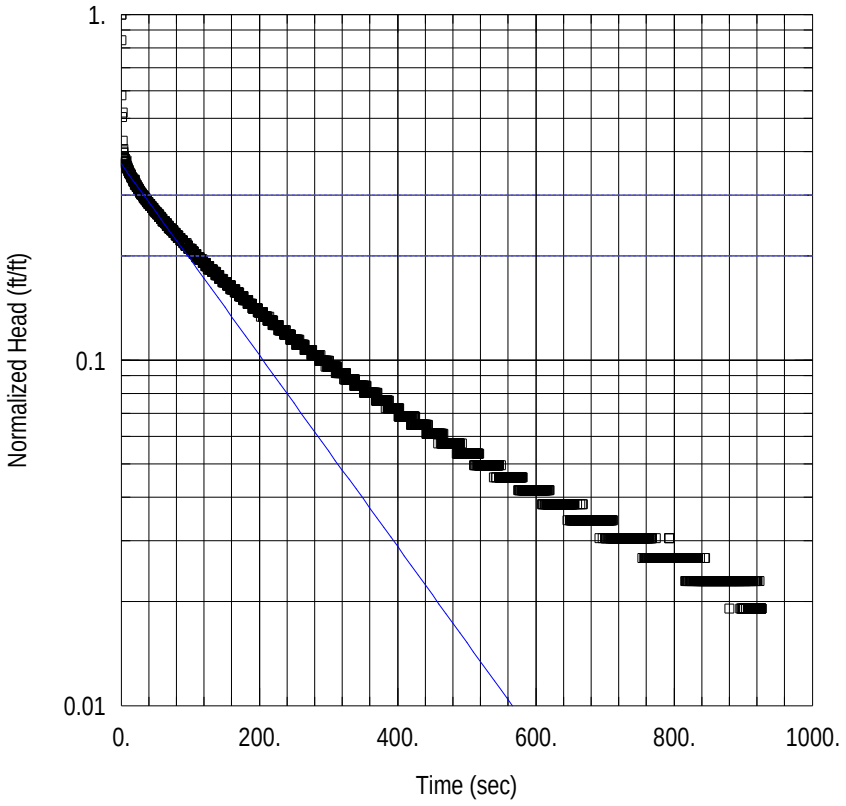
Saturated Thickness: 14.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-4)

Initial Displacement: 2.62 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.083 ft
Static Water Column Height: 10.93 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003609 cm/sec
y0 = 0.9685 ft



WELL TEST ANALYSIS

Data Set: C:\Users\sadixon\OneDrive - Terracon Consultants Inc\Desktop\StruthersPond\PZ-4-RH1.aqt
Date: 07/10/23 Time: 12:00:37

PROJECT INFORMATION

Company: Terracon Consultants, Inc
Client: Wilson and Co
Project: 23195091
Location: Colorado Springs, Colorado
Test Well: PZ-2
Test Date: December 28, 2023

AQUIFER DATA

Saturated Thickness: 14.12 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (PZ-4)

Initial Displacement: 2.62 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.083 ft
Static Water Column Height: 10.93 ft
Screen Length: 10. ft
Well Radius: 0.083 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003609 cm/sec
y0 = 0.9685 ft

WILSON &COMPANY
5755, Mark Dabling Blvd, Ste.100
Colorado Springs, CO 80919
719-520-5800 phone
719-520-0108 fax

APPENDIX E

CONSTRUCTION PLANS

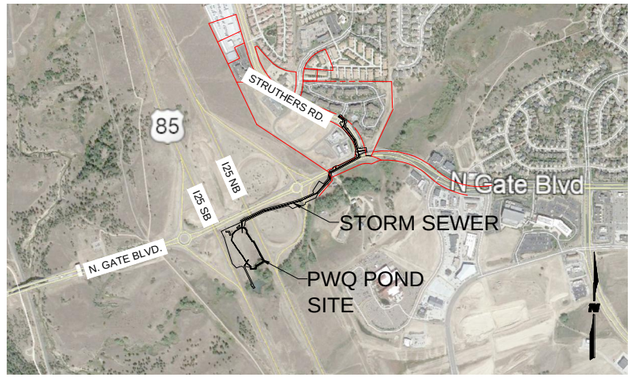
NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STRUTHERS RD AND NORTH GATE BLVD

CDOT PROJECT NO. C040-042 (21233)

FINAL PLANS

SHEET LIST TABLE		
SHEET NUMBER	SUBSET SHEET	SHEET TITLE
01	GN-1.01	COVER
02-03	GN-1.02.1	GENERAL NOTES
04	GN-1.03	CONTROL MAP
05	GN-1.04	HORIZONTAL CONTROL PLAN
06	GN-1.05	SUMMARY OF APPROXIMATE QUANTITIES
07 - 11	DM-1.01 - DM-1.05	DEMOLITION PLANS
12 - 15	SD-1.01 - SD-1.04	STORM DRAIN PLAN AND PROFILES
16	SD-1.05	POND AND OUTLET PLAN AND PROFILE
17	GR-1.01	GRADING & LAYOUT PLAN
18	GR-1.02	GRADING POINT TABLES
19 - 28	SD 2.01 - SD- 2.10	DRAINAGE DETAILS
29 - 31	ST-2.01 - ST-2.03	OUTLET STRUCTURE DETAILS
32 - 35	RD-1.01 - RD-1.04	ROADWAY RECONSTRUCTION PLANS
36	EC-3.01	GEC COVER
37 - 40	EC-3.02 - EC-3.05	GEC AND SURFACING PLANS
41	EC-3.06	GEC NOTES
42 - 44	EC-3.07 - EC-3.09	GEC DETAILS
45	UGN-01	UTILITY CONTACTS, NOTES, LEGEND
46 - 47	UTH-01 - UTH-02	UTILITY TEST HOLE SUMMARY
48 - 52	UT-01 - UT-05	UTILITY PLAN
53	L1	LANDSCAPE COVER SHEET
54 - 55	L2 - L3	LANDSCAPE NOTES
56	L4	PLANT LIST AND DETAILS
57	L5	PLANTING PLAN - NORTH GATE BLVD. AND POND
58	L6	PLANTING PLAN - POND AND SMITH CREEK



VICINITY MAP

SCALE 1"=2000'

Design Engineer's Statement:

These detailed plans and specifications were prepared under my direction and supervision. Said plans and specifications have been prepared according to the criteria established by the County for detailed roadway, drainage, grading and erosion control plans and specifications, and said plans and specifications are in conformity with applicable master drainage plans and master transportation plans. Said plans and specifications meet the purposes for which the particular roadway and drainage facilities are designed and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of these detailed plans and specifications.

Vancel Fossinger, P.E. 11/12/2024

Engineer of Record Date

COLORADO REGISTERED VANCEL S FOSSINGER 31972 11/12/24 PROFESSIONAL ENGINEER

El Paso County:

County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document.

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2, and Engineering Criteria Manual as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years, the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Directors discretion.

County Engineer / ECM Administrator Date

Print Date: November 12, 2024
File Name: 1.01 GEN - COVER.DWG
Horiz. Scale: Vert. Scale:
Unit Information Unit Leader

Sheet Revisions

Date:	Comments	Init.

Know what's below. Call before you dig.

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 100
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

As Constructed

No Revisions:

Revised:

Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

COVER

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GENERAL	Subset Sheets:	GN-1.01

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

01 OF 58

11/12/2024 C:\Users\mgarcia\AppData\Local\Bentley\ProjectWise\wc1_projects\d039883621.01 GEN - COVER.dwg

GENERAL NOTES

1. THIS PROJECT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (2023) REFERRED TO AS THE STANDARD SPECIFICATIONS, EXCEPT WHERE OTHERWISE NOTED IN THE PROJECT PLANS AND THE PROJECT SPECIAL PROVISIONS.
2. THE CONTRACTOR SHALL HAVE A COPY OF ALL APPLICABLE STANDARDS ON SITE FOR THE DURATION OF THE PROJECT.
3. THE CONTRACTOR SHALL ACQUIRE ALL PERMITS AND INSPECTIONS NECESSARY TO COMPLETE THE WORK PRESENTED HEREIN.
4. "THE ENGINEER" SHALL MEAN THE COUNTY ENGINEER OF EL PASO COUNTY OR THEIR DESIGNATED REPRESENTATIVE. THE ENGINEER SHALL BE NOTIFIED 48 HOURS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
5. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL CONSTRUCTION EASEMENTS WITH THE COUNTY.
6. THE CONTRACTOR SHALL LIMIT CONSTRUCTION ACTIVITIES TO THOSE AREAS WITHIN THE LIMITS OF DISTURBANCE AS SHOWN ON THE PLANS. ANY DISTURBANCE BEYOND THESE LIMITS SHALL BE RESTORED TO ORIGINAL CONDITIONS AT THE CONTRACTORS EXPENSE. CONSTRUCTION ACTIVITIES, IN ADDITION TO NORMAL CONSTRUCTION PROCEDURES, SHALL INCLUDE PARKING OF VEHICLES OR EQUIPMENT, DISPOSAL OF LITTER AND ANY OTHER ACTION WHICH WOULD ALTER EXISTING CONDITIONS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A SITE-SPECIFIC STAGING PLAN FOR ACCESS TO THE WORK AREAS AND FIELD FACILITIES TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO BEGINNING CONSTRUCTION. ALL COSTS ASSOCIATED WITH THE CONSTRUCTION OF TEMPORARY INGRESS/EGRESS WILL NOT BE PAID FOR SEPARATELY. EARTHWORK, DRAINAGE, AND OTHER ITEMS RELATED TO THE ACCESS SHALL BE SUBSIDIARY TO THE WORK INCLUDING EROSION CONTROL MEASURE FOR RESTORATION OF THE SITE TO ORIGINAL CONDITIONS.
8. PROJECT SUPERINTENDENT SHALL BE AVAILABLE ON A 24 HOURS/7 DAYS PERIOD AND CREW WILL RESPOND WITHIN 4 HOURS OF CONTACT.

PROJECT ACTIVITY NOTES

9. ALL QUANTITIES ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK NECESSARY TO COMPLETE THE CONSTRUCTION SHOWN IN THESE PLANS.
10. ALL MATERIAL AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE COUNTY'S REPRESENTATIVE.
11. ALL WORK SHALL BE DONE TO THE LINES, GRADES, SECTIONS, AND ELEVATIONS SHOWN ON THE PLANS UNLESS OTHERWISE NOTED OR APPROVED BY THE ENGINEER.
12. LIMITS OF REMOVAL ITEMS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THEIR REMOVAL. IF DISCREPANCIES ARISE BETWEEN THE DEMOLITION AND THE NEW WORK, THE CONTRACTOR SHALL NOTIFY THE ENGINEER PRIOR TO DISTURBANCE.
13. ALL EXCESS MATERIAL REMOVED FROM THE PROJECT NOT DESIGNATED IN THE CONTRACT SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE DISPOSED OF PROPERLY.
14. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ANY TEMPORARY EXCAVATION SUPPORT AS REQUIRED. EXCAVATION SHORING SHALL COMPLY WITH OSHA STANDARDS. COST FOR SHORING WILL BE INCIDENTAL TO THE WORK AND WILL NOT BE PAID FOR SEPARATELY.

SURVEY NOTES

15. STATIONS AND OFFSETS SHOWN REFERENCE THE CENTERLINE FOR THE PRIMARY DRAINAGE CONVEYANCE FACILITIES. ELEVATIONS SHOWN ARE TO FINISHED GRADE OF PAVEMENT UNLESS OTHERWISE NOTED.
16. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EASEMENTS AND RIGHT-OF-WAYS PRIOR TO CONSTRUCTION.
17. THE CONTRACTOR SHALL CAREFULLY PRESERVE ALL MONUMENTS, BENCHMARKS, RANGE TIES, PROPERTY MARKERS, REFERENCE POINTS AND STAKES. IN CASE OF HIS DESTRUCTION OF THESE, THE CONTRACTOR WILL BE RESPONSIBLE FOR RESETTING SAME, AT NO COST TO THE OWNER, AND SHALL BE RESPONSIBLE FOR ANY LOSS OF TIME THAT MAY BE CAUSED.
18. ALL SURVEYING NECESSARY TO COMPLETE THE PROJECT WILL BE PAID FOR UNDER 1 LS CONSTRUCTION SURVEYING ITEM 625-00000.

TRAFFIC CONTROL NOTES

19. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION, REMOVAL, AND MAINTENANCE OF ALL NEW, EXISTING, AND TEMPORARY TRAFFIC CONTROL DEVICES LOCATED WITHIN THE PROJECT LIMITS FOR THE DURATION OF THE PROJECT, PER THE PROJECT PLANS AND AS DIRECTED BY THE ENGINEER. THE DURATION OF THE PROJECT BEGINS FROM THE ISSUANCE OF THE NOTICE TO PROCEED UNTIL FINAL ACCEPTANCE OF THE PROJECT.
20. EXISTING SIGNS IN CONFLICT WITH THE TEMPORARY CONDITIONS SHALL BE COVERED OR RESET AS NEEDED FOR EACH CONSTRUCTION PHASE AND AS DIRECTED BY THE ENGINEER. MASKING OF EXISTING SIGNS, INCLUDING THE COVERING MATERIALS AND FASTENING DEVICES, WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF THE WORK.
21. THE CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL SIGNAL OPERATIONAL EXPERTISE, MATERIALS, EQUIPMENT, AND STAFF, AS NECESSARY, TO IMPLEMENT AND MAINTAIN SIGNAL OPERATIONAL CHANGES FOR THE MODIFIED TRAFFIC SIGNALS LOCATED WITHIN THE PROJECT LIMITS IN ACCORDANCE WITH CONSTRUCTION ZONE TRAFFIC CONTROL PHASING, PROJECT PLANS, AND AS DIRECTED BY THE ENGINEER.
22. TEMPORARY PAVEMENT MARKINGS SHALL BE REMOVED BY WATERBLASTING OR OTHER COUNTY-APPROVED METHOD IN SUCH A MANNER AS TO CAUSE AS LITTLE DAMAGE AS POSSIBLE TO THE SURFACE TEXTURE OF THE PAVEMENT.
23. THE CONTRACTOR SHALL BEAR RESPONSIBILITY AND EXPENSE FOR MAINTAINING ADEQUATE DRAINAGE AND SAFE DRIVING CONDITIONS AT ALL TIMES. THIS WORK SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF RELATED WORK. SEE SWMP FOR DETAILS.
24. THE CONTRACTOR SHALL REFER TO THE PROJECT SPECIAL PROVISIONS "TRAFFIC CONTROL PLAN - GENERAL" FOR WORK HOUR AND LANE CLOSURE RESTRICTIONS. THE CONTRACTOR SHALL PERFORM ALL WORK INVOLVING LANE CLOSURES IN COMPLIANCE WITH THE SPECIFIED RESTRICTIONS.ALL SIGNAGE AND STRIPING SHALL FOLLOW THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) LATEST EDITION, AND ALL APPLICABLE CDOT M&S STANDARDS. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A METHOD OF HANDLING TRAFFIC (MHT) TO THE ENGINEER FOR APPROVAL FOR EACH PHASE OF WORK.
25. A PAVEMENT MARKING PLAN SHALL BE SUBMITTED BY THE CONTRACTOR PRIOR TO THE REMOVAL OF ANY EXISTING PAVEMENT MARKINGS, REMOVAL OF ASPHALT MAT, OR PCCP PAVING, PER SUBSECTION 627.03A OF THE STANDARD SPECIFICATIONS.
26. ALL STRIPING (TEMPORARY AND PERMANENT) SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL MAINTAIN FULL COMPLIANCE PAVEMENT MARKINGS ON OPEN ROADWAYS DURING ALL PHASES OF CONSTRUCTION. TEMPORARY PAVEMENT MARKINGS AND REMOVAL OF TEMPORARY PAVEMENT MARKING WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
27. THE CONTRACTOR SHALL FURNISH, INSTALL, AND MAINTAIN TEMPORARY TRAFFIC CONTROL DEVICES THROUGHOUT THE DURATION OF CONSTRUCTION IN CONFORMANCE WITH APPROVED MHT'S.
28. TEMPORARY OR PERMANENT STRIPING THAT DOES NOT MEET THE CONTRACT REQUIREMENTS OR PLACED WITH OVER SPRAY SHALL BE REMOVED AND REPLACED BY SANDBLASTING OR WATER BLASTING AT NO COST TO THE PROJECT. PAYMENT WILL NOT BE MADE FOR INFERIOR OR OVER SPRAYED STRIPING.
29. THE TRAFFIC CONTROL SUPERVISOR SHALL COORDINATE CONSTRUCTION ZONE TRAFFIC CONTROL ACTIVITIES WITH ALL APPROPRIATE OFFICIALS, INCLUDING BUT NOT LIMITED TO THE ENGINEER, EMERGENCY SERVICES, POSTMASTER, ETC.
30. THE CONTRACTOR SHALL MAINTAIN ACCESS THROUGH ALL EXISTING INTERSECTIONS ALL PROPERTIES IN THE PROJECT AREA AT ALL TIMES DURING CONSTRUCTION.

SIGNING NOTES:

31. GROUND MOUNTED SIGNS SHALL BE INSTALLED PER CDOT M&S STANDARDS.
32. THE CONTRACTOR SHALL INVENTORY ALL EXISTING SIGNS PRIOR TO CONSTRUCTION ACTIVITIES AND PROVIDE LIST TO THE ENGINEER.
33. SIGN LOCATIONS ARE TO BE APPROVED BY THE ENGINEER BEFORE BEING PLACED.

COLORADO REGISTERED VANCE L S FOSSINGER 31972 PROFESSIONAL ENGINEER
11/12/24
Vance Fossinger

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11/12/2024

Print Date: November 12, 2024	Sheet Revisions			As Constructed
File Name: 1.02 GEN - GENERAL NOTES.DWG	Date:	Comments	Init.	No Revisions:
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GENERAL NOTES

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GENERAL	Subset Sheets:	GN-1.02.1

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
02 OF 58

34. THE CONTRACTOR SHALL REPAIR OR REPLACE AT THEIR EXPENSE ANY EXISTING SIGN THAT IS DAMAGED DURING CONSTRUCTION ACTIVITIES NOT SCHEDULED TO BE REMOVED.

UTILITY NOTES

35. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 811 THREE BUSINESS DAYS IN ADVANCE OF ANY EXCAVATING OR GRADING.

36. UTILITY FACILITIES EXIST WITHIN THE LIMITS OF PROPOSED CONSTRUCTION. THE CONTRACTOR SHALL COOPERATE AND COORDINATE WITH THE UTILITY OWNERS IN THEIR REMOVAL AND RELOCATION OPERATIONS AND DURING CONSTRUCTION SO THAT PROGRESS IS EXPEDITED.

37. IT IS ESTIMATED THAT 100 HOURS WILL BE REQUIRED FOR POTHOLING PAID AS ITEM 203-01597. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING AND COORDINATING WITH THE APPROPRIATE UTILITY REPRESENTATIVES TO BE ONSITE DURING POTHOLING AND SHALL LIKEWISE BE RESPONSIBLE FOR DETERMINING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL REFER TO THE UTILITY SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

38. THE LOCATIONS OF EXISTING STRUCTURES, PIPELINES, UTILITIES, ETC., SHOWN ON THE DRAWINGS HAVE BEEN DERIVED FROM THE BEST AVAILABLE INFORMATION. THERE MAY BE OTHER STRUCTURES, PIPELINES, UTILITIES, ETC., NOT SHOWN ON THE DRAWINGS WHICH PRESENTLY EXIST IN THE AREA OF CONSTRUCTION. THE ENGINEER AND/OR OWNER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL IMPACTED EXISTING STRUCTURES, PIPELINES, UTILITIES, ETC., IN THE PROJECT SITE, AND SHALL BE RESPONSIBLE FOR ANY DAMAGES THERETO.

39. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL UTILITIES AND STRUCTURES AFFECTED BY THE WORK AND ANY DAMAGE SHALL BE REPAIRED AND RESTORED TO THE SATISFACTION OF THE ENGINEER OR APPLICABLE ENTITY AT THE CONTRACTOR'S EXPENSE.

40. THE CONTRACTOR SHALL NOTIFY THE ENGINEER WHERE UTILITIES CONFLICT WITH THE NEW WORK IN CONFORMANCE WITH THE SPECIFICATIONS. CONFLICT IS DEFINED WHERE THE NEW WORK CANNOT BE COMPLETED WITHOUT PROPER CLEARANCES AROUND THE UTILITY. WHERE FIELD VERIFICATION IS NOTED ON THE PLANS, THIS SHALL REQUIRE THE CONTRACTOR TO DETERMINE THE LOCATION OF THE FACILITY IN QUESTION PRIOR TO THE NEW CONSTRUCTION. A DETERMINATION SHALL BE MADE BY THE CONTRACTOR IF THE CURRENT DESIGN WILL MATCH THE EXISTING FACILITY AND NOTIFY THE ENGINEER IN WRITING IF IT DOES NOT.

ENVIRONMENTAL NOTES

41. RESTORATION OF THE PROJECT AREA WILL INCLUDE REMOVAL OF ALL DEBRIS, LITTER, EXCAVATION SPOILS, AND WASTE MATERIALS GENERATED BY CONSTRUCTION.

42. IN ORDER TO AVOID VIOLATING THE MIGRATORY BIRD TREATY ACT OF 1918, IF ANY TREES OR SHRUBS ARE TO BE REMOVED OR WORK ON/UNDER BRIDGES IS TO BE COMPLETED BETWEEN APRIL 1 AND AUGUST 31, A SURVEY MUST BE COMPLETED FOR ACTIVE NESTS. IF AN ACTIVE NEST(S) IS FOUND NO WORK MAY BE DONE WITHIN 50 FEET OF THE NEST(S) UNTIL THE NEST(S) BECOMES INACTIVE. TO AVOID THE SURVEY REQUIREMENT, IT IS RECOMMENDED THAT ALL VEGETATION THAT NEEDS TO BE REMOVED, BE REMOVED AFTER AUGUST 31 AND BEFORE APRIL 1. SEE SPEC 240 FOR DETAILS. THE SURVEY WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.

43. THE CONTRACTOR SHALL REMOVE ALL SEDIMENT AND CONSTRUCTION DEBRIS FROM THE FLOW LINES TO AVOID POLLUTANTS FROM DISCHARGING INTO WATERWAYS AS DIRECTED BY THE COUNTY'S REPRESENTATIVE. THE COST OF REMOVAL SHALL BE INCLUDED IN THE WORK.

44. FUELING AND ROUTINE MAINTENANCE OF CONSTRUCTION EQUIPMENT SHALL ONLY OCCUR AT DESIGNATED AREAS, AT LEAST 75 FEET FROM WETLAND AND AQUATIC HABITATS AND AWAY FROM DRAINAGE OR DITCHES TO PRECLUDE ADVERSE WATER QUALITY IMPACTS TO EXISTING DRAINAGES AND WETLAND HABITATS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PREVENT ADVERSE IMPACTS TO WATER QUALITY. MAJOR REPAIRS TO EQUIPMENT WILL BE MADE OFFSITE.

45. CONSTRUCTION EQUIPMENT SHALL BE CHECKED FREQUENTLY FOR LEAKS. ANY LEAKS OR SPILLS WILL BE CLEANED UP IMMEDIATELY TO PREVENT THE CONTAMINATION OF SOLID OR RESIDUE ON PAVED SURFACES. SPILL AREAS WILL NOT BE "HOSED DOWN", DRY CLEANUP METHODS WILL BE USED.

46. PUMPING AND/OR DISCHARGE OF WATER FROM DEWATERING OPERATIONS WILL REQUIRE A DISCHARGE PERMIT FROM THE CDPHE WATER QUALITY CONTROL DIVISION AND THE EPA. DISCHARGE PERMITS OR ALTERNATE ARRANGEMENTS FOR WATER MANAGEMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR (SEE STANDARD SPECIFICATION 107.25(B) 6). APPLICABLE CONDITIONS FOR THE DISCHARGE INCLUDING MONITORING AND REPORTING SHALL BE INCLUDED IN THE COST OF THE WORK AND SHALL NOT BE COMPENSATED SEPARATELY.

47. THE CONTRACTOR SHALL SAVE, PROTECT, AND MAINTAIN ALL EXISTING VEGETATION IN THE PROJECT, EXCEPT FOR THE VEGETATION THAT MUST BE REMOVED TO ACCOMMODATE CONSTRUCTION OF THE PROJECT.

48. THE CONTRACTOR SHALL FLAG TREES ADJACENT TO AND WITHIN THE LIMITS OF DISTURBANCE THAT ARE TO REMAIN IN PLACE. THE CONTRACTOR SHALL USE ALL APPROPRIATE CARE TO AVOID DAMAGE OR REMOVAL OF THE FLAGGED TREES. FLAGGED TREES THAT ARE DAMAGED SHALL BE REPLACED IN-KIND AT THE CONTRACTORS EXPENSE. TREES THAT ARE DAMAGED AND ASSESSED AS SALVAGEABLE SHALL BE PROMPTLY REPAIRED, PRUNED, WRAPPED, AND PROTECTED FROM FURTHER DAMAGE AT THE CONTRACTOR'S EXPENSE. ALL REPLACEMENT TREES AND SHRUBS SHALL BE NATIVE SPECIES PER THE COLORADO SPRINGS LANDSCAPE MANUAL.

49. THE CONTRACTOR SHALL REPAIR OR REPLACE IN-KIND ALL LANDSCAPE MATERIAL AND VEGETATION THAT IS DISTURBED BY THE WORK. REPLACED MATERIALS SHALL BE EQUAL OR BETTER THAN THE EXISTING MATERIALS IN SIZE, TYPE, AND CONDITION.

50. PORTIONS OF THE PROJECT LIE WITHIN HABITAT OF THE PREBLES MEADOW JUMPING MOUSE (PMJM), A MAMMAL PROTECTED UNDER THE FEDERAL ENDANGERED SPECIES ACT. SPECIAL MEASURES ARE REQUIRED TO MINIMIZE IMPACTS TO PMJM AND TO ITS HABITAT, INCLUDING, BUT NOT LIMITED TO:

    A. A QUALIFIED ECOLOGIST OR LANDSCAPE ARCHITECT SHALL PROVIDE A BRIEFING TO THE CONTRACTOR AND THEIR ONSITE PERSONNEL PRIOR TO LAND DISTURBING ACTIVITIES TO DISCUSS THE PROJECT AND ENSURE UNDERSTANDING OF AVOIDANCE AND MINIMIZATION MEASURES.

    B. AN ADEQUATE CONSTRUCTION FENCE SHALL BE CONSTRUCTED TO CONFINE PROJECT DISTURBANCES AND STAGING TO THE APPROVED DISTURBANCE LIMITS.

    C. VEGETATION SHALL BE REESTABLISHED IN AREAS DISTURBED BY THE PROJECT AND ENHANCE THE HABITAT QUALITY IN ADJACENT AREAS IN ACCORDANCE WITH LANDSCAPE PLANS.

FACILITIES NOTES

51. LENGTH OF PIPE BETWEEN INLETS AND MANHOLES IS MEASURED FROM INSIDE EDGE TO INSIDE EDGE.

52. MANHOLE LIDS IN ROADWAYS SHALL BE PLACED SO THEY ARE NOT WITHIN WHEELPATHS.

53. ALL MANHOLE AND STRUCTURE PENETRATIONS SHALL BE FLUSH WITH THE INSIDE OF STRUCTURE WALL. NO PIPE PROTUSIONS WILL BE ALLOWED.

54. ALL PIPES SHALL BE RCP CLASS III UNLESS OTHERWISE NOTED ON THE PLANS.

55. ALL MANHOLES SHALL BE PER CDOT STANDARD PLANS M-604-20 EXCEPT AS NOTED ON THE PLANS.

56. CDOT TYPE C INLETS SHALL BE PER CDOT STANDARD PLANS M-604-10.

57. CDOT TYPE D INLETS SHALL BE PER CDOT STANDAR PLANS M-604-11 WITH LEVEL GRATE INSTALLATION.

58. CDOT TYPE R INLETS SHALL BE PER CDOT STANDARD PLANS M-604-12 EXCEPT AS NOTED ON THE PLANS.

COLORADO REGISTERED
VANCE L FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GENERAL NOTES

Designer: NAB
Detailer: KDL
Sheet Subset: GENERAL
Structure Numbers:
Subset Sheets: GN-1.02.2

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
03 OF 58

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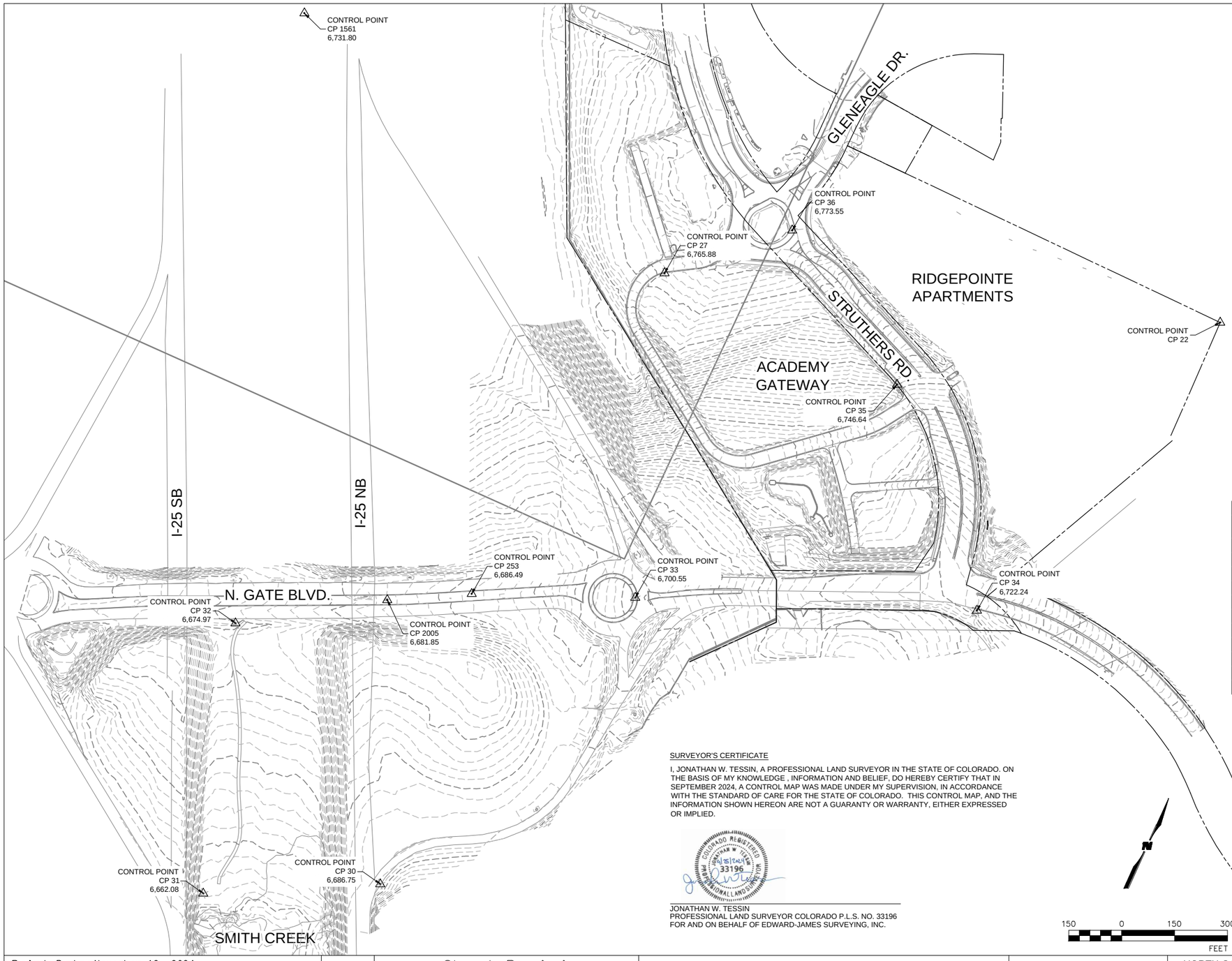
SURVEY CONTROL MAP



GENERAL NOTES

1. NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU DISCOVER SUCH DEFECT. IN NO EVENT MAY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE CERTIFICATION SHOWN HEREON.
2. PROJECT BENCHMARK: CONTROL POINT NO. 2005, ELEVATION = 6681.85 FT. NAVD88, A 1 INCH ZAPIT WASHER STAMPED WITH "CSU FIMS CONTROL" SET IN THE TOP OF CONCRETE ON THE EASTERLY SIDE OF A GRATE INLET LOCATED IN THE MEDIAN AREA OF NORTHGATE BLVD, APPROXIMATELY 60 FEET EAST OF I-25 NORTHBOUND BRIDGE OVER NORTHGATE BLVD.
3. COORDINATE DATUM: PROJECT COORDINATES ARE MODIFIED COLORADO STATE PLANE CENTRAL ZONE NAD '83/(92) (CHARN) COORDINATES. PROJECT COORDINATES ARE "GROUND" COORDINATES. THE COMBINED ELEVATION/SCALE FACTOR USED TO MODIFY THE COORDINATES FROM STATE PLANE TO PROJECT COORDINATES IS 1.000384948. THE RESULTING PROJECT COORDINATES ARE TRUNCATED BY 1,000,000 IN THE NORTHING AND 3,000,000 IN THE EASTING AFTER CONVERTING FROM STATE PLANE COORDINATES TO PROJECT COORDINATES.
4. PROJECT COORDINATES NORTHING US SURVEY FEET = (STATE PLANE COORDINATE NORTHING * 1.000384948 - 1,000,000). PROJECT COORDINATES EASTING US SURVEY FEET = (STATE PLANE COORDINATE EASTING * 1.000384948 - 3,000,000).
5. THIS TOPOGRAPHICAL SURVEY IS NOT A BOUNDARY SURVEY OF THE ADJOINING PROPERTY AND IS PREPARED FOR THE EL PASO COUNTY DEPARTMENT OF PUBLIC WORKS PURPOSES ONLY. NO ANALYSIS HAS BEEN PERFORMED TO DETERMINE IF THE FOUND MONUMENTS SHOWN ARE IN THEIR PROPER POSITION, OR IF THEY ARE AT THE BOUNDARY CORNERS THEY MAY HAVE BEEN INTENDED TO REPRESENT. BOUNDARY LINES AS SHOWN HEREON ARE INCLUDED FOR INFORMATIONAL PURPOSES ONLY. THIS SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF TITLE POLICY, TITLE COMMITMENT, NOR TITE RESEARCH. EASEMENTS, RIGHTS, AND RESTRICTIONS OF RECORD AS SHOWN ARE FROM LIMITED AVAILABLE INFORMATION IN THE PUBLIC RECORD OF THE OFFICE OF THE EL PASO COUNTY CLERK AND RECORDER.

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
22	437505.35	192525.44	N/A	2-1/2" ALUMINUM CAP 1/16 CORNER PLS 10377
27	436965.44	191037.65	6765.88	CHISELED X ON CURB BY ELEC BOX
253	435909.77	190926.13	6686.49	NO. 5 REBAR
1561	437201.63	189800.33	6731.8	CDOT MP 156.1 - 3-1/2" ALUMINUM CAP
2005	435792.97	190716.45	6681.85	FIMS ZAPIT
30	435054.23	191039.08	6686.752	CP 30 5RBR 15FT EAST EOA
31	434818.09	190595.23	6662.082	CP 31 5RBR 15FT WEST TOE
32	435551.18	190354.56	6674.974	CP 32 MAG IN SE COR ELECTVAULT
33	436095.78	191351.22	6700.546	CP 33 MAG IN WALK
34	436472.25	192244.98	6722.243	CP 34 MAG SE COR INLET
35	436957.61	191768.91	6746.638	CP 35 MAG IN INLET
36	437228.37	191314.54	6773.549	CP 36 MAG IN WALK

SURVEYOR'S CERTIFICATE

I, JONATHAN W. TESSIN, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO. ON THE BASIS OF MY KNOWLEDGE , INFORMATION AND BELIEF, DO HEREBY CERTIFY THAT IN SEPTEMBER 2024, A CONTROL MAP WAS MADE UNDER MY SUPERVISION. IN ACCORDANCE WITH THE STANDARD OF CARE FOR THE STATE OF COLORADO. THIS CONTROL MAP, AND THE INFORMATION SHOWN HEREON ARE NOT A GUARANTY OR WARRANTY, EITHER EXPRESSED OR IMPLIED.

COLORADO REGISTERED JONATHAN W. TESSIN 33196 PROFESSIONAL LAND SURVEYOR

JONATHAN W. TESSIN
PROFESSIONAL LAND SURVEYOR COLORADO P.L.S. NO. 33196
FOR AND ON BEHALF OF EDWARD-JAMES SURVEYING, INC.

Print Date: November 12, 2024
File Name: 1.03 GEN- CONTROL MAP TO WILSON.DWG
Horiz. Scale: Vert. Scale:
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

CONTROL MAP

Designer: NAB
Detailer: KDL
Sheet Subset: GENERAL
Structure Numbers:
Subset Sheets: GN-1.03

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
04 OF 58

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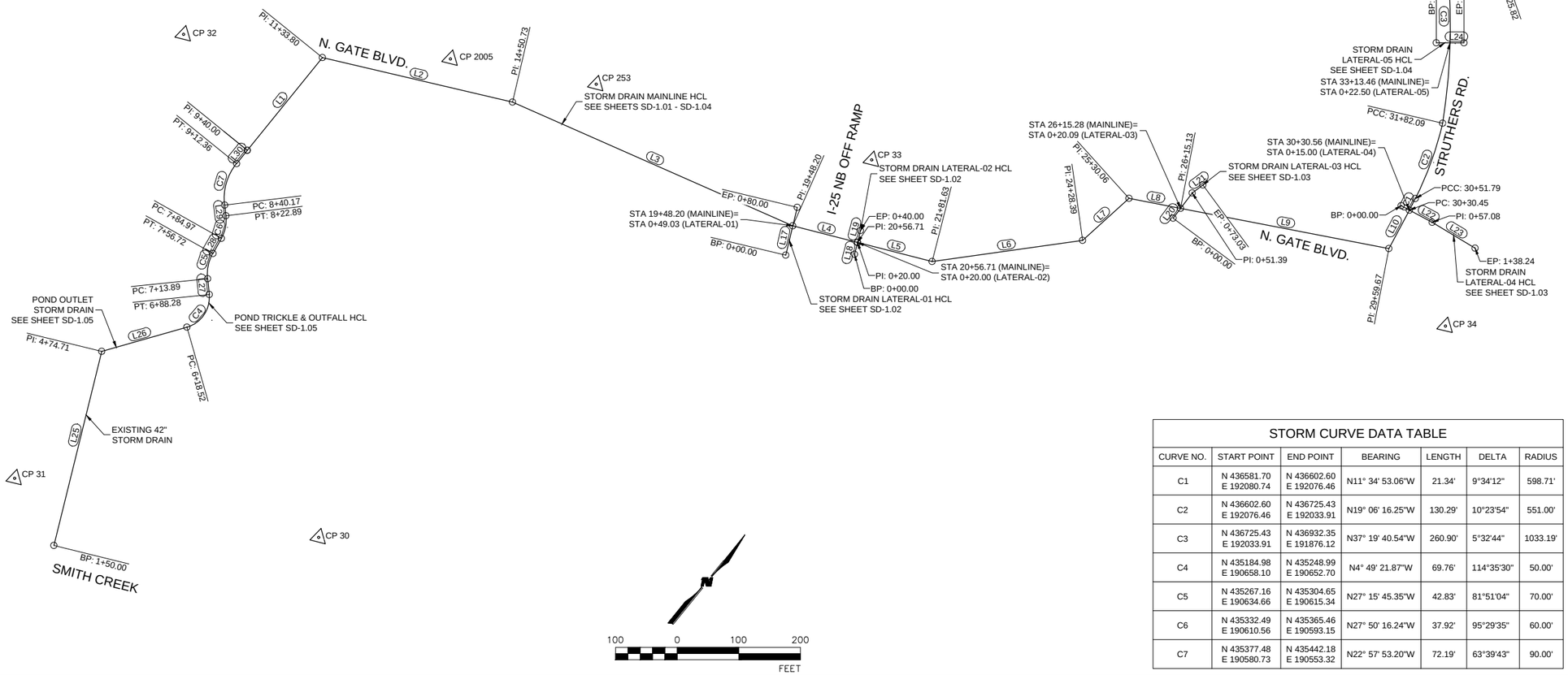
PROJECT SURVEY CONTROL NOTES

1. PERMANENT MONUMENTS HAVE BEEN SET ON THE PROJECT SITE TO CONTROL THE WORK. (SEE SHEET GN-1.03 FOR DATA)
2. THE HORIZONTAL DATUM FOR THE PROJECT IS COLORADO STATE PLAN, CENTRAL ZONE, NORTH AMERICAN DATUM 1983 (1986).
3. THE VERTICAL DATUM FOR THE PROJECT IS LOCAL. VERTICAL CONTROL OF ALL PROJECT ELEMENTS SHALL BE BASED ON THE PROJECT ELEVATIONS PROVIDED FOR PROJECT CONTROL POINTS. (SEE SHEET GN-1.03)

COLORADO REGISTERED
VANCEL S FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24



STORM LINE DATA TABLE

LINE NO.	START POINT	END POINT	BEARING	LENGTH
L1	N 435469.82 E 190553.32	N 435663.62 E 190553.32	N0°00'00.00"E	193.80'
L2	N 435663.62 E 190553.32	N 435801.58 E 190838.65	N64°11'43.76"E	316.93'
L3	N 435801.58 E 190838.65	N 435931.88 E 191318.76	N74°48'56.35"E	497.47'
L4	N 435931.88 E 191318.76	N 435977.18 E 191417.36	N65°19'43.97"E	108.51'
L5	N 435977.18 E 191417.36	N 436029.32 E 191530.88	N65°19'43.97"E	124.91'
L6	N 436029.32 E 191530.88	N 436209.77 E 191699.19	N43°00'26.25"E	246.77'
L7	N 436209.77 E 191699.19	N 436310.20 E 191715.01	N8°57'04.02"E	101.67'
L8	N 436310.20 E 191715.01	N 436350.20 E 191790.08	N61°57'11.11"E	85.06'
L9	N 436350.20 E 191790.08	N 436512.20 E 192094.17	N61°57'11.11"E	344.54'
L10	N 436512.20 E 192094.17	N 436581.70 E 192080.74	N10°56'04.69"W	70.78'
L11	N 436932.35 E 191876.12	N 437002.80 E 191919.68	N31°43'39.40"E	82.83'
L12	N 437002.80 E 191919.68	N 437029.14 E 191889.00	N49°21'11.66"W	40.44'
L13	N 437029.14 E 191889.00	N 437050.78 E 191839.67	N66°18'43.26"W	53.86'
L14	N 437050.78 E 191839.67	N 437050.17 E 191819.33	S88°17'16.58"W	20.35'
L15	N 437050.17 E 191819.33	N 437064.92 E 191785.81	N66°15'10.48"W	36.62'
L16	N 437064.92 E 191785.81	N 437226.32 E 191374.06	N68°35'44.98"W	442.25'
L17	N 435887.63 E 191339.87	N 435959.84 E 191305.42	N25°30'19.24"W	80.00'
L18	N 435959.00 E 191425.71	N 435977.18 E 191417.36	N24°40'16.03"W	20.00'
L19	N 435977.18 E 191417.36	N 435995.35 E 191409.02	N24°40'16.03"W	20.00'
L20	N 436330.20 E 191791.02	N 436381.55 E 191788.96	N2°17'53.52"W	51.39'
L21	N 436381.55 E 191788.96	N 436402.49 E 191794.41	N14°35'20.00"E	21.63'
L22	N 436578.96 E 192065.99	N 436589.76 E 192122.04	N79°05'31.68"E	57.08'
L23	N 436589.76 E 192122.04	N 436600.80 E 192202.45	N82°10'58.53"E	81.16'
L24	N 436820.47 E 191943.50	N 436848.75 E 191978.50	N51°02'57.34"E	45.00'
L25	N 434773.50 E 190713.39	N 435067.39 E 190575.31	N25°09'57.37"W	324.71'
L26	N 435067.39 E 190575.31	N 435184.98 E 190658.10	N35°08'47.61"E	143.81'
L27	N 435248.99 E 190652.70	N 435267.16 E 190634.66	N44°47'31.35"W	25.61'
L28	N 435304.65 E 190615.34	N 435332.49 E 190610.56	N9°43'59.35"W	28.25'
L29	N 435365.46 E 190593.15	N 435377.48 E 190580.73	N45°56'33.13"W	17.28'
L30	N 435442.18 E 190553.32	N 435469.82 E 190553.32	N0°00'46.74"E	27.65'

STORM CURVE DATA TABLE

CURVE NO.	START POINT	END POINT	BEARING	LENGTH	DELTA	RADIUS
C1	N 436581.70 E 192080.74	N 436602.60 E 192076.46	N11° 34' 53.06"W	21.34'	9°34'12"	598.71'
C2	N 436602.60 E 192076.46	N 436725.43 E 192033.91	N19° 06' 16.25"W	130.29'	10°23'54"	551.00'
C3	N 436725.43 E 192033.91	N 436932.35 E 191876.12	N37° 19' 40.54"W	260.90'	5°32'44"	1033.19'
C4	N 435184.98 E 190658.10	N 435248.99 E 190652.70	N4° 49' 21.87"W	69.76'	114°35'30"	50.00'
C5	N 435267.16 E 190634.66	N 435304.65 E 190615.34	N27° 15' 45.35"W	42.83'	81°51'04"	70.00'
C6	N 435332.49 E 190610.56	N 435365.46 E 190593.15	N27° 50' 16.24"W	37.92'	95°29'35"	60.00'
C7	N 435377.48 E 190580.73	N 435442.18 E 190553.32	N22° 57' 53.20"W	72.19'	63°39'43"	90.00'

Print Date: November 12, 2024	Sheet Revisions		
File Name: 1.03 GEN- CONTROL MAP.DWG	Date:	Comments	Init.
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

HORIZONTAL CONTROL PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GENERAL	Subset Sheets:	GN-1.04

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

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SUMMARY OF QUANTITIES
NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

Item Code #	Description	Unit	Project Total	As-Const.
201-00000	Clearing and Grubbing	L S	1	
202-00010	Removal of Tree	EACH	13	
202-00019	Removal of Inlet	EACH	1	
202-00021	Removal of Manhole	EA	1	
202-00035	Removal of Pipe (Storm Sewer)	LF	113	
202-00036	Removal of Pipe (Special) (Gas Line)	LF	385	
202-00037	Removal of End Section (Storm Sewer)	EACH	6	
202-00195	Removal of Median Cover	SY	13	
202-00203	Removal of Curb and Gutter	LF	305	
202-00200	Removal of Sidewalk	SY	26	
202-00220	Removal of Asphalt Mat	SY	3,065.0	
202-00206	Removal of Concrete Curb Ramp	SY	12	
202-0026	Removal of Slope Paving	SY	2	
202-00027	Removal of Riprap (Rock Check Dam)	SY	29	
202-00810	Removal of Ground Sign	EACH	2	
202-04002	Clean Culvert	LS	1	
203-00000	Unclassified Excavation (CIP)	CY	15,361	
203-00100	Muck Excavation	CY	100	
203-01597	Potholing	HOUR	100	
208-00002	Erosion Log (12 Inch)	LF	400	
208-00020	Silt Fence	LF	446	
208-00035	Aggregate Bag	LF	48	
208-00041	Rock Check Dam	EACH	1	
208-00045	Concrete Washout Structure	EACH	3	
208-00056	Storm Drain Inlet Protection (Type III)	EACH	6	
208-00070	Vehicle Tracking Pad	EACH	3	
208-00106	Sweeping (Sediment Removal)	HOUR	40	
208-00207	Erosion Control Management (ECM)	DAY	64	
210-04011	Adjust MH (Special)	EACH	1	
210-00810	Reset Ground Sign	EACH	2	
212-00006	Seeding (Native)	ACRE	6.41	
212-00047	Soil Preparation (Special) (For Native Seeding)	ACRE	6.41	
212-00701	Compost (Mechanically Applied)	CY	838	
213-00011	Mulch (Hydraulic)	ACRE	6.41	
214-00000	Landscape Maintenance	L S	1	
214-00302	Deciduous Shrub (60 Cl)	EACH	320	
214-00350	Deciduous Shrub (5 Gallon Container)	EACH	184	
214-00205	Deciduous Tree (5 Gallon Container)	EACH	13	
214-00450	Evergreen Tree (5 Galllon Container)	EACH	11	
214-01013	Live Willow Stakes	EACH	860	
216-00201	Soil Retention Blanket (Staw-Coconut) (Biodegradable Class 1)	SY	917	
218-0000	Noxious Weed Management	LS	1	
304-06007	Aggregate Base Course (Class 6)	CY	1,228	
403-34722	HMA (Gr SX) (75) (PG 58-28) (6" Thick)	SY	3,076	
420-00114	Geotextile (Drainage) (Class 3)	SY	520	
506-00409	Soil Riprap (9 Inch)	CY	160	

Item Code #	Description	Unit	Project Total	As-Const.
506-00412	Soil Riprap (12 Inch)	CY	218	
507-00105	Concrete Slope and Ditch Paving (Reinforced)(Colored)	CY	108.4	
507-00318	Grouted Boulder Edging (18 Inch)	LF	664	
507-00336	Grouted Boulder Edging (36 Inch)	LF	110	
507-00348	Grouted Boulder Edging (48 Inch)	LF	170	
601-03055	Concrete Class D (Wall)(Special)	CY	5.1	
603-01185	18 Inch Reinforced Concrete Pipe (Complete In Place)	LF	9	
603-01245	24 Inch Reinforced Concrete Pipe (Complete In Place)	LF	608	
603-01365	36 Inch Reinforced Concrete Pipe (Complete In Place)	LF	535	
603-01485	48 Inch Reinforced Concrete Pipe (Complete In Place)	LF	1,548	
603-05048	48 Inch Reinforced Concrete End Section	EACH	1	
604-00305	Inlet Type C (5 Foot)	EACH	1	
604-00505	Inlet Type D (5 Foot)	EACH	1	
604-19205	Inlet Type R L 10 (5 Foot)	EACH	2	
604-19410	Inlet Type R L 10 (Special)(10 Foot)	EACH	1	
604-20000	Outlet Structure	EACH	1	
604-30010	Manhole Slab Base (10 Foot)	EACH	7	
604-30015	Manhole Slab Base (15 Foot)	EACH	6	
604-32015	Manhole T-Base (15 Foot)	EACH	3	
604-32020	Manhole T-Base (20 Foot)	EACH	1	
605-00060	6 In PP Underdrain (Special)	LF	538	
605-01080	8" Horz. Drain (Special Trench Foundation Zone Treatment)	LF	1,200	
607-11525	Fence (Temporary)(4' High Plastic)	LF	2,744	
607-60117	16 Foot Gate (Chain Barrier)	EACH	1	
608-00000	Concrete Sidewalk	SY	27.0	
608-00010	Concrete Curb Ramp	SY	12.1	
609-21010	Curb and Gutter Type 2 (Section I-B)	LF	35	
609-21020	Curb and Gutter Type 2 (Section II-B)	LF	201	
610-00020	Median Cover Material (Patterned Concrete)	SF	37.0	
610-0003X	10' Plowable Median Nose	LS	1.0	
614-01582	Steel Sign Support (2-1/2 Inch Round)(Post and Slipbase)	LF	8	
620-00005	Field Office	EACH	1	
620-00020	Sanitary Facility	EACH	2	
625-00000	Construction Surveying	LS	1	
626-00000	Mobilization	LS	1	
627-00005	Epoxy Pavement Marking	GAL	10	
627-30405	Preformed Thermoplastic Pavement Marking (Word-Symbol)	SF	20	
627-30410	Preformed Thermoplastic Pavement Marking (Xwalk-Stop Line	SF	40	
630-00007	Traffic Control Inspection	DAY	147	
630-00012	Traffic Control Management	DAY	50	
630-00016	Traffic Control (Special)	LS	1	
630-80355	Portable Message Sign Panel	EACH	2	
630-00000	Flagging	HOUR	500	
700-70010	F/A Minor Contract Revisions	F A		
700-70426	F/A Post Construction Stabilization	F A		
700-70530	F/A Utility Coordination	F A		

EARTHWORK SUMMARY

Item 203-00000 Unclassified Excavation (CIP) Excavation to the in contact outline of the proposed improvements on the pond site (excluding the storm sewer and underdrain trenching) Includes excavation of the top 3" of topsoil in the pond site fill areas.	**15,361 CY**
Estimated embankment volume to the in contact outline of proposed improvements on the pond site	10,016 CY
Estimated volume of excavated material needed to construct the proposed embankment assuming a 10% shrink factor.	11,018 CY
Estimated volume of excess storm sewer trench excavation material considering the volume displaced by the proposed pipe and an assumed 10% shrink factor.	1,136 CY
Estimated export & disposal of excess excavated material including 3" of topsoil from fill areas on the pond site.	5,479 CY

The total quantity of Unclassified Excavation to be paid for will be the bid form quantity unless the Engineer makes significant design changes after contract award that significantly impacts quantities. The contractor is encouraged to perform their own estimate of earthwork and other bid form quanties and bring any large desrepancies to the attention of the Engineer before completion and submittal of their bid.

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VANCE L S FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24
Vance Fossinger

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
SUMMARY OF APPROXIMATE QUANTITIES

Designer: NAB
Detailer: KDL
Sheet Subset: GENERAL
Structure Numbers:
Subset Sheets: GN-1.05

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
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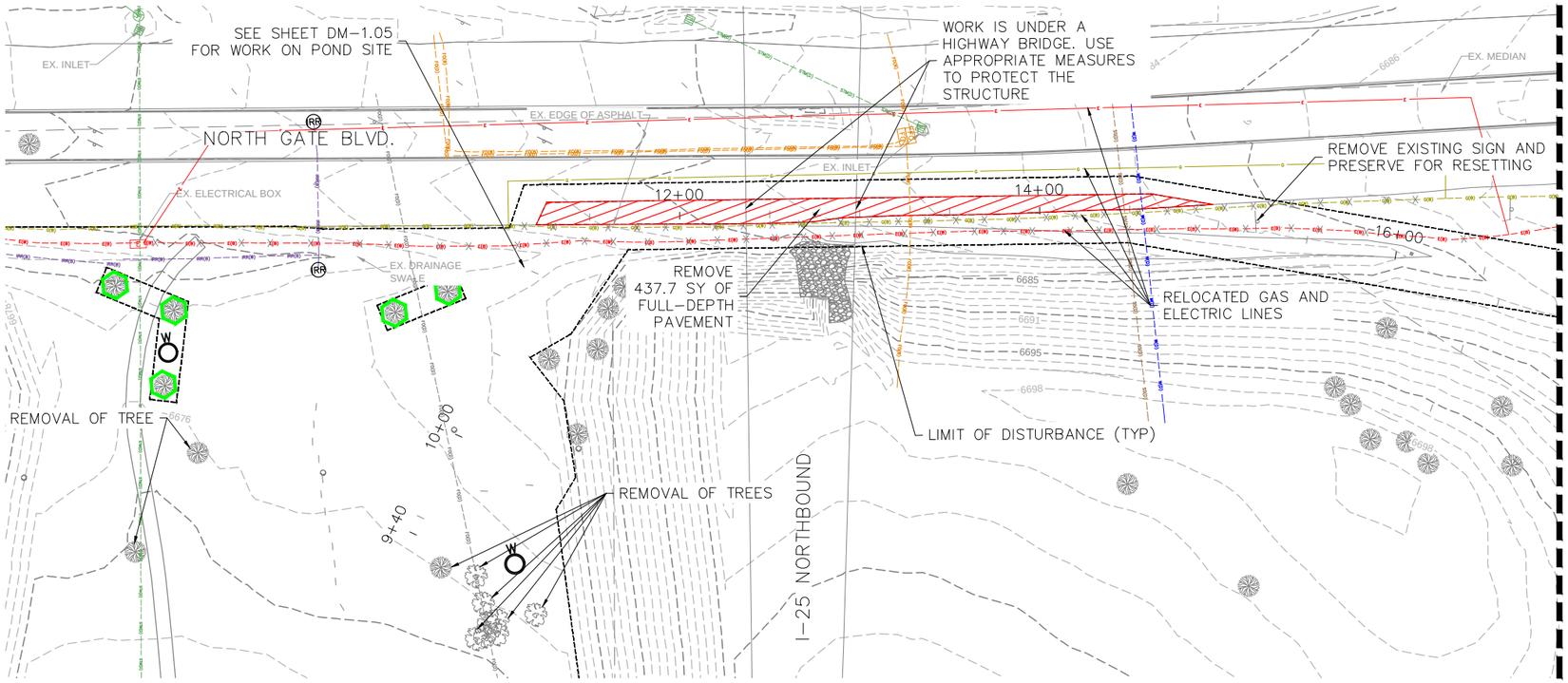

NOTES:

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4. EDGES OF PAVEMENT REMOVAL SHALL BE NEATLY SAWCUT.

LEGEND

REMOVAL OF CURB AND GUTTER

REMOVAL OF ASPHALT MAT

REMOVAL OF CONCRETE

TREE TO REMAIN

40 0 40 80
FEET

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

DEMOLITION PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	REMOVAL	Subset Sheets:	DM-1.01

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

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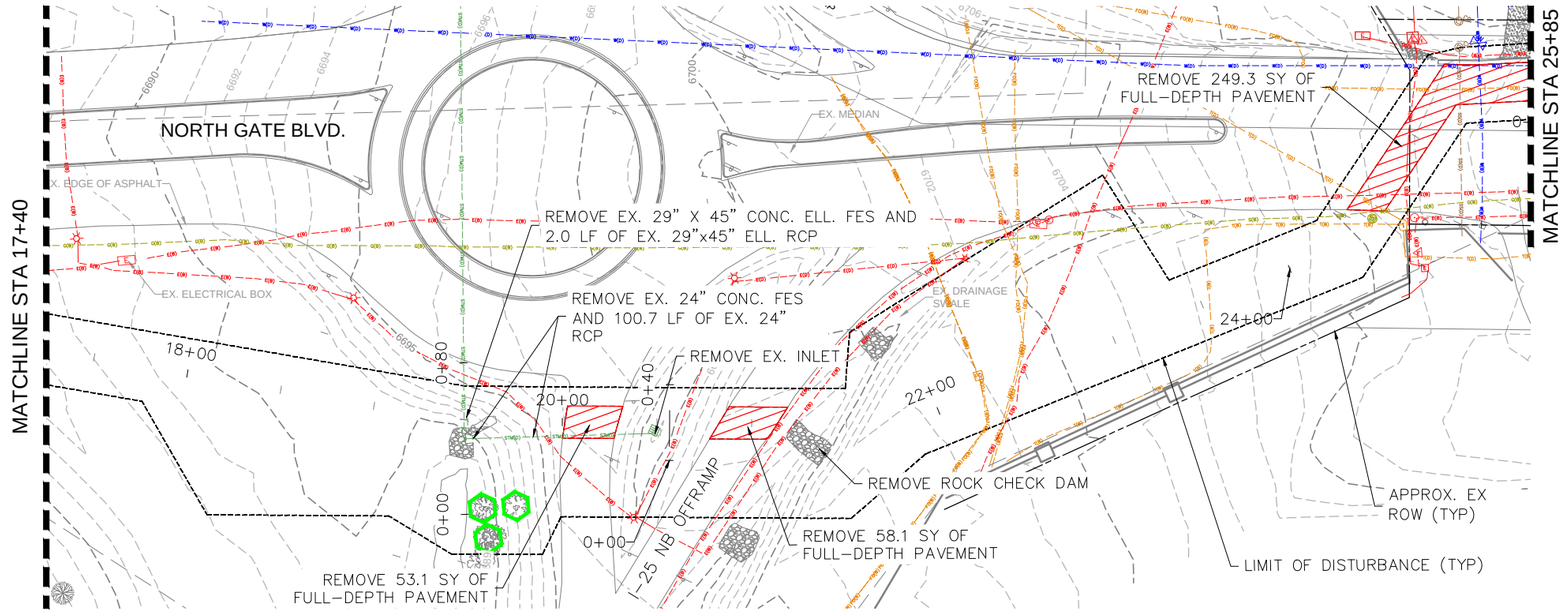

LEGEND

REMOVAL OF CURB AND GUTTER

REMOVAL OF ASPHALT MAT

REMOVAL OF CONCRETE

TREE TO REMAIN

40 0 40 80
FEET

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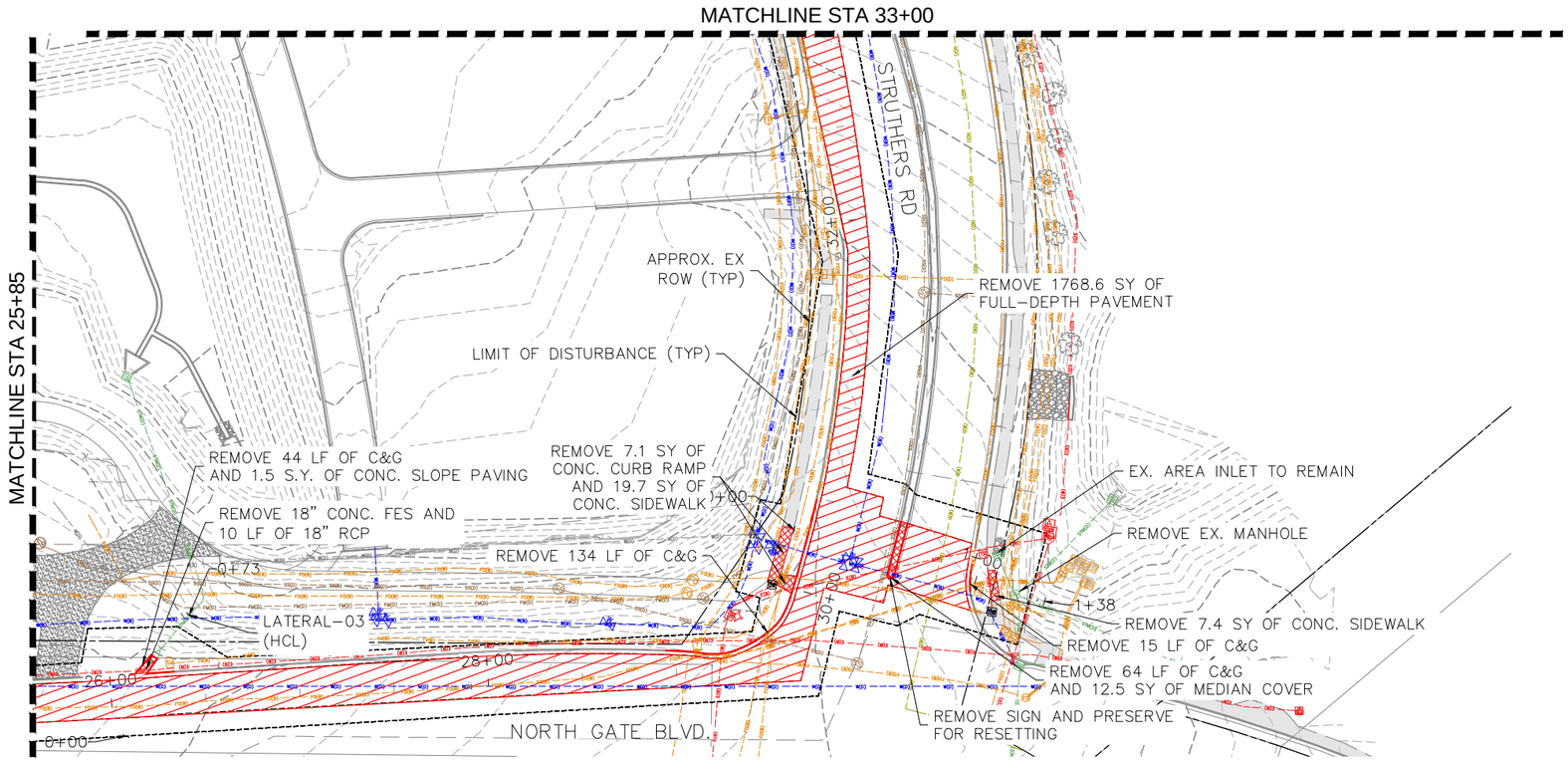

LEGEND

- REMOVAL OF CURB AND GUTTER
- REMOVAL OF ASPHALT MAT
- REMOVAL OF CONCRETE
- TREE TO REMAIN

40 0 40 80
FEET

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT				Project No./Code
DEMOLITION PLAN				CDOT Project No. C040-042 (21233)
Designer: NAB		Structure Numbers		Sheet Number
Detailer: KDL				09 OF 58
Sheet Subset: REMOVAL		Subset Sheets: DM-1.03		

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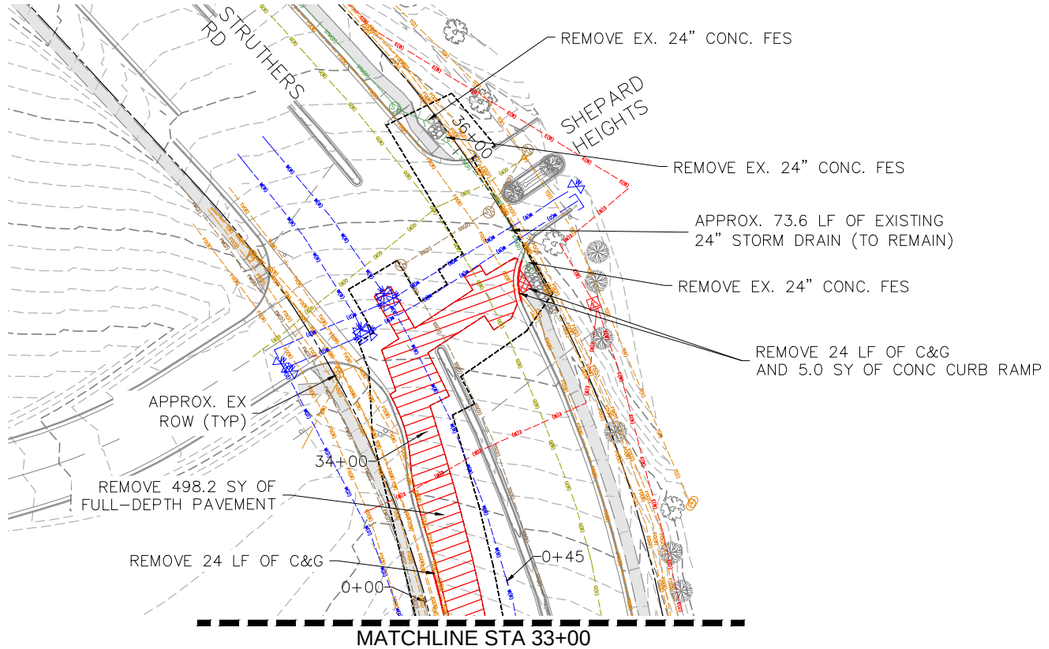

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LEGEND

REMOVAL OF CURB AND GUTTER

REMOVAL OF ASPHALT MAT

REMOVAL OF CONCRETE

TREE TO REMAIN

40 0 40 80
FEET

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Sheet Number
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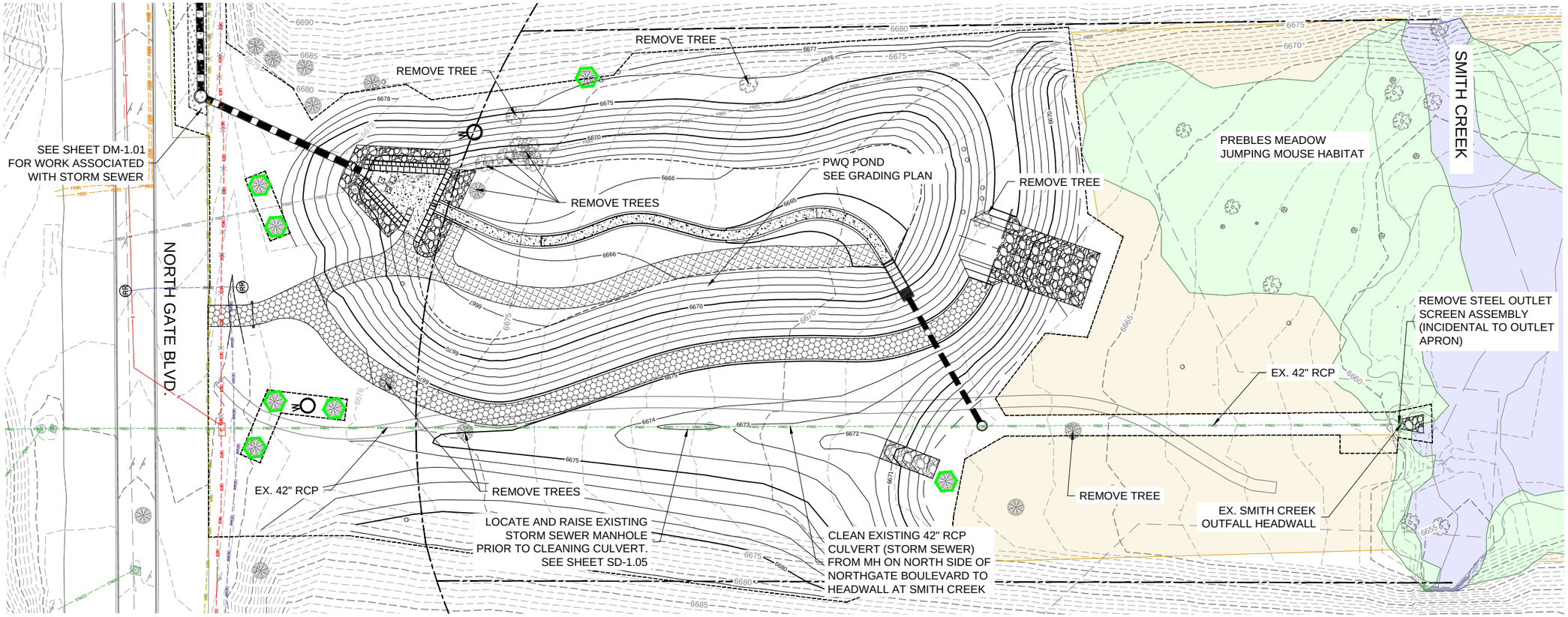

LEGEND

- REMOVAL OF CURB AND GUTTER
- REMOVAL OF ASPHALT MAT
- REMOVAL OF CONCRETE
- TREE TO REMAIN
- HIGH QUALITY PMJM HABITAT
- PMJM HABITAT UPLAND AREA
- OPEN WATERS IN PMJM HABITAT

NOTES:

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DEMOLITION PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	REMOVAL	Subset Sheets:	DM-1.05

Project No./Code

CDOT Project No. C040-042 (21233)

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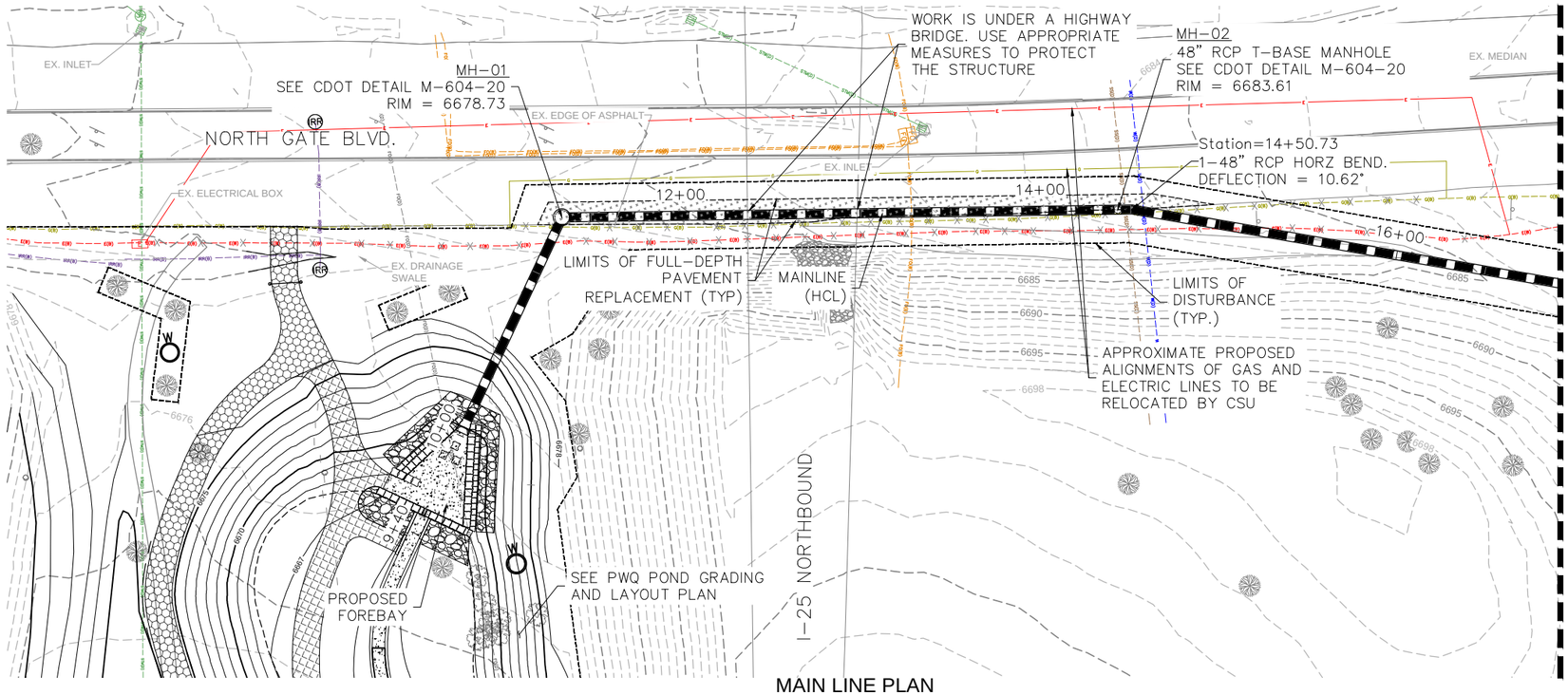
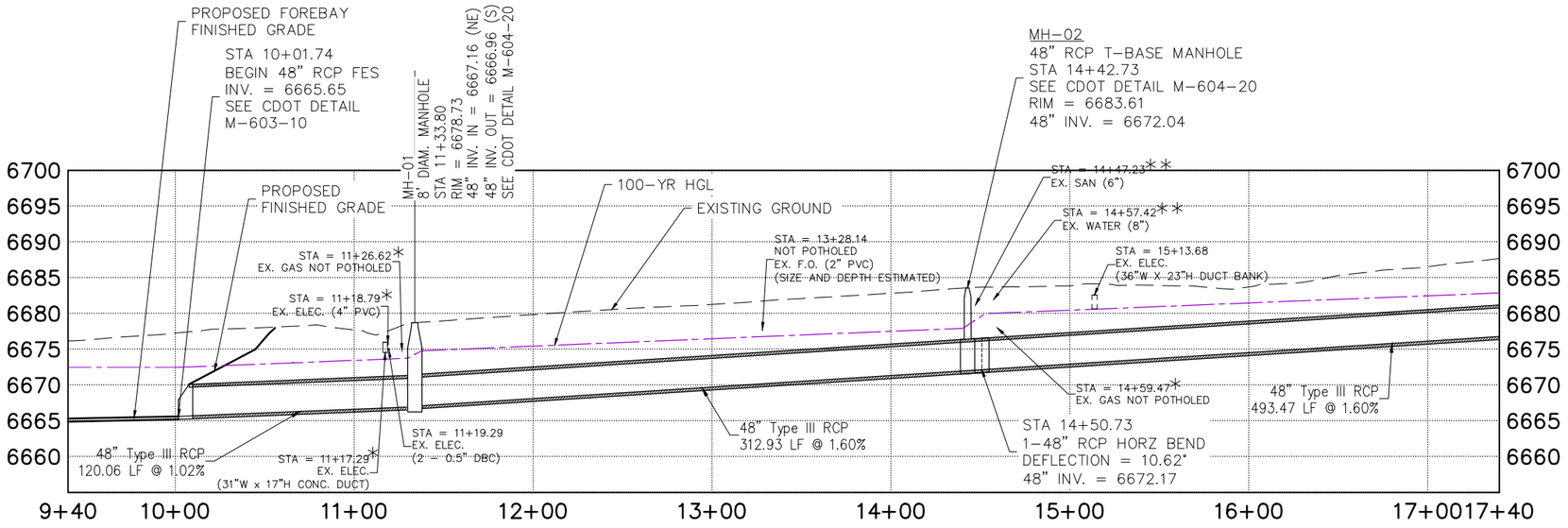


MAIN LINE PLAN



MAIN LINE PROFILE STA 9+40 TO 17+40

NOTES:

1. PIPE LENGTHS ARE MEASURED TO HORIZONTAL DEFLECTION POINT OF BENDS AND TO INNER FACE OF MANHOLE OR INLET.
2. PIPE SLOPES ARE MEASURED TO INNER FACE OF MANHOLE OR INLET AND HORIZONTAL DEFLECTION POINT OF HORIZONTAL BENDS.
3. HORIZONTAL CONTROL LINES (HCL) ARE TO CENTER OF PIPE.
4. MANHOLE STATION AND OFFSET ARE TO CENTER OF STRUCTURE.
5. INVERT OF STORM DRAIN HORIZONTAL BENDS AND T-BASE MANHOLES ARE TO BE CONTINUOUS AND FLUSH WITH CONNECTING SEGMENTS OF RCP PIPE.
6. INVERT OF T-BASE MANHOLES ARE TO CENTER OF MANHOLE.
7. WHERE GAS AND ELECTRIC ARE TO BE LOWERED BY CSU CONTRACTOR SHALL PROVIDE EXCAVATION, BACKFILL, AND PAVEMENT REMOVAL AND REPLACEMENT. EXCAVATION AND BACKFILL ASSOCIATED WIT THE UTILITY RELOCATIONS WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE CONSIDERED INCIDENTAL TO THE STORM DRAIN ITEMS.
8. T-BASES FOR T-BASE MANHOLES ARE ASSUMED TO BE 8' LONG AND ARE EXCLUDED FROM THE STORM SEWER PAYMENT QUANTITY.

NOTE: SEE UTILITY PLANS FOR FURTHER EXISTING UTILITY INFORMATION

* UTILITY TO BE RELOCATED BY CSU PRIOR TO CONSTRUCTION. CONTRACTOR TO CONFIRM ABANDONMENT PRIOR TO DISTURBANCE OF UTILITY.

** THESE LINES ARE INDICATED TO BE INSTALLED THROUGH BORING. THEIR DEPTHS ARE UNKNOWN.

10 5 0 20' 40' 80'

N

COLORADO REGISTERED VANCE L S FOSSINGER 31972 PROFESSIONAL ENGINEER 11/12/24

Vance Fossinger

Print Date: November 12, 2024	Sheet Revisions		
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STORM DRAIN PLAN AND PROFILE

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	STORM	Subset Sheets:	SD-1.01

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

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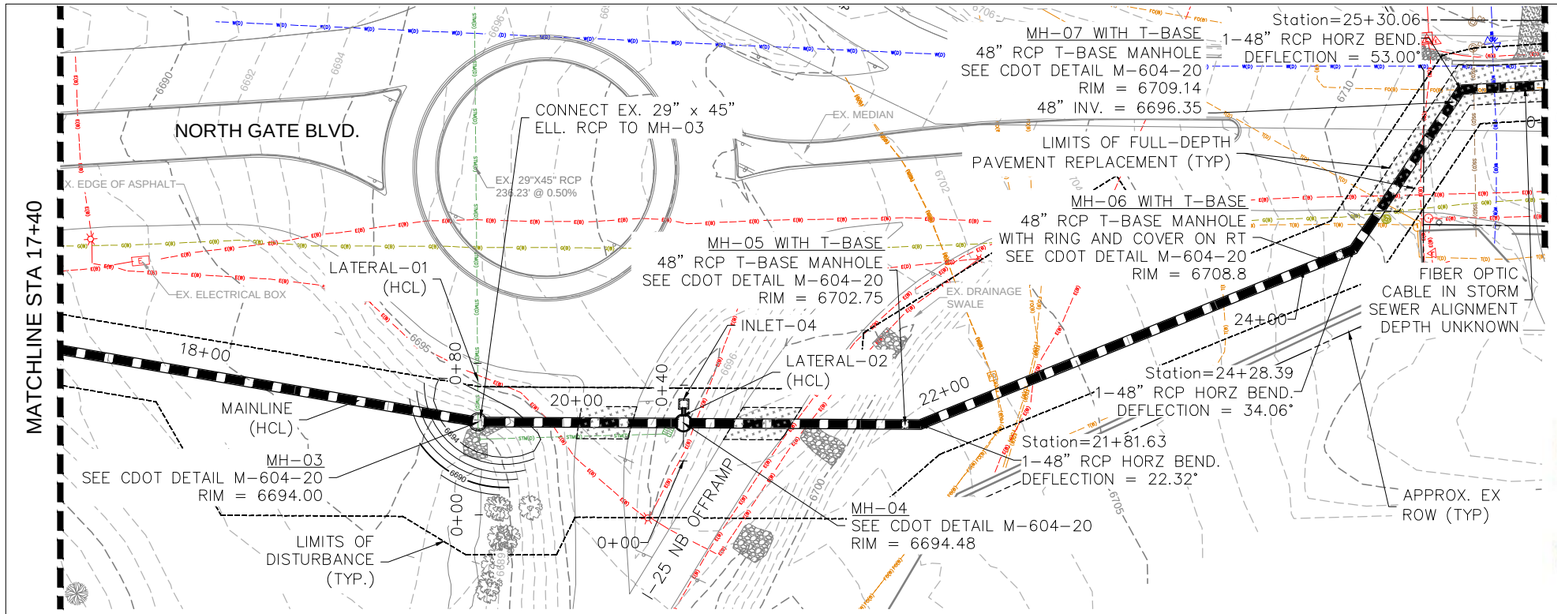
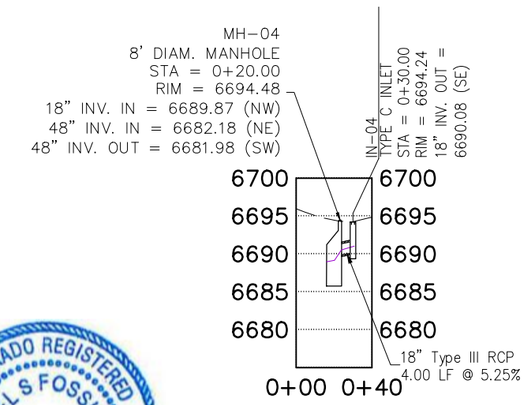
11/12/2024



MAIN LINE PLAN

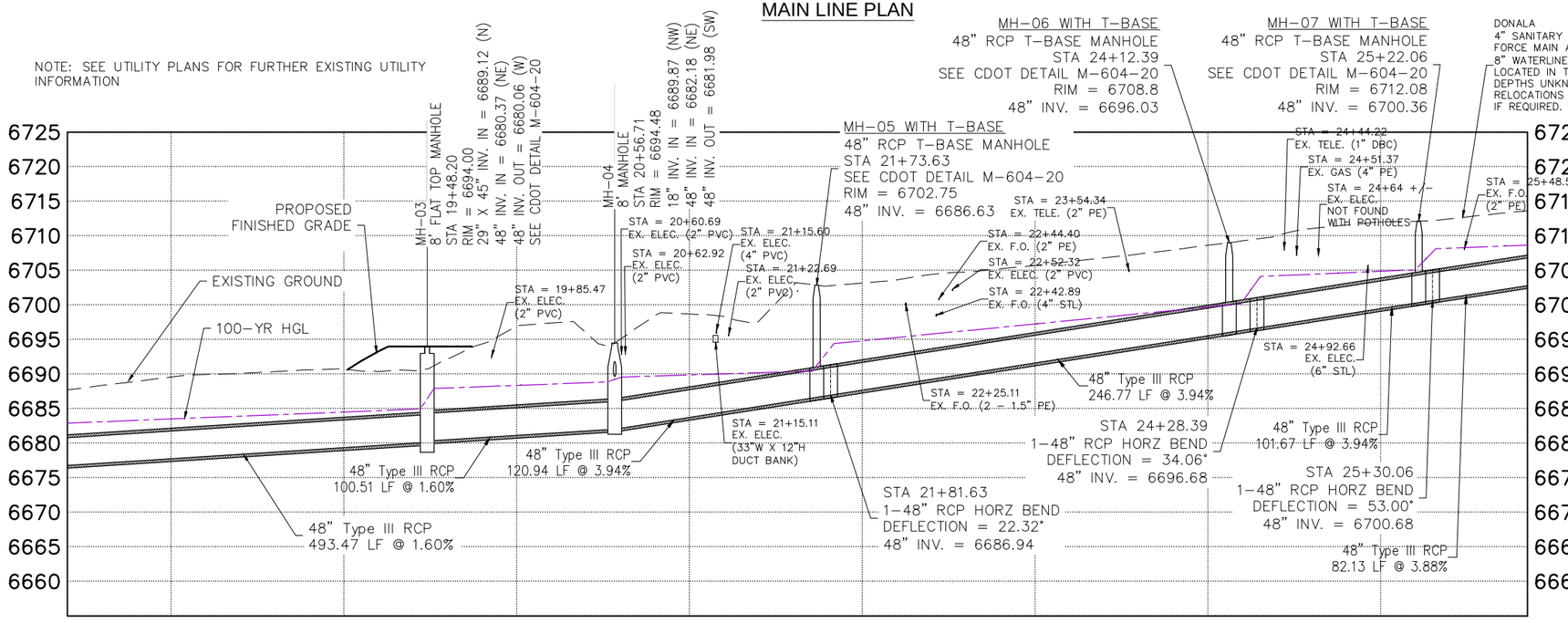


LATERAL-02 PROFILE

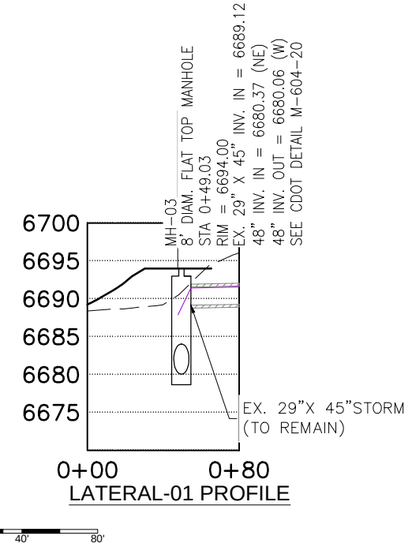
NOTES:

1. PIPE LENGTHS ARE MEASURED TO HORIZONTAL DEFLECTION POINT OF BENDS AND TO INNER FACE OF MANHOLE OR INLET.
2. PIPE SLOPES ARE MEASURED TO INNER FACE OF MANHOLE OR INLET AND HORIZONTAL DEFLECTION POINT OF HORIZONTAL BENDS.
3. HORIZONTAL CONTROL LINES (HCL) ARE TO CENTER OF PIPE.
4. MANHOLE STATION AND OFFSET ARE TO CENTER OF STRUCTURE.
5. INVERT OF STORM DRAIN HORIZONTAL BENDS AND T-BASE MANHOLES ARE TO BE CONTINUOUS AND FLUSH WITH CONNECTING SEGMENTS OF RCP PIPE.
6. INVERT OF T-BASE MANHOLES ARE TO CENTER OF MANHOLE.
7. WHERE GAS AND ELECTRIC ARE TO BE LOWERED BY CSU CONTRACTOR SHALL PROVIDE EXCAVATION, BACKFILL, AND PAVEMENT REMOVAL AND REPLACEMENT. EXCAVATION AND BACKFILL ASSOCIATED WIT THE UTILITY RELOCATIONS WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE CONSIDERED INCIDENTAL TO THE STORM DRAIN ITEMS.
8. T-BASES FOR T-BASE MANHOLES ARE ASSUMED TO BE 8' LONG AND ARE EXCLUDED FROM THE STORM SEWER PAYMENT QUANTITY.

NOTE: SEE UTILITY PLANS FOR FURTHER EXISTING UTILITY INFORMATION



MAIN LINE PROFILE STA 17+40 TO 25+85



LATERAL-01 PROFILE

Print Date: November 12, 2024		Sheet Revisions			As Constructed	NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT	Project No./Code
File Name: 1.01 - 1.04 STM - PLAN & PROFILE.DWG		Date:	Comments	Init.	No Revisions:	STORM DRAIN PLAN AND PROFILE	CDOT Project No. C040-042 (21233)
Horiz. Scale:	Vert. Scale:				Revised:	Designer: NAB / Detailer: KDL / Structure Numbers	Sheet Number
Unit Information	Unit Leader				Void:	Sheet Subset: STORM / Subset Sheets: SD-1.02	13 OF 58

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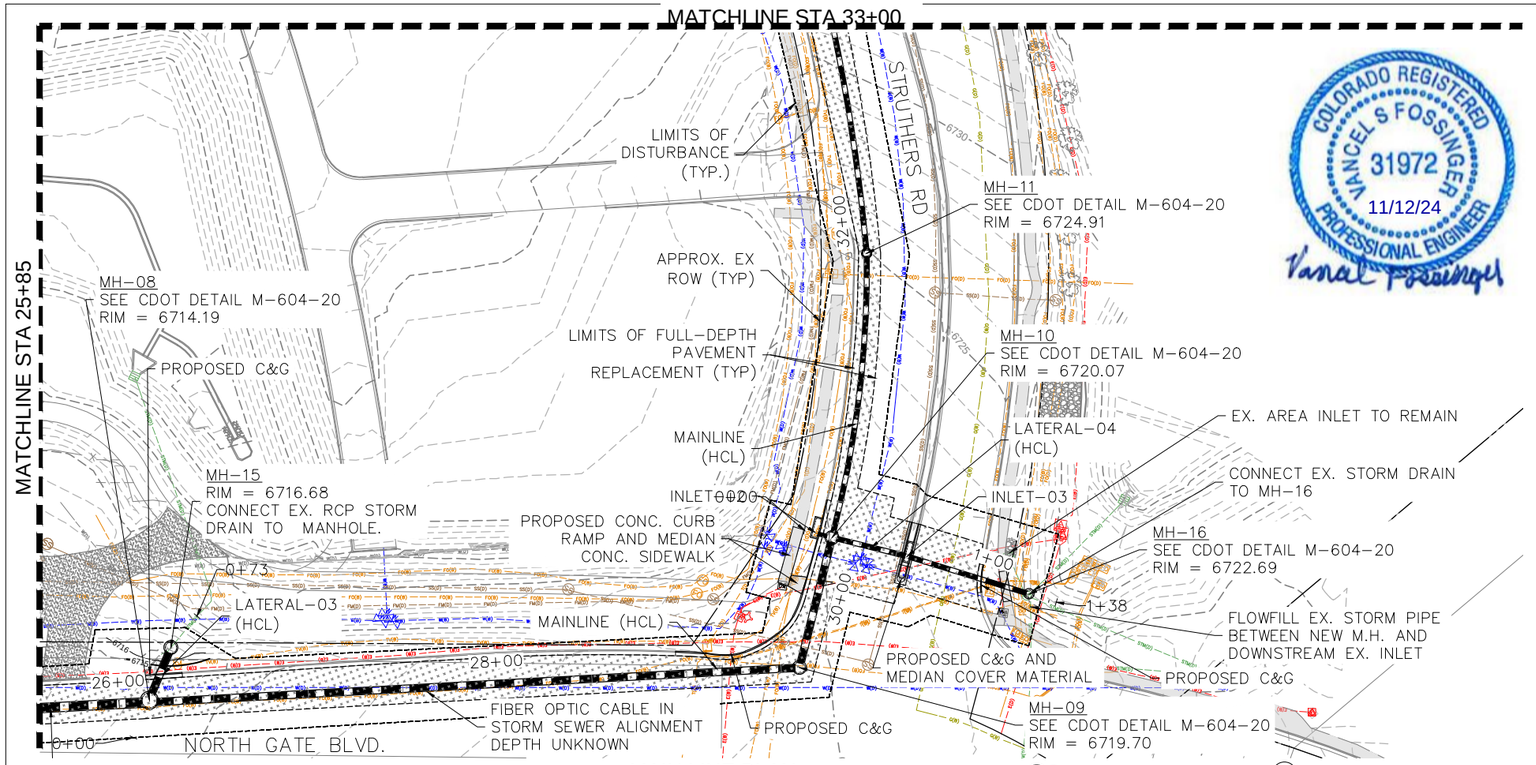
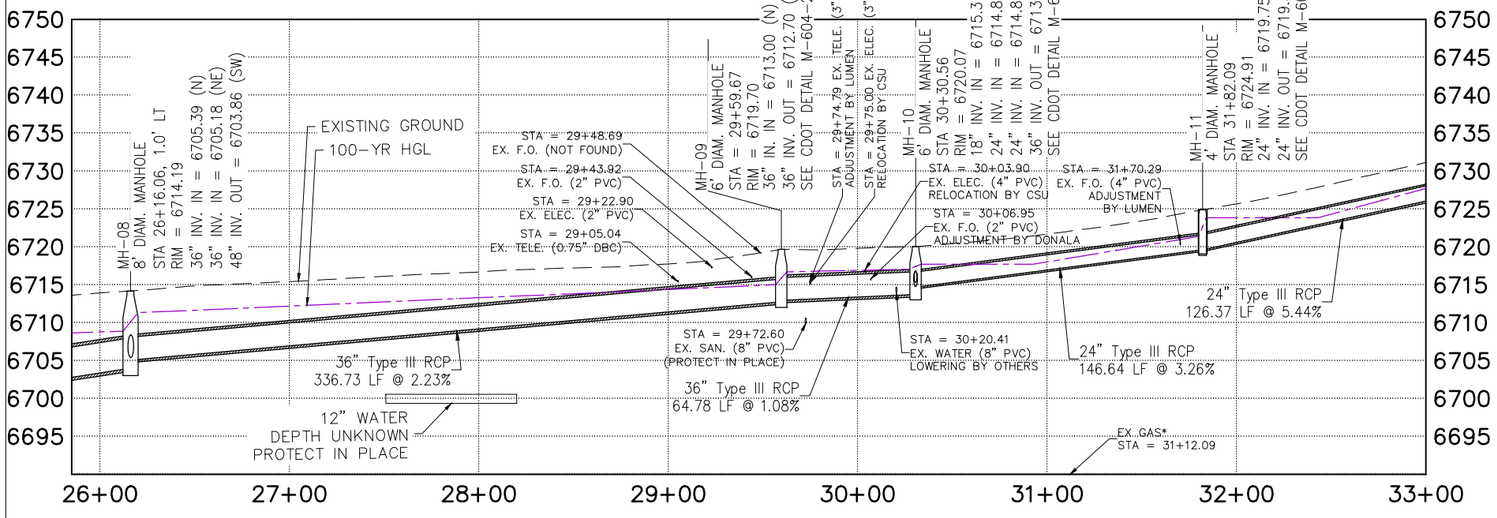
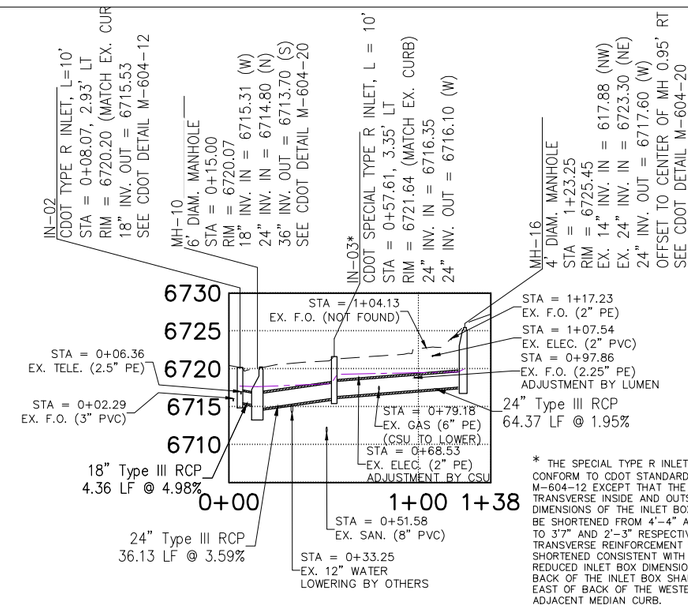


NOTE: SEE UTILITY PLANS FOR FURTHER EXISTING UTILITY INFORMATION

MAIN LINE PLAN

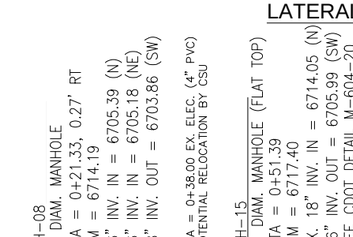


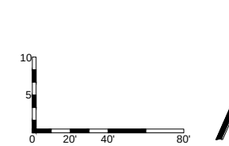
MAIN LINE PROFILE STA 25+85 TO 33+00



* THE SPECIAL TYPE R INLET SHALL CONFORM TO CDOT STANDARD PLAN M-604-12 EXCEPT THAT THE TRANSVERSE INSIDE AND OUTSIDE DIMENSIONS OF THE INLET BOX SHALL BE SHORTENED FROM 4'-4" AND 3'-0" TO 3'7" AND 2'-3" RESPECTIVELY. TRANSVERSE REINFORCEMENT SHALL BE SHORTENED CONSISTENT WITH THE REDUCED INLET BOX DIMENSIONS. THE BACK OF THE INLET BOX SHALL BE EAST OF BACK OF THE WESTERN ADJACENT MEDIAN CURB.

LATERAL-04 PROFILE





NOTES:

1. PIPE LENGTHS ARE MEASURED TO HORIZONTAL DEFLECTION POINT OF BENDS AND TO INNER FACE OF MANHOLE OR INLET.
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LATERAL-03 PROFILE

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Unit Information	Unit Leader				Void:

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STORM DRAIN PLAN AND PROFILE

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	STORM	Subset Sheets:	SD-1.03

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

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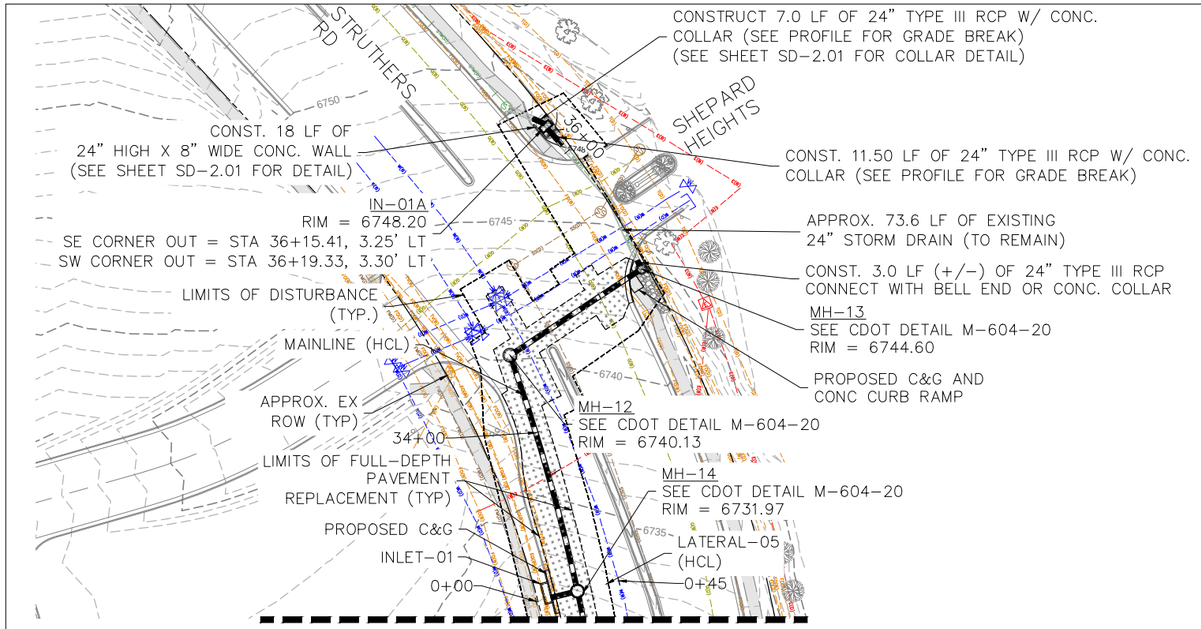

MATCHLINE STA 33+00

MAIN LINE PLAN

NOTE: SEE UTILITY PLANS FOR FURTHER EXISTING UTILITY INFORMATION

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1. PIPE LENGTHS ARE MEASURED TO HORIZONTAL DEFLECTION POINT OF BENDS AND TO INNER FACE OF MANHOLE OR INLET.
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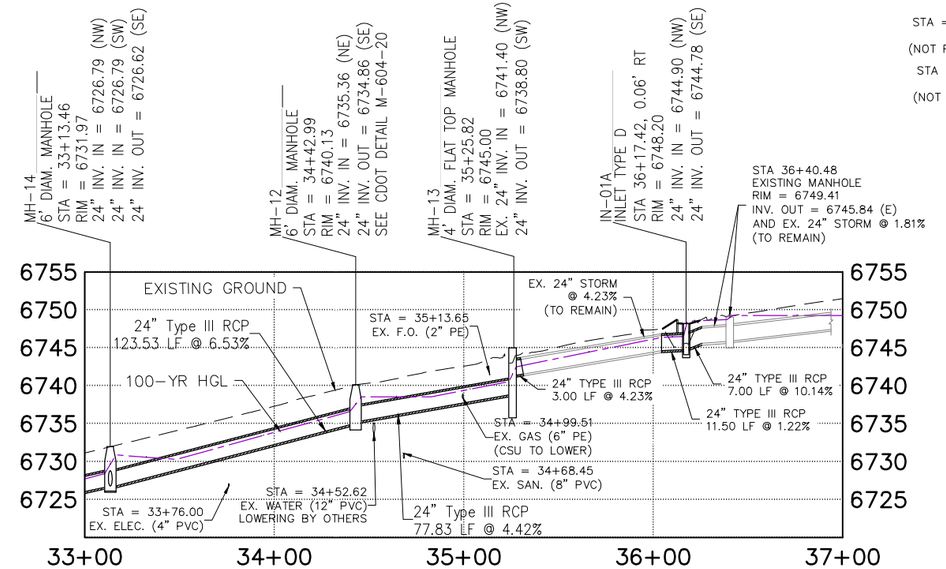
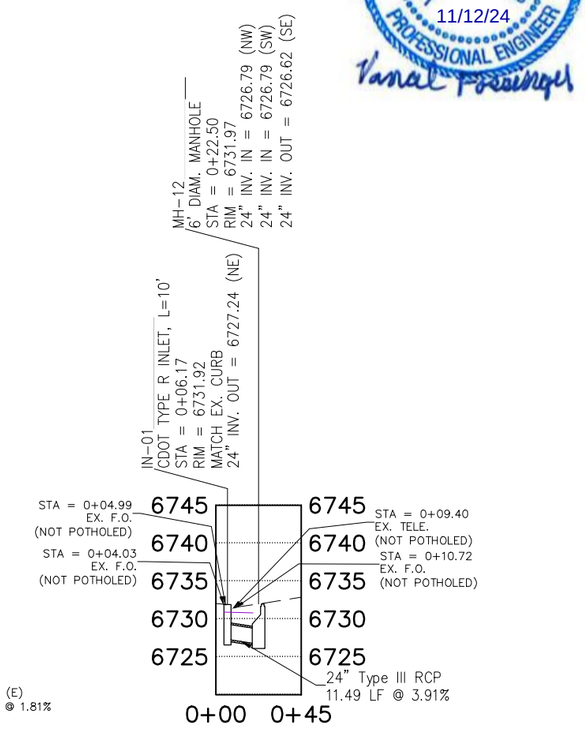


MAIN LINE PROFILE STA 33+00 TO 37+00



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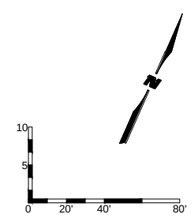

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Print Date: November 12, 2024	Sheet Revisions			
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STORM DRAIN PLAN AND PROFILE

Designer: NAB
Detailer: KDL
Sheet Subset: STORM
Structure Numbers:
Subset Sheets: SD-1.04

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
15 OF 58

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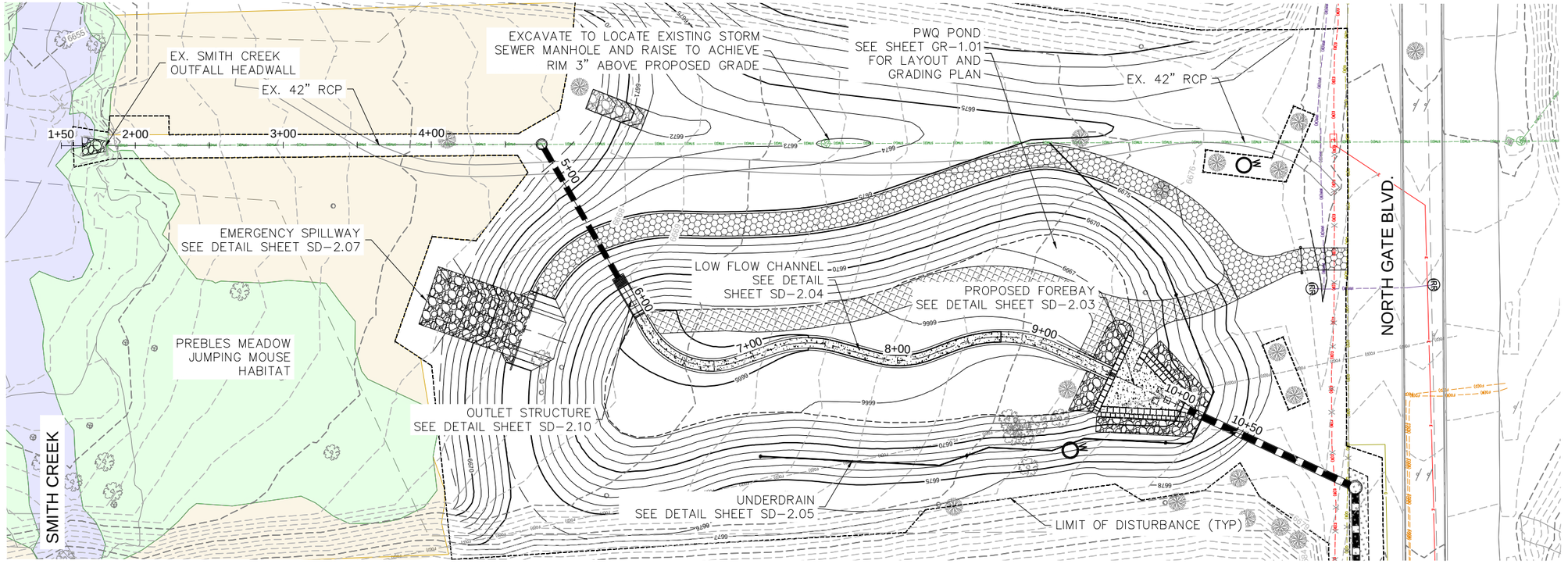


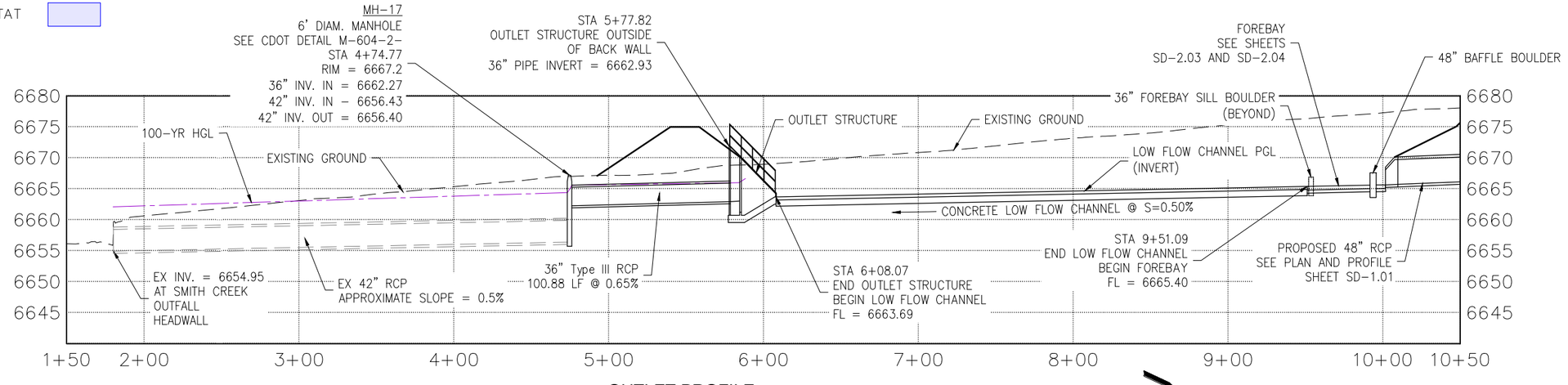
OUTLET PLAN

LEGEND

HIGH QUALITY PMJM HABITAT

PMJM HABITAT UPLAND AREA

OPEN WATERS IN PMJM HABITAT



OUTLET PROFILE

40 0 40 80
FEET

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File Name: 1.05 STM - POND & OUTLET.DWG	Date:	Comments	Init.
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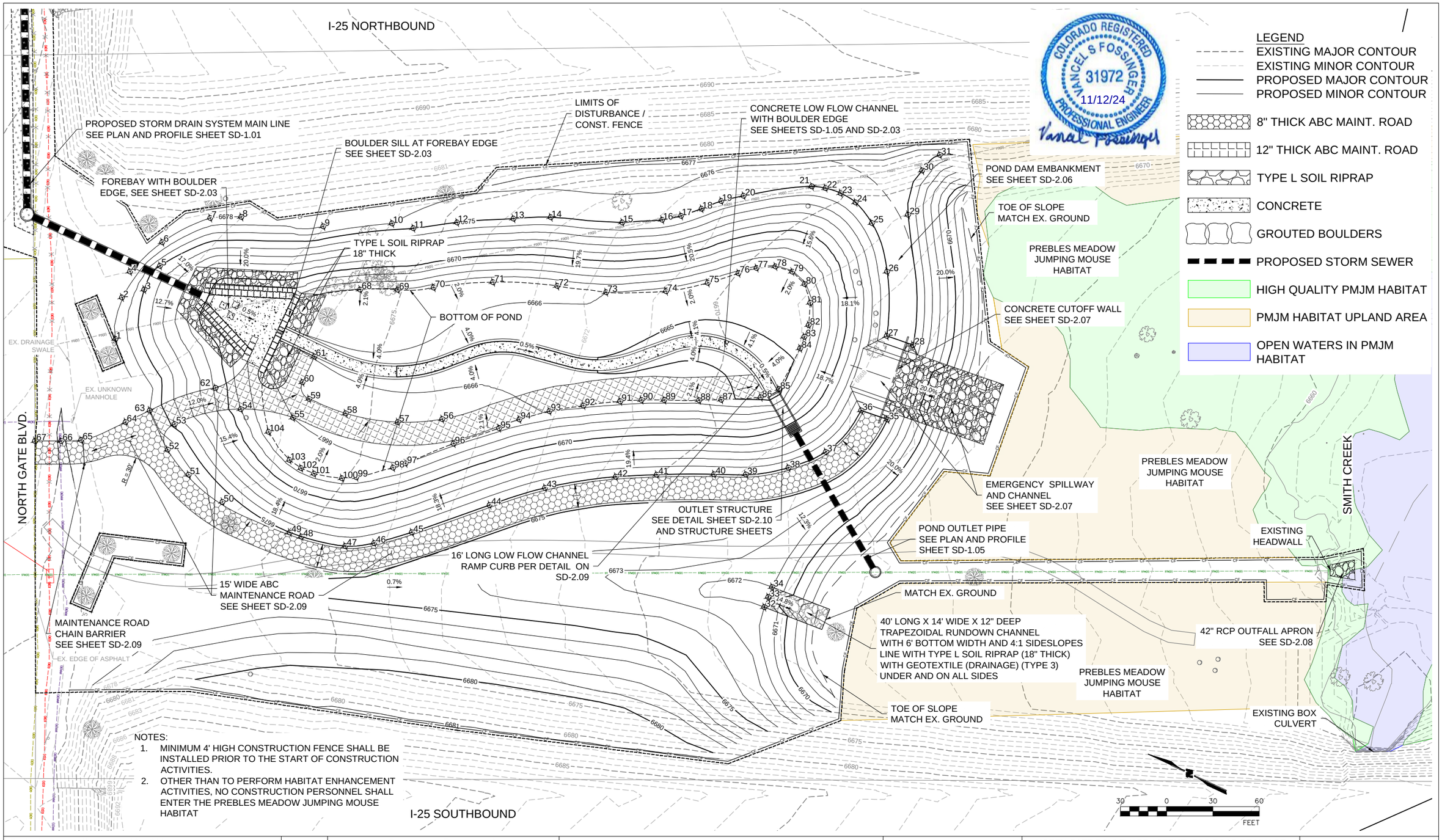
No Revisions:	POND AND OUTLET PLAN AND PROFILE		CDOT Project No. C040-042 (21233)
Revised:	Designer: NAB	Structure Numbers	Sheet Number
Void:	Detailer: KDL		16 OF 58
	Sheet Subset: STORM	Subset Sheets: SD-1.05	

11/12/2024 C:\Users\mgarcter\appdata\local\bentley\projectwise\wc1_projects\d039884221.05 STM - POND & OUTLET.dwg



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Print Date: November 12, 2024	Sheet Revisions		
File Name: 1.01 DTN-GRADING PLAN.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GRADING & LAYOUT PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GRADING	Subset Sheets:	GR-1.01

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

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POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
1	TOP OF SLOPE	6677.00	435577.58	190504.15
2	TOP OF SLOPE	6677.00	435585.19	190530.28
3	TOP OF SLOPE	6675.00	435574.23	190540.99
4	TOP OF SLOPE	6678.00	435587.56	190547.69
5	TOP OF SLOPE	6675.00	435571.52	190559.29
6	TOP OF SLOPE	6678.00	435576.66	190573.75
7	TOP OF SLOPE	6678.00	435555.08	190601.11
8	TOP OF SLOPE	6678.00	435537.12	190610.28
9	TOP OF SLOPE	6677.00	435486.38	190627.16
10	TOP OF SLOPE	6676.00	435446.77	190647.73
11	TOP OF SLOPE	6675.00	435433.00	190650.76
12	TOP OF SLOPE	6675.00	435408.85	190666.14
13	TOP OF SLOPE	6675.00	435376.81	190683.85
14	TOP OF SLOPE	6675.00	435355.29	190694.83
15	TOP OF SLOPE	6675.00	435311.85	190711.40
16	TOP OF SLOPE	6675.00	435289.16	190723.85
17	TOP OF SLOPE	6675.00	435279.14	190731.36
18	TOP OF SLOPE	6675.00	435269.04	190741.16
19	TOP OF SLOPE	6675.00	435259.58	190751.03
20	TOP OF SLOPE	6675.00	435247.95	190760.21

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
21	TOP OF SLOPE	6675.00	435210.36	190784.47
22	TOP OF SLOPE	6675.00	435201.86	190787.21
23	TOP OF SLOPE	6674.99	435191.57	190788.34
24	TOP OF SLOPE	6675.00	435180.33	190787.05
25	TOP OF SLOPE	6675.00	435165.06	190779.38
26	TOP OF SLOPE	6675.00	435142.84	190755.02
27	TOP OF SLOPE	6675.00	435125.47	190717.11
28	TOP OF SLOPE	6675.00	435107.57	190718.96
29	TOP OF SLOPE	6675.00	435146.13	190794.09
30	TOP OF SLOPE	6675.00	435149.95	190823.99
31	TOP OF SLOPE	6675.00	435143.89	190838.02
32	TOP OF SLOPE	6672.00	435123.09	190524.31
33	TOP OF SLOPE	6671.00	435123.56	190531.29
34	TOP OF SLOPE	6672.00	435124.03	190538.28
35	TOP OF SLOPE	6675.00	435102.15	190668.25
36	TOP OF SLOPE	6675.00	435120.06	190666.40
37	TOP OF SLOPE	6675.00	435129.51	190632.30
38	TOP OF SLOPE	6675.00	435147.11	190612.82
39	TOP OF SLOPE	6675.00	435170.24	190597.23
40	TOP OF SLOPE	6675.00	435189.01	190588.56

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
41	TOP OF SLOPE	6675.00	435222.55	190572.64
42	TOP OF SLOPE	6675.00	435246.02	190560.20
43	TOP OF SLOPE	6674.99	435284.59	190534.28
44	TOP OF SLOPE	6675.00	435312.42	190509.03
45	TOP OF SLOPE	6675.00	435350.64	190471.70
46	TOP OF SLOPE	6675.00	435369.81	190455.12
47	TOP OF SLOPE	6675.00	435385.96	190445.43
48	TOP OF SLOPE	6675.00	435414.26	190439.00
49	TOP OF SLOPE	6675.00	435422.20	190438.19
50	TOP OF SLOPE	6675.53	435470.17	190437.77
51	TOP OF SLOPE	6676.01	435497.41	190444.43
52	TOP OF SLOPE	6676.02	435516.65	190453.40
53	EDGE OF MAINTENANCE ROAD	6674.70	435519.48	190470.38
54	EDGE OF MAINTENANCE ROAD	6669.00	435484.79	190497.23
55	EDGE OF MAINTENANCE ROAD	6666.99	435451.76	190506.56
56	EDGE OF MAINTENANCE ROAD	6666.50	435363.79	190546.53
57	EDGE OF MAINTENANCE ROAD	6666.43	435389.01	190532.63
58	EDGE OF MAINTENANCE ROAD	6666.50	435422.03	190523.51
59	EDGE OF MAINTENANCE ROAD	6666.59	435447.46	190521.96
60	EDGE OF MAINTENANCE ROAD	6666.43	435455.92	190529.94

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
61	EDGE OF MAINTENANCE ROAD	6665.99	435455.92	190548.32
62	EDGE OF MAINTENANCE ROAD	6670.84	435505.43	190502.79
63	EDGE OF MAINTENANCE ROAD	6676.00	435537.91	190471.51
64	EDGE OF MAINTENANCE ROAD	6677.00	435548.91	190458.00
65	EDGE OF MAINTENANCE ROAD	6676.03	435570.08	190435.37
66	EDGE OF MAINTENANCE ROAD	6674.78	435581.58	190429.32
67	EDGE OF MAINTENANCE ROAD	6676.52	435596.93	190422.15
68	TOE OF SLOPE	6667.00	435447.44	190600.17
69	TOE OF SLOPE	6666.98	435425.34	190610.31
70	TOE OF SLOPE	6666.93	435404.85	190621.47
71	TOE OF SLOPE	6666.84	435371.43	190640.90
72	TOE OF SLOPE	6666.75	435332.67	190656.24
73	TOE OF SLOPE	6666.00	435302.22	190665.95
74	TOE OF SLOPE	6665.92	435267.32	190682.96
75	TOE OF SLOPE	6665.91	435245.10	190699.29
76	TOE OF SLOPE	6665.95	435229.74	190713.32
77	TOE OF SLOPE	6665.97	435220.51	190721.42
78	TOE OF SLOPE	6665.98	435209.87	190727.49
79	TOE OF SLOPE	6666.00	435198.54	190729.03
80	TOE OF SLOPE	6666.00	435187.89	190725.11

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
81	TOE OF SLOPE	6665.96	435179.48	190715.61
82	TOE OF SLOPE	6665.89	435174.28	190702.11
83	TOE OF SLOPE	6665.73	435173.60	190694.10
84	TOE OF SLOPE	6665.68	435172.91	190686.09
85	TOE OF SLOPE	6664.16	435174.25	190656.41
86	TOE OF SLOPE	6664.66	435182.70	190646.62
87	TOE OF SLOPE	6665.69	435205.22	190634.32
88	TOE OF SLOPE	6665.92	435218.06	190627.97
89	TOE OF SLOPE	6665.91	435238.55	190618.56
90	TOE OF SLOPE	6665.89	435251.91	190612.35
91	TOE OF SLOPE	6665.89	435264.06	190605.76
92	TOE OF SLOPE	6665.94	435284.45	190593.20
93	TOE OF SLOPE	6666.00	435302.99	190580.53
94	TOE OF SLOPE	6666.76	435318.41	190567.49
95	TOE OF SLOPE	6666.93	435327.83	190556.82
96	TOE OF SLOPE	6666.96	435350.35	190535.34
97	TOE OF SLOPE	6667.00	435373.18	190510.51
98	TOE OF SLOPE	6667.35	435379.32	190504.61
99	TOE OF SLOPE	6667.78	435398.30	190488.89
100	TOE OF SLOPE	6667.84	435406.42	190484.37

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
101	TOE OF SLOPE	6667.89	435424.05	190479.43
102	TOE OF SLOPE	6667.89	435433.20	190479.09
103	TOE OF SLOPE	6667.89	435442.25	190480.71
104	TOE OF SLOPE	6667.78	435462.25	190491.51

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11/12/2024

Print Date: November 12, 2024
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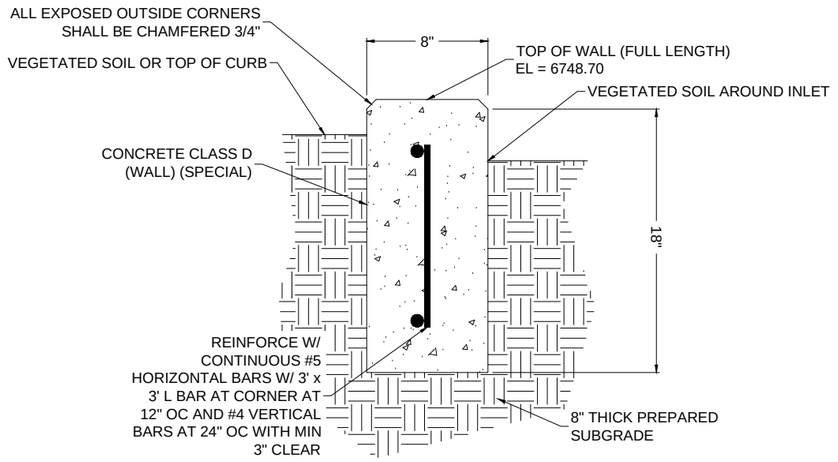
NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GRADING POINT TABLES

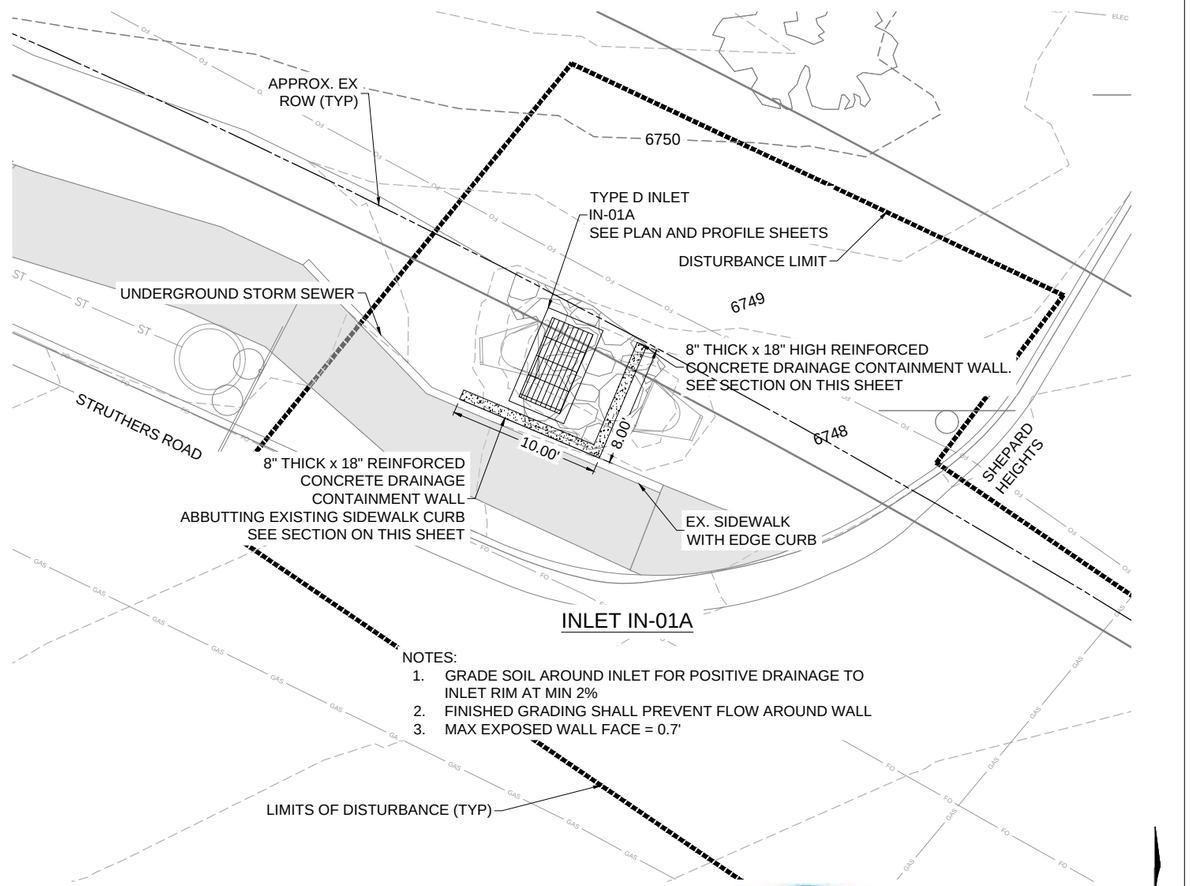
Designer: NAB
Detailer: KDL
Sheet Subset: GRADING
Structure Numbers:
Subset Sheets: GR-1.02

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
18 OF 58

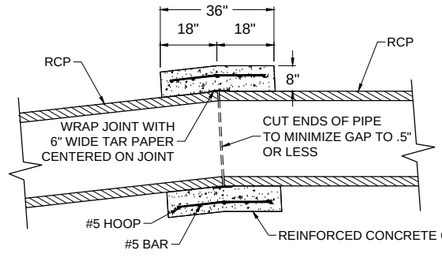


DRAINAGE CONTAINMENT WALL SECTION



INLET IN-01A

NOTES:
1. GRADE SOIL AROUND INLET FOR POSITIVE DRAINAGE TO INLET RIM AT MIN 2%
2. FINISHED GRADING SHALL PREVENT FLOW AROUND WALL
3. MAX EXPOSED WALL FACE = 0.7'



CONCRETE COLLAR FOR RCP SPECIAL CONNECTIONS SECTION

NOTES:
1. ALIGN INSIDE SURFACES OF PIPES @ THE JOINT
2. COLLAR AND REINFORCEMENT IS TO BE CONTINUOUS AROUND PIPES
3. REINFORCE WITH 5 - #5 BAR HOOPS AROUND PIPES AT 9" OC. HOOP BARS SHOULD HAVE MIN. 12" OVERLAP AT CLOSURE
4. ATTACH #5 BARS PERPENDICULAR TO HOOP BARS @ 12" OC.

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INLET IN-01A DRAINAGE CONTAINMENT WALL & PIPE COLLAR DETAILS

Print Date: November 12, 2024	Sheet Revisions			As Constructed
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
DETENTION DETAILS

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	DETAILS	Subset Sheets:	SD 2.01

Project No./Code
CDOT Project No. C040-042 (21233)

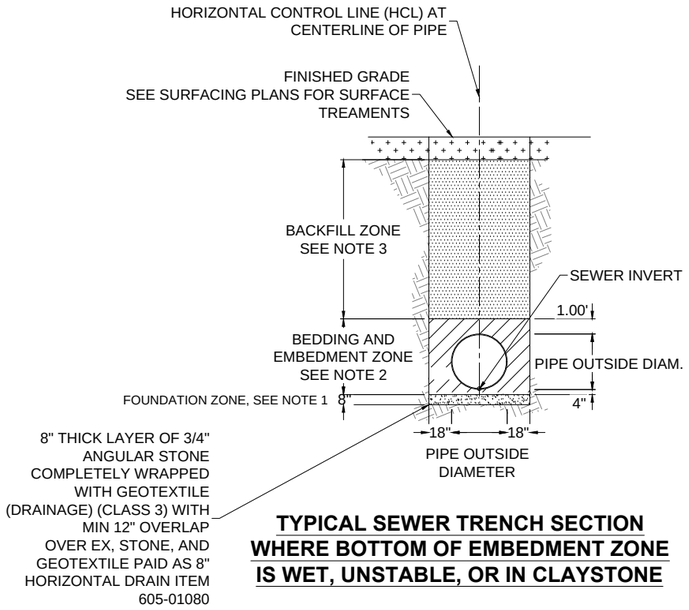
Sheet Number
19 OF 58

STORM SEWER TRENCH & BEDDING NOTES

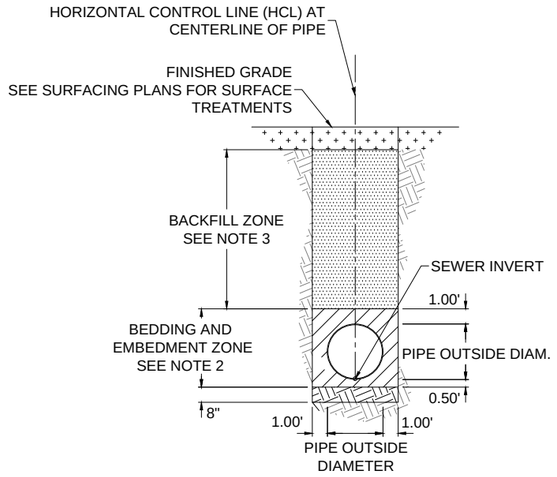
1. THE BOTTOM OF THE TRENCH SHALL BE FIRM, STABLE & UNIFORM. IF UNSTABLE SOIL OR CLAYSTONE IS PRESENT AT THE BOTTOM OF THE BEDDING & EMBEDMENT ZONE, OVER-EXCAVATION TO 12" BELOW THE BOTTOM OF THE PIPE (8" BELOW THE BEDDING AND EMBEDMENT ZONE) AND PLACEMENT OF AN 8" THICK LAYER OF ¾" ANGULAR STONE WRAPPED IN GEOTEXTILE (DRAINAGE) (CLASS 3) WITH 12" OVERLAP IN THE BOTTOM WILL BE REQUIRED. IN ORDER FOR THIS SPECIAL FOUNDATION ZONE TREATMENT TO BE PAID FOR, WRITTEN AUTHORIZATION BY THE COUNTY'S INSPECTOR MUST BE COMPLETED PRIOR TO ITS IMPLEMENTATION AND THE TREATMENT MUST BE COMPLETED TO THE SATISFACTION OF THE COUNTY'S INSPECTOR.

2. FILL MATERIAL USED IN THE BEDDING AND EMBEDMENT ZONE SHALL BE ONSITE OR INPORTED GRANULAR SOILS CONFORMING TO AASHTO A-1, A-2-OR A-3 SOILS CLASSIFICATIONS. THE MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% MAXIMUM STANDARD PROCTOR DENSITY PER ASTM D698 FOR COURSE GRAINED SOILS. THIS ZONE SHALL BE COMPACTED VIA HAND TAMPING.

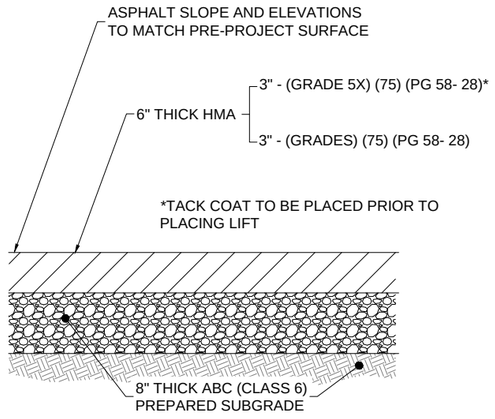
3. ONSITE-SOILS (EXCLUDING CLAYSTONE, AND HIGHLY PLASTIC CLAYS) MAY BE USED IN THE BACKFILL ZONE. DRYING MAY BE REQUIRED TO ACHIEVE PROPER COMPACTION. THE MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 98% MAXIMUM STANDARD PROCTOR DENSITY PER ASTM D698 FOR COURSE GRAINED SOILS. IMPORTED SOILS CONFORMING TO THE STANDARDS FOR ENGINEERED FILL IN THE PROJECT GEOTECHNICAL ENGINEERING REPORT MAY ALSO BE UTILIZED IN THIS ZONE.



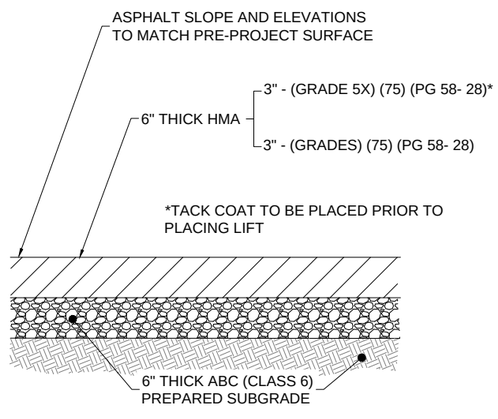
TYPICAL SEWER TRENCH SECTION WHERE BOTTOM OF EMBEDMENT ZONE IS WET, UNSTABLE, OR IN CLAYSTONE



TYPICAL SEWER TRENCH SECTION WHERE BOTTOM OF EMBEDMENT ZONE IS STABLE AND FREE OF CLAYSTONE AND WATER



TYPICAL ASPHALT PATCHING SECTION FOR NORTHGATE BLVD.



TYPICAL ASPHALT PATCHING SECTION FOR STRUTHERS RD.

TRENCH & PAVEMENT DETAILS AND NOTES

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

DRAINAGE DETAILS

Designer:	NAB	Structure Numbers	
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Project No./Code: CDOT Project No. C040-042 (21233)

Sheet Number: 20 OF 58

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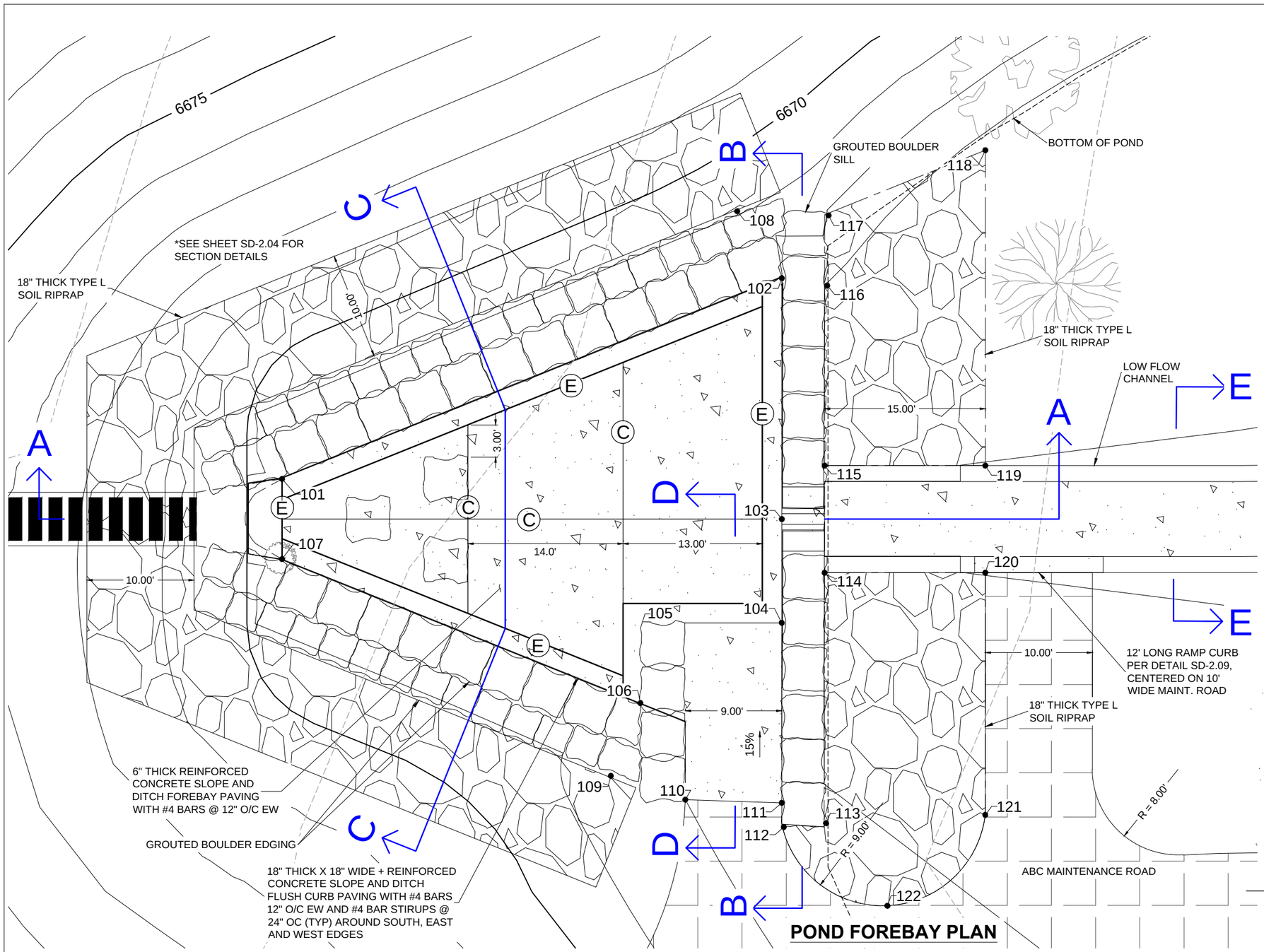
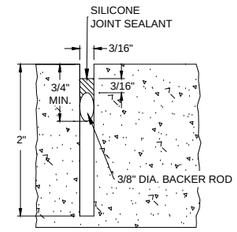
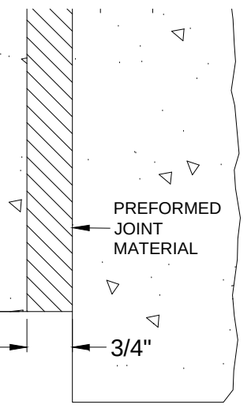
11/12/2024

POINT TABLE				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
101	Invert Pavement Edge	6665.65	435531.57	190557.07
102	Invert Pavement Edge	6665.54	435484.92	190575.82
103	Invert Pavement Edge	6665.42	435484.92	190553.32
104	Invert Pavement Edge	6665.47	435484.92	190543.63
105	Invert Pavement Edge	6665.53	435497.91	190543.74
106	Invert Pavement Edge	6665.57	435498.12	190536.14
107	Invert Pavement Edge	6665.65	435531.57	190549.58
108	Ground/Riprap	6669.10	435489.08	190582.07
109	Ground/Riprap	6669.10	435500.87	190529.34
110	Concrete Ramp Corner	6668.00	435493.92	190527.12
111	Concrete Ramp Corner	6667.92	435484.92	190526.82
112	Edge of Maint. Road	6667.90	435484.73	190524.57
113	Riprap at Boulder Sill	6667.20	435480.78	190524.92
114	Riprap at Low Flow Chain	6666.10	435480.92	190548.32
115	Riprap at Low Flow Chain	6666.10	435480.92	190558.32
116	Riprap at Boulder Sill	6667.00	435480.68	190575.13
117	Riprap at Boulder Sill	6668.00	435480.54	190581.67
118	Riprap/Soil	6667.00	435465.92	190587.76
119	Riprap/Soil at Low Flow Channel	6666.00	435465.92	190558.32
120	Riprap/Soil at Low Flow Channel	6666.00	435465.92	190548.32
121	Riprap/Soil	6666.80	435465.93	190525.69
122	Riprap at Maint. Road	6667.40	435475.06	190517.21







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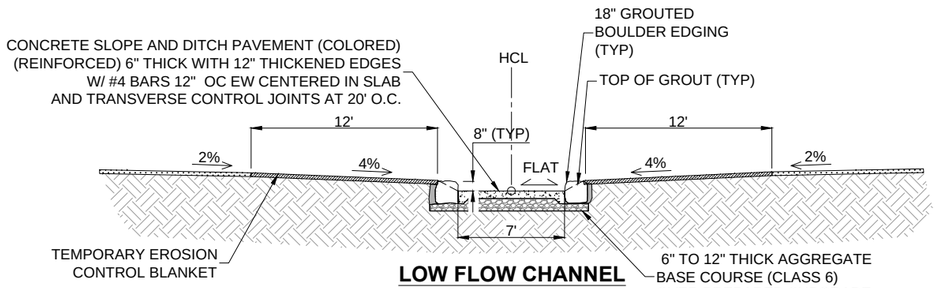
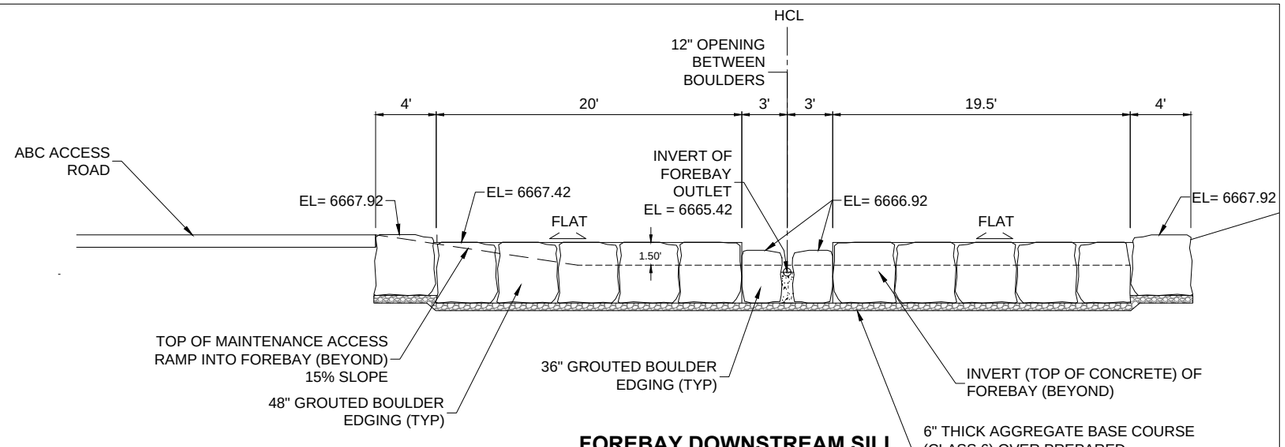
CONCRETE AND GROUT NOTES:

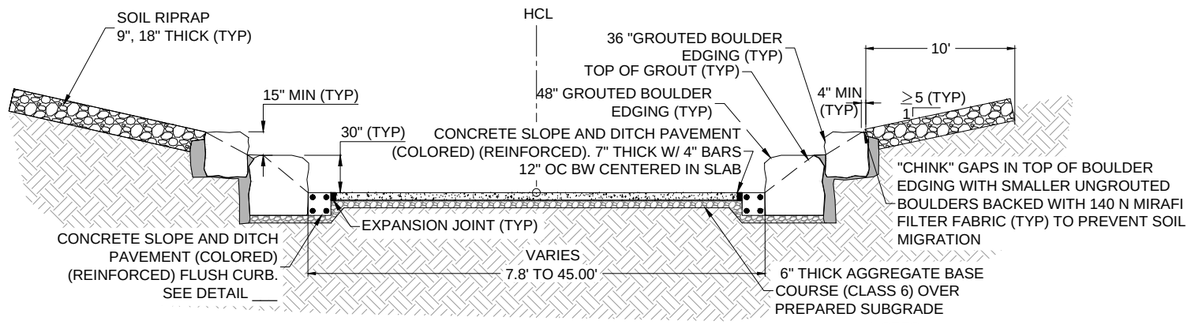
1. WHERE COLORED CONCRETE IS INDICATED, COLOR SHALL BE DAVIS COLORS OMAHA TAN 5084.
2. ALL EXPOSED GROUT SHALL BE COLORED WITH DAVIS COLORS OMAHA TAN 5084.
3. SMALLER ANGULAR STONE SHALL BE PLACED TO REDUCE GAPS BETWEEN STONES PRIOR TO PLACEMENT OF GROUT. TO THE EXTENT PRACTICAL, GROUT SHALL BE RECESSED BEHIND AND BELOW THE SURFACE OF BOULDERS.
4. A MINIMUM 4" WIDE STRIP OF BOULDER OR GROUT SHALL BE CONTINOUS ALONG THE BACKS OF THE BOULDER EDGING AND CENTER OF THE FOREBAY SILL AT THE TOP OF EDGING OR SILL DESIGN ELEVATION.



LOW FLOW CHANNEL TYPICAL SECTION E-E

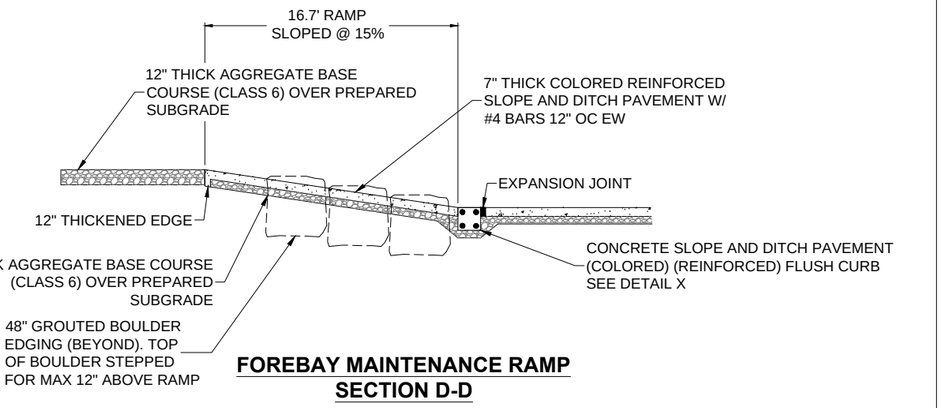


FOREBAY DOWNSTREAM SILL TYPICAL SECTION B-B

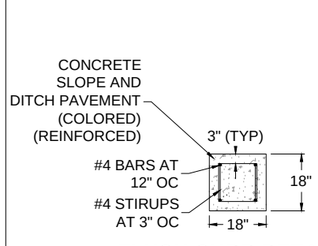


FOREBAY TRANSVERSE SECTION TYPICAL SECTION C-C

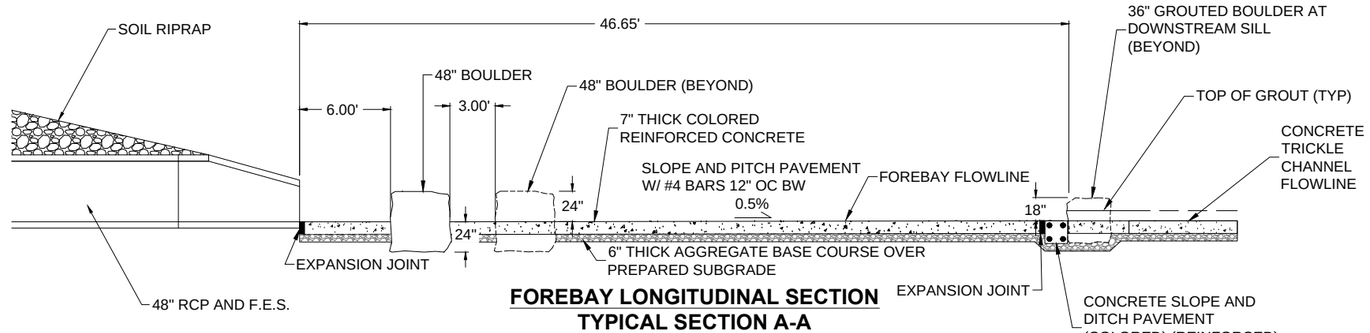
NOTES:
1. SEE SHEET SD-2.04 FOR LOCATION OF SECTIONS



FOREBAY MAINTENANCE RAMP SECTION D-D



FLUSH CURB DETAIL X



FOREBAY LONGITUDINAL SECTION TYPICAL SECTION A-A

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FOREBAY & LOW FLOW CHANNEL DETAILS

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No Revisions:	DRAINAGE DETAILS		CDOT Project No. C040-042 (21233)
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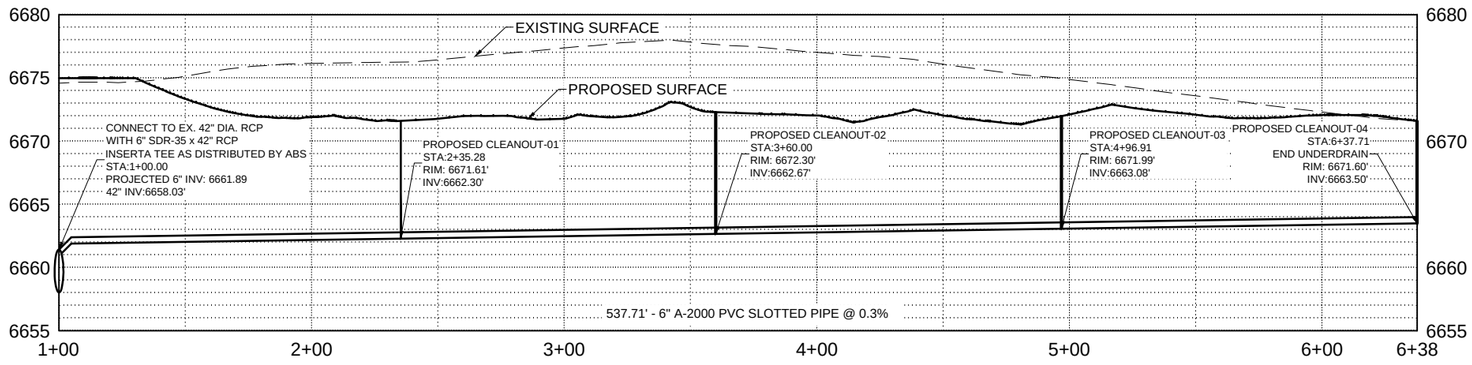
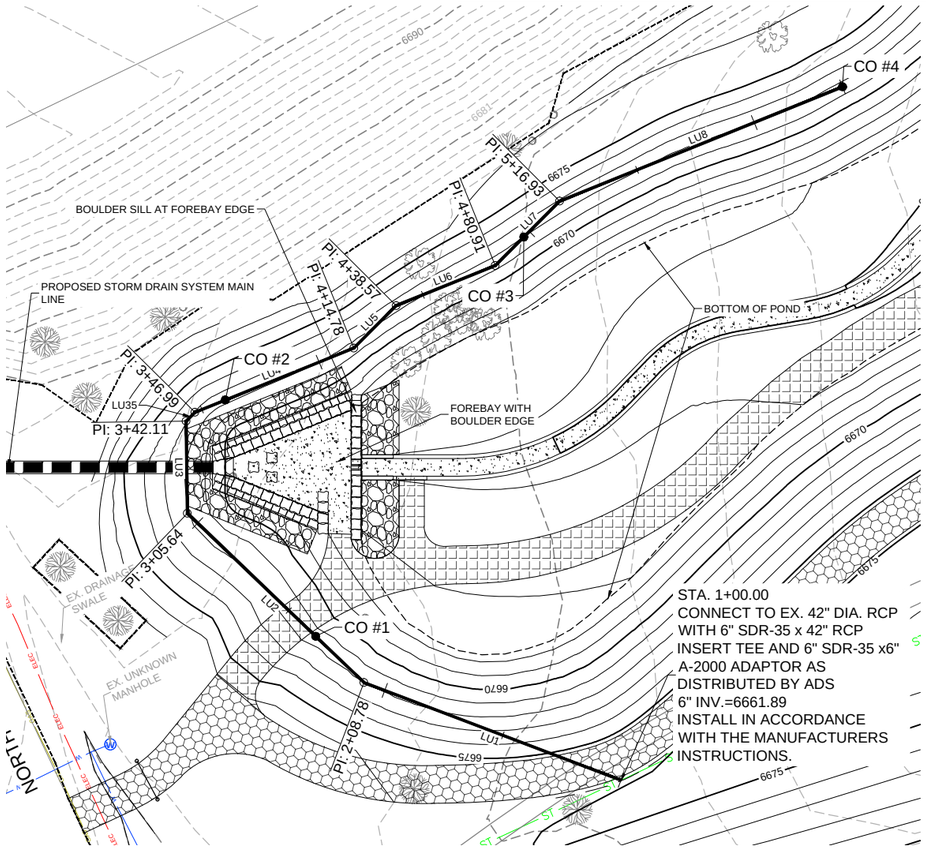
Void:	Detailer: KDL		22 OF 58
	Sheet Subset: DETAILS	Subset Sheets: SD-2.04	

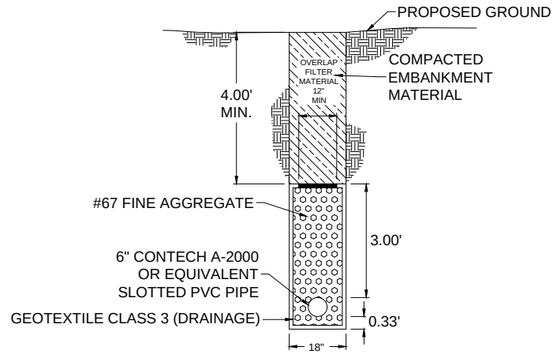


PIPE UNDERDRAIN PROFILE

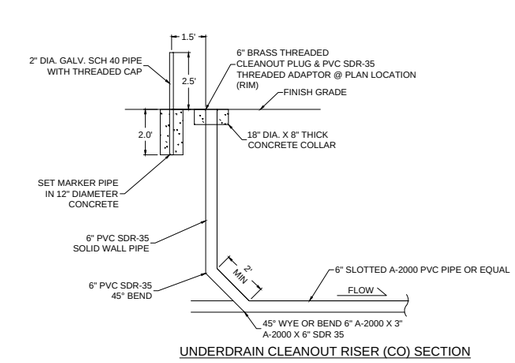
PROPOSED UNDERDRAIN DATA TABLE				
LINE NO.	LENGTH	BEARING	NORTHING	EASTING
LU1	108.78'	N20° 49' 10.70"E	435378.1479 435479.8239	190429.4068 190468.0698
LU2	96.86'	N43° 48' 44.93"E	435479.8239 435549.7165	190468.0698 190535.1237
LU3	36.47'	N89° 16' 36.49"E	435549.7165 435550.1769	190535.1237 190571.5941
LU35	4.88'	S45° 15' 31.95"E	435550.1769 435546.7401	190571.5941 190575.0621
LU4	67.79'	S22° 00' 55.56"E	435546.7401 435483.8905	190575.0621 190600.4747
LU5	23.78'	S45° 04' 52.95"E	435483.8905 435467.0968	190600.4747 190617.3162
LU6	42.34'	S22° 00' 55.56"E	435467.0968 435427.8424	190617.3162 190633.1883
LU7	36.02'	S45° 00' 33.53"E	435427.8424 435402.3786	190633.1883 190658.6604
LU8	120.78'	S22° 00' 55.56"E	435402.3786 435290.4066	190658.6604 190703.9351



PIPE UNDERDRAIN PLAN



PIPE UNDERDRAIN



UNDERDRAIN CLEANOUT RISER (CO) SECTION

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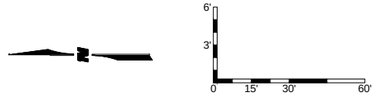

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

DRAINAGE DETAILS

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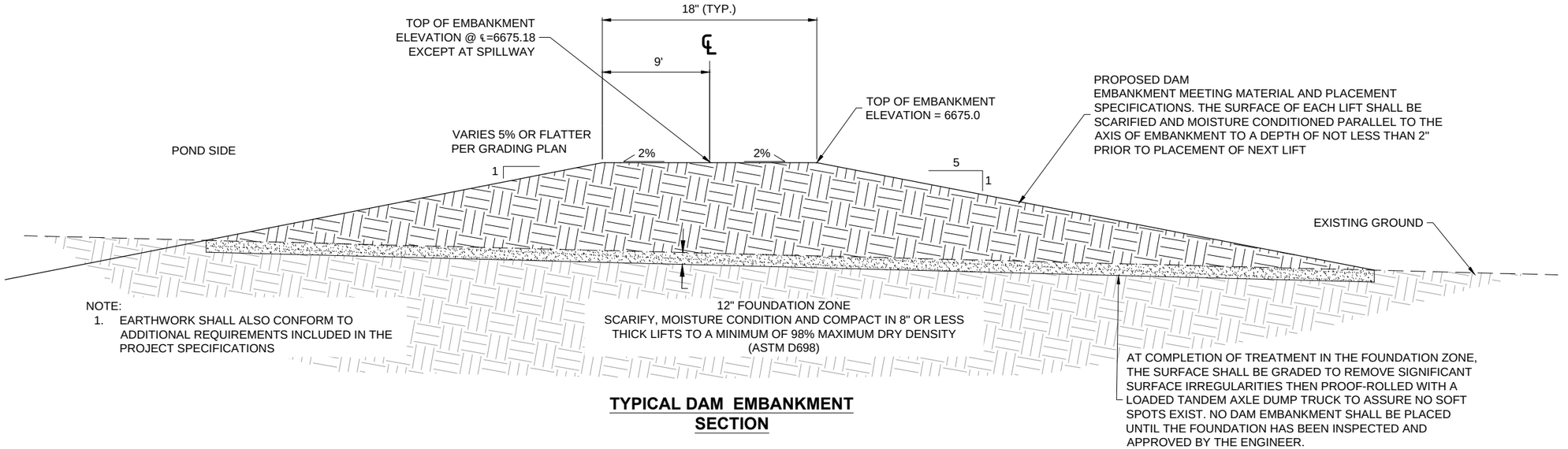
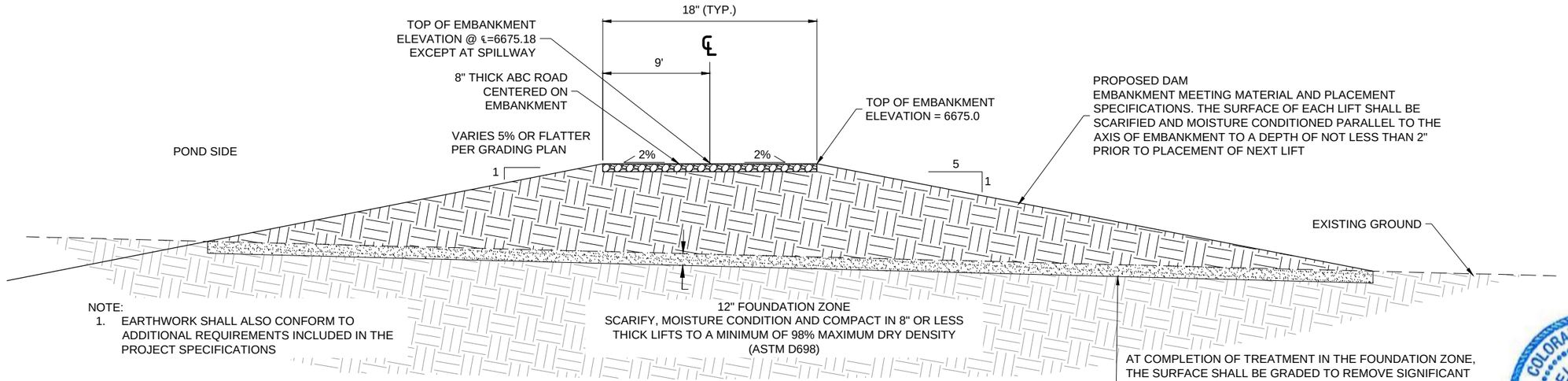


TYPICAL DAM EMBANKMENT SECTION



TYPICAL DAM EMBANKMENT SECTION WITH MAINTENANCE ROAD

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DAM EMBANKMENT SECTIONS

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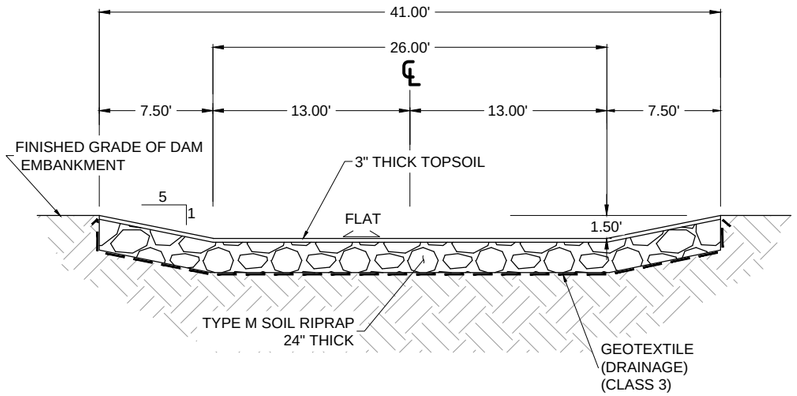
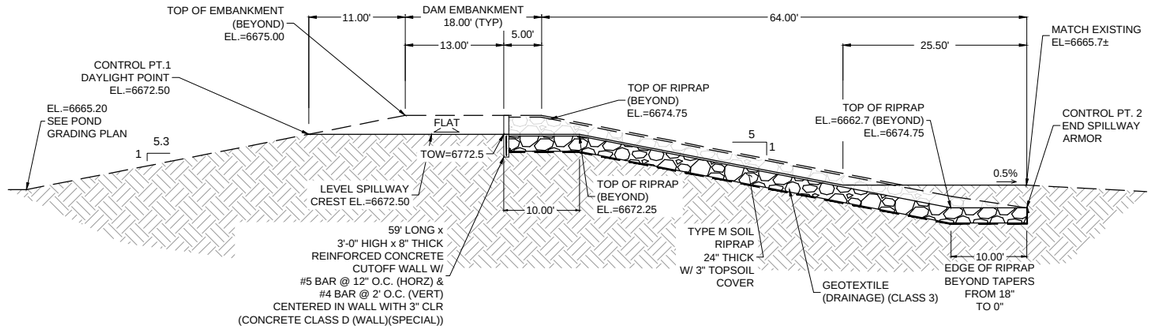
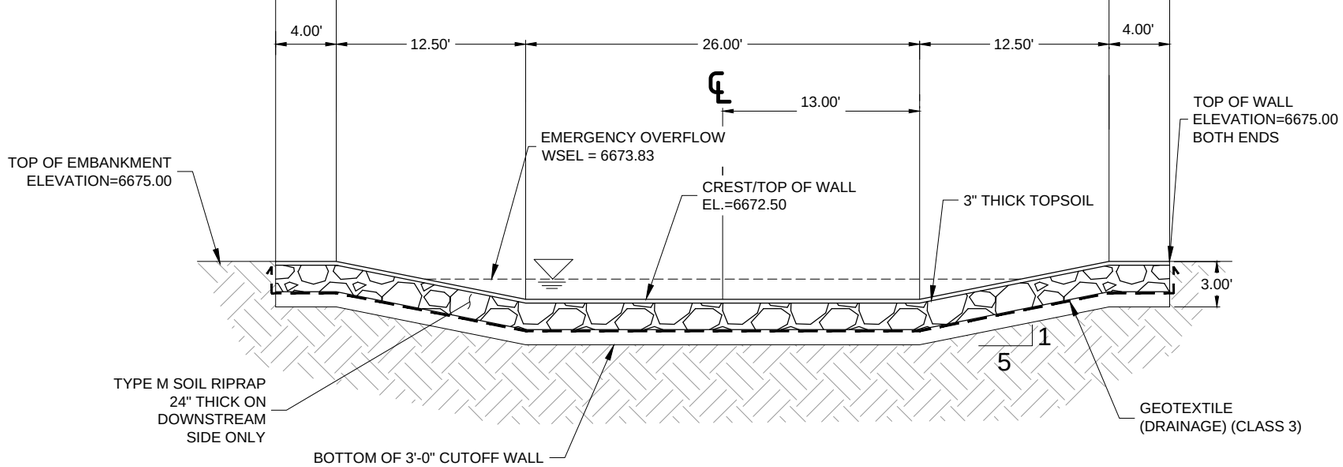
Unit Information Unit Leader						Void:	Project No./Code: CDOT Project No. C040-042 (21233)
							Sheet Number: 24 OF 58



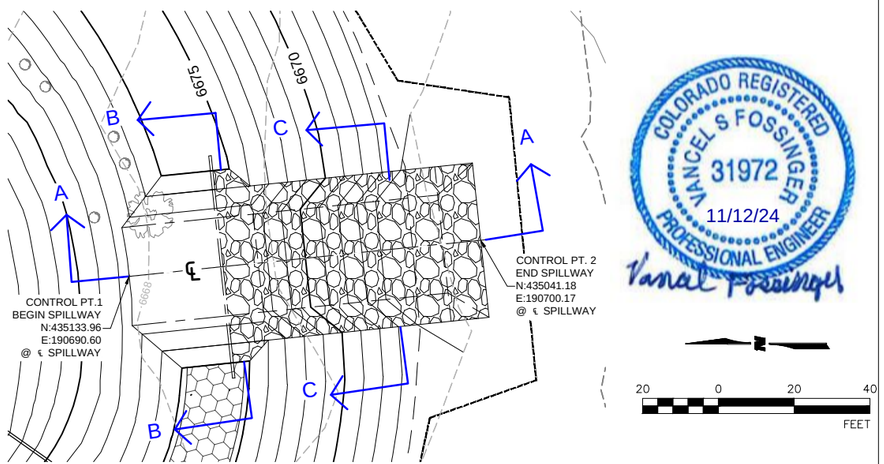
EMERGENCY SPILLWAY RUNDOWN CHANNEL TRANSVERSE SECTION C-C



EMERGENCY SPILLWAY PROFILE AT ℄ OF SPILLWAY SECTION A-A



EMERGENCY SPILLWAY TRANSVERSE SECTION AT CREST CUTOFF WALL SECTION B-B



EMERGENCY SPILLWAY PLAN

COLORADO REGISTERED VANCEL S FOSSINGER 31972 11/12/24 PROFESSIONAL ENGINEER

Print Date: November 12, 2024
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
DRAINAGE DETAILS

Designer: NAB
Detailer: KDL
Sheet Subset: DETAILS
Structure Numbers:
Subset Sheets: SD-2.07

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
25 OF 58

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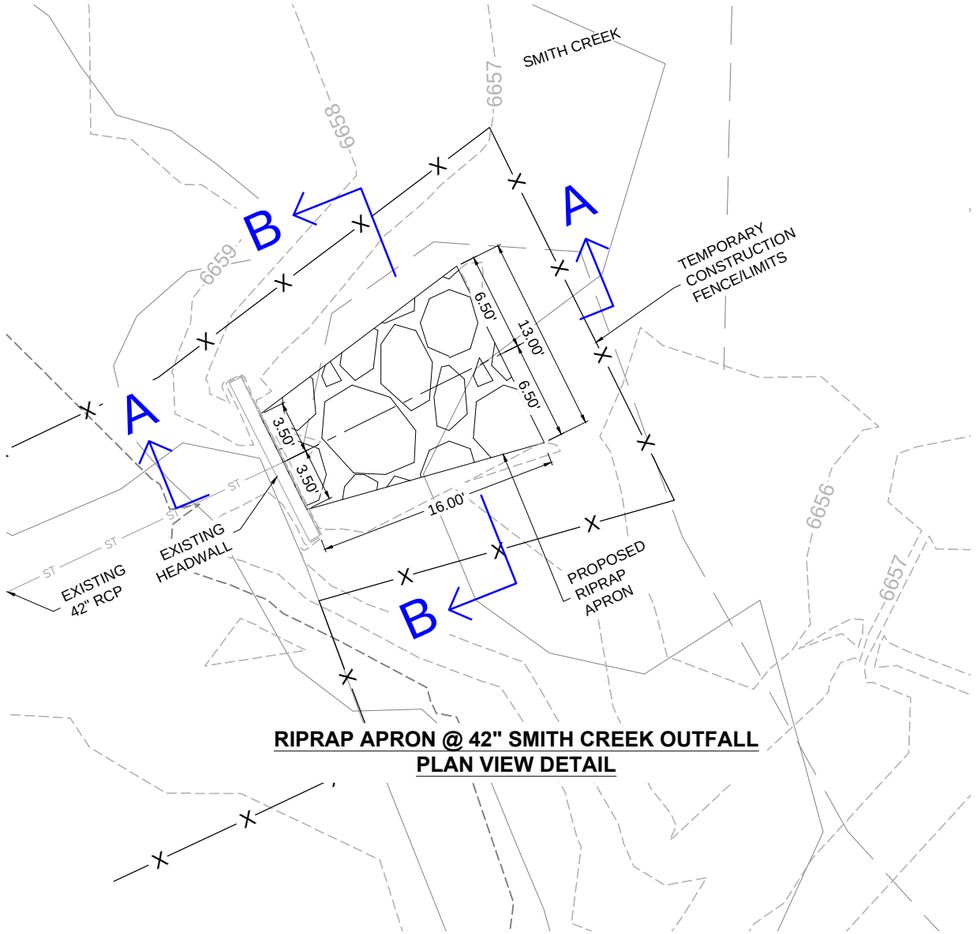
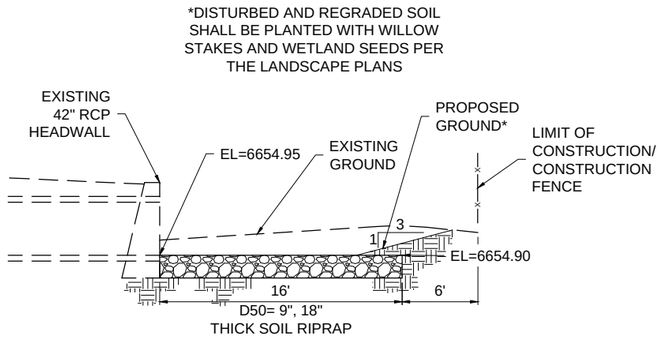
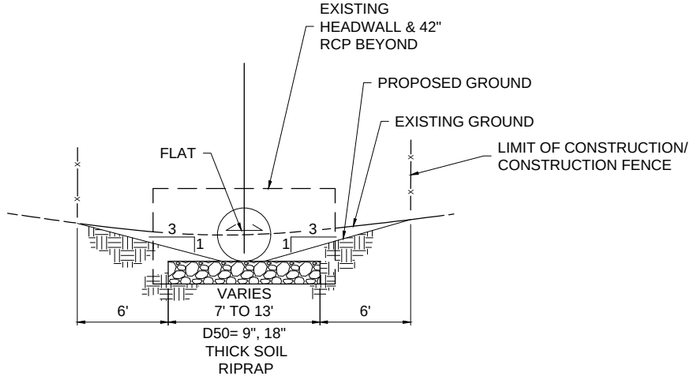


RIPRAP APRON @ 42" SMITH CREEK OUTFALL
PLAN VIEW DETAIL



RIPRAP APRON @ 42" SMITH CREEK OUTFALL
LONGITUDINAL SECTION A-A



RIPRAP APRON @ 42" SMITH CREEK OUTFALL
TRANSVERSE SECTION B-B

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VANCEL S FOSSINGER
31972
11/12/24
PROFESSIONAL ENGINEER

5 0 5 10
FEET

RIPRAP APRON @ 42" OUTFALL TO SMITH CREEK

Print Date: November 12, 2024		Sheet Revisions			As Constructed	NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT	Project No./Code
File Name: 2.08 DTN-DETAILS.DWG		Date:	Comments	Init.	No Revisions:	DRAINAGE DETAILS	CDOT Project No. C040-042 (21233)
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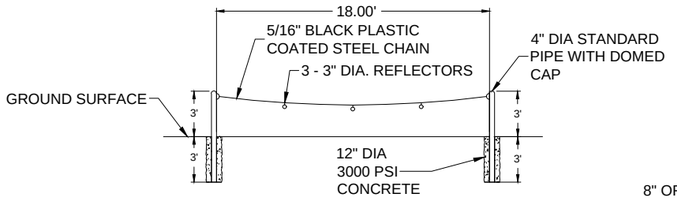
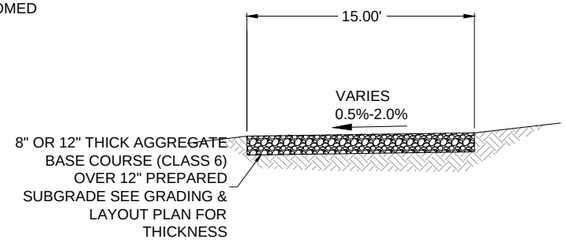


POND MAINTENANCE RD. CHAIN BARRIER

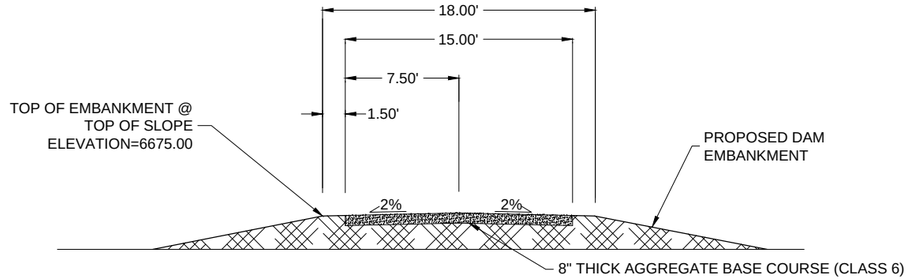
NOTES:

1. LOCATE 32' SOUTH OF THE SOUTH CURB LINE OF NORTH GATE BOULEVARD AND PERPENDICULAR TO MAINTENANCE ROAD.
2. PAINT STEEL PIPE AND LOOPS WITH 1 COAT OF PRIMER AND 2 COATS OF BLACK INDUSTRIAL ENAMEL PAINT



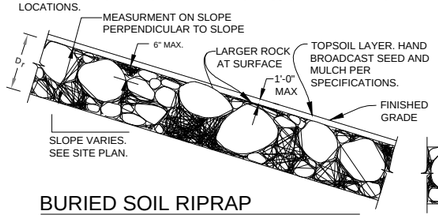
MAINTENANCE ROAD DETAIL OUTSIDE OF DAM EMBANKMENT

NTS

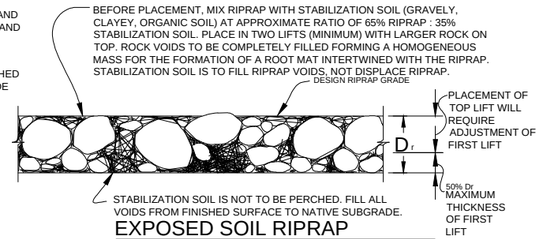


MAINTENANCE ROAD ON DAM EMBANKMENT SECTION

NOTE:
SEE PLANS AND SECTIONS FOR RIPRAP THICKNESS GREATER AT LAYDOWN BANKS, TOES, AND OTHER LOCATIONS.



BURIED SOIL RIPRAP



EXPOSED SOIL RIPRAP

D_r= MINIMUM DEPTH OF RIPRAP LAYER. SEE TABLE BELOW (UNLESS NOTED OTHERWISE ON PLANS.)

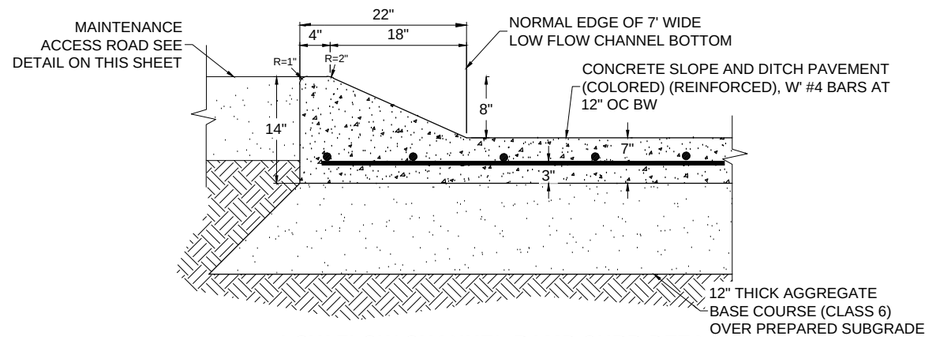
USED THIS PROJECT	RIPRAP TYPE	D 50	Dr
	VL	6	11
X	L	9	18
	M	12	24
	H	18	32
	VH	24	42

ALL DIMENSIONS IN INCHES

NOTES:
1. EXPOSED AND BURIED SOIL RIPRAP DETAILS ARE APPLICABLE TO FLAT OR SLOPED AREAS. REFER TO SITE PLAN FOR ACTUAL LOCATION AND LIMITS OF EACH TYPE.
2. REFER TO SPECIFICATIONS FOR MATERIALS AND PLACEMENT REQUIREMENTS FOR RIPRAP.
3. GENERAL PLACEMENT TECHNIQUES SHOULD RESULT IN LARGER ROCK AT THE SURFACE WITH ROCK SECURELY INTERLOCKED AT THE DESIGN THICKNESS AND GRADE. COMPACTION AND LEVELING SHOULD RESULT IN MINIMAL VOIDS AND PROJECTIONS ABOVE GRADE. TYPICAL FOR BOTH BURIED AND EXPOSED SOIL RIPRAP.
4. FOR BURIED SOIL RIPRAP: FINAL SOIL RIPRAP TO BE COMPACTED BY FULL LOADING OF BACK HOE BUCKET AS APPROVED. ANY SOFT, YIELDING OR POCKETS OF SMALL ROCK WILL BE REWORKED. PLACE TOPSOIL SO NO MORE THAN 4 INCHES THICK OVER SOIL RIPRAP. COORDINATE ROCK PLACEMENT TO PROVIDE TREE OR SHRUB PLANTING PITS AS INDICATED ON PLANTING PLANS.

TYPICAL SOIL RIPRAP PLACEMENT

NTS



LOW FLOW CHANNEL RAMP CURB DETAIL

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MAINTENANCE ROAD, SOIL RIPRAP, CHAIN BARRIER & L.F RAMP DETAILS

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DRAINAGE DETAILS

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Subset Sheets: SD-2.09

Project No./Code
CDOT Project No. C040-042 (21233)

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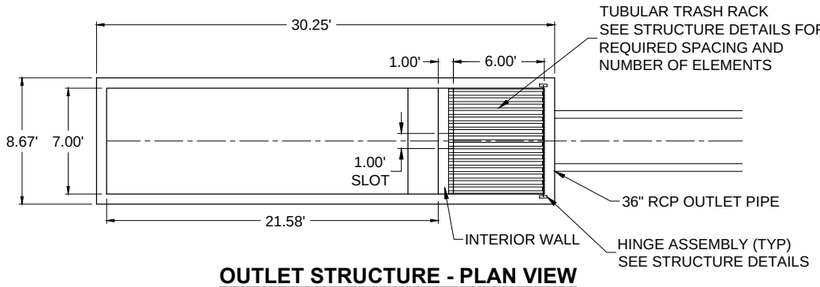
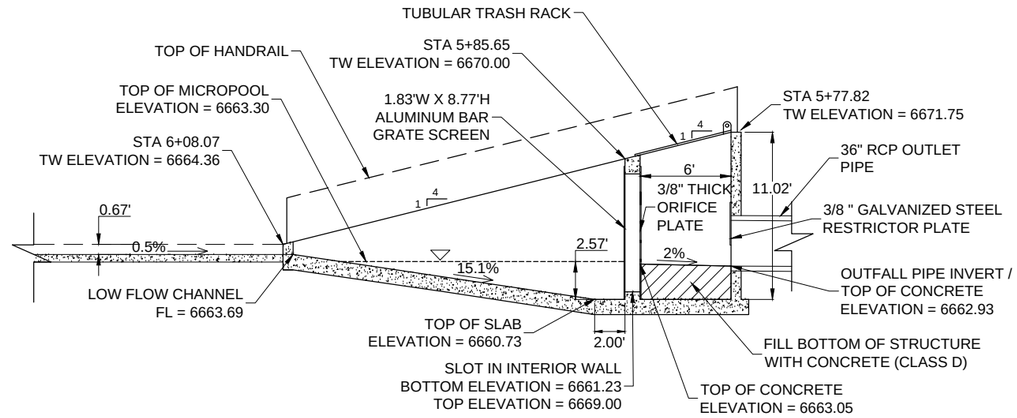


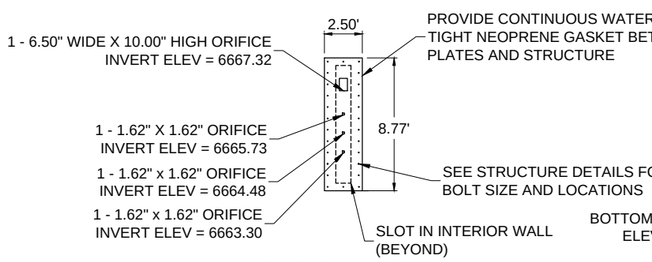
OUTLET STRUCTURE - PLAN VIEW

OUTLET STRUCTURE NOTES

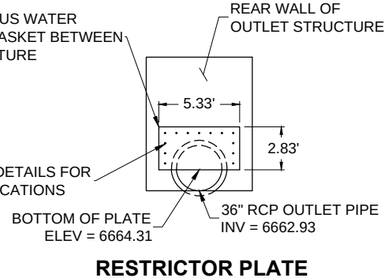
1. ALUMINUM BAR GRATE SCREEN SHALL BE KLEMP SR SERIES ALUMINUM BAR GRATE (OR APPROVED EQUIVALENT) WITH 2-1/4"X3/16" BEARING BARS SPACED ON 1-3/16" CENTER AND CROSS RODS SPACED ON 2" CENTERS. BEARING BARS ARE TO BE ALIGNED VERTICALLY.
2. SEE STRUCTURAL DETAILS FOR REINFORCEMENT AND ADDITION REQUIREMENTS
3. THE OUTLET STRUCTURE WILL BE MEASURED AND PAID FOR AS A LUMP SUM ITEM INCLUDING ALL MATERIALS, LABOR, EXCAVATION, AND BACKFILL.



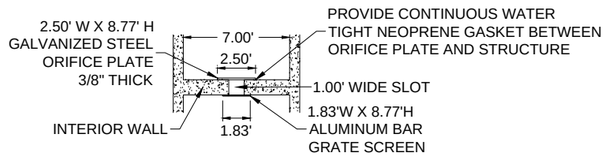
OUTLET STRUCTURE SECTION



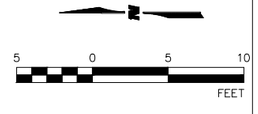
ORIFICE PLATE



RESTRICTOR PLATE



DETAIL AT SLOT IN INTERIOR WALL



POND OUTLET STRUCTURE DRAINAGE DETAILS

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File Name: 2.10 DTN-DETAILS NEW.DWG	Date:	Comments	Init.
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No Revisions:	DRAINAGE DETAILS		CDOT Project No. C040-042 (21233)
Revised:	Designer: NAB	Structure Numbers	Sheet Number
Void:	Detailer: KDL		28 OF 58
	Sheet Subset: DETAILS	Subset Sheets: SD- 2.10	

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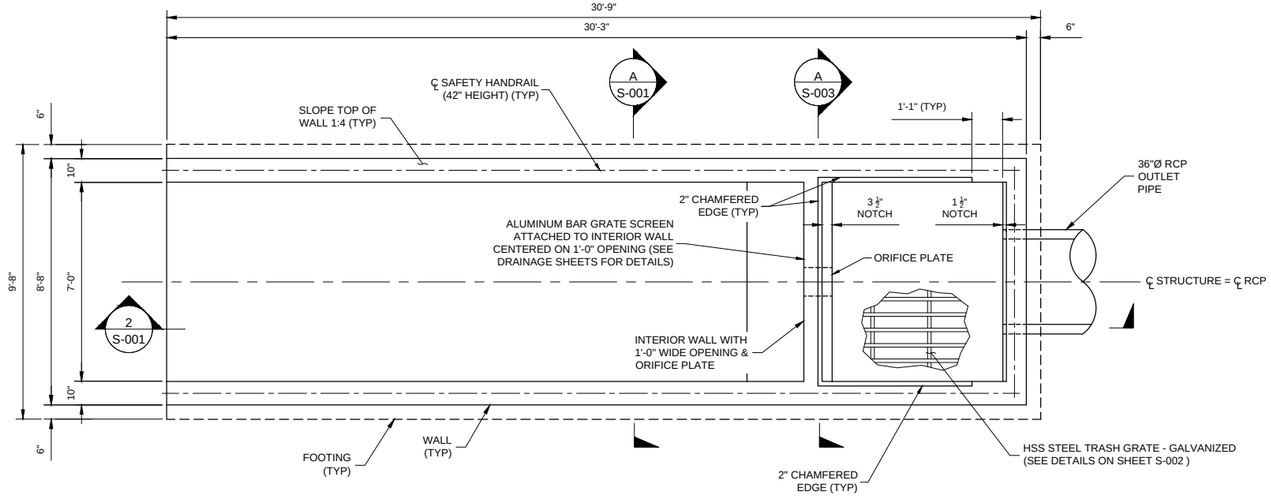
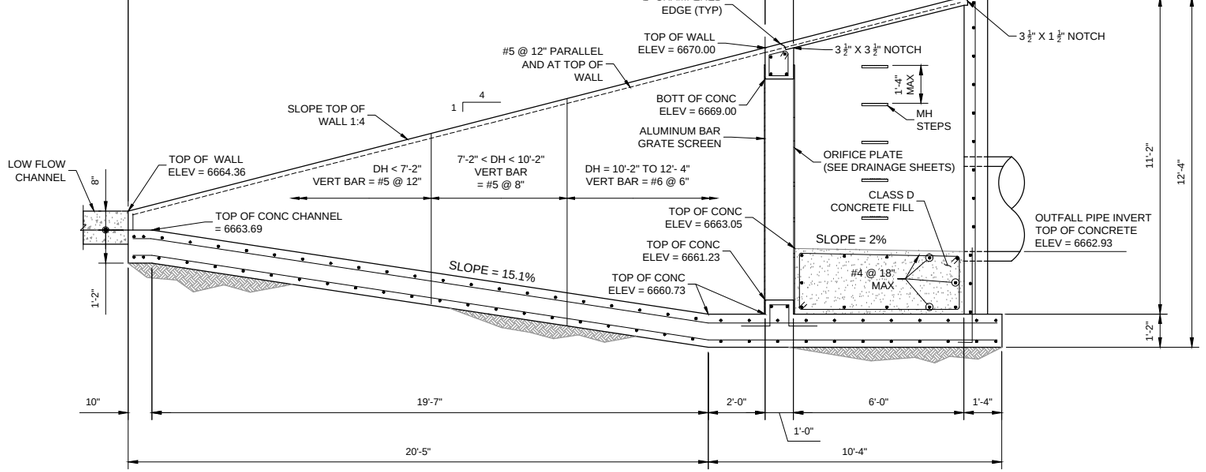


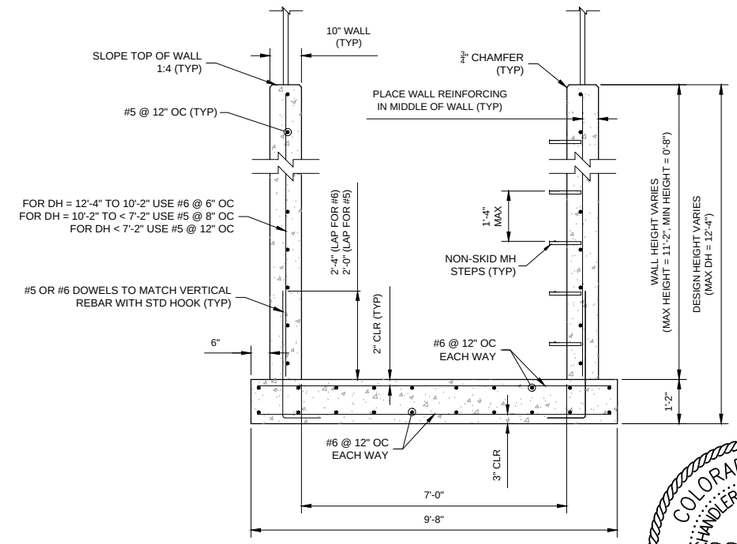
1 PLAN - POND OUTLET STRUCTURE

SCALE: 3/16" = 1'-0"



2 ELEVATION - POND OUTLET STRUCTURE

SCALE: 3/16" = 1'-0"



A TYPICAL SECTION

SCALE: 1/4" = 1'-0"

COLORADO LICENSED
CHANDLER MICHAEL HUDAK
0064424
11-11-2024
PROFESSIONAL ENGINEER

STRUCTURAL GENERAL NOTES:

1. EXCAVATE SOIL BENEATH THE STRUCTURE FOUNDATION TO A MINIMUM DEPTH OF 2-FEET BELOW THE BOTTOM OF THE FOOTING. THE 2-FOOT DEPTH SHALL EXTEND 1.5-FEET BEYOND THE FOOTING LIMITS REPRESENTED IN PLAN VIEW. REPLACE EXCAVATION WITH APPROVED STRUCTURAL BACKFILL ACCORDING TO THE PROJECT GEOTECHNICAL REPORT.
2. NATIVE MATERIAL MAY BE USED FOR STRUCTURE BACKFILL. NATIVE MATERIAL SHALL COMPLY AND BE CLASSIFIED PER USCS AND AASHTO CLASSIFICATIONS AS "SM", "SP", "SW-SM," AND "A1" THROUGH "A-3". NATIVE MATERIAL EXCAVATED 2-FEET BELOW THE FOUNDATION SHALL BE REWORKED AND DESIGNATED AS ENGINEERED FILL. PLASTIC CLAY SOILS ARE NOT TO BE USED AS ENGINEERED FILL. CLAYSTONE BEDROCK IS ALSO NOT SUITABLE TO BE USED AS ENGINEERED FILL. ENGINEERED FILL MATERIAL SHALL BE COMPACTED TO 98% OF MAXIMUM DRY DENSITY, COMPACTED WITHIN THREE PERCENT (3%) OF OPTIMUM WATER CONTENT, AND MUST COMPLY WITH ALL OTHER PARAMETERS SET FORTH IN THE NORTH GATE / STRUTHERS PWQ POND & STORM SEWER GEOTECHNICAL ENGINEERING REPORT BY TERRACON, DATED AUGUST 2, 2024.
3. IMPORTED MATERIAL USED FOR ENGINEERED FILL SHALL COMPLY WITH THE GRADATION AND SOIL PROPERTIES SPECIFIED IN THE GEOTECHNICAL ENGINEERING REPORT BY TERRACON. THE GRADATION AND SOIL PROPERTIES ARE SPECIFIED IN TABLES PROVIDED FOR IMPORTED ENGINEERED FILL IN THE MATERIAL TYPES SECTION.
4. THE CONTRACTOR SHALL ADEQUATELY SHORE STRUCTURE EXCAVATIONS ACCORDING TO OSHA REQUIREMENTS AND AS NECESSARY THROUGHOUT ALL CONSTRUCTION ACTIVITIES RELATED TO THE DESIGN PLANS. SHORING AT A MINIMUM SHALL COMPLY WITH ALL APPLICABLE OSHA SHORING STANDARDS AND OSHA REGULATIONS, INCLUDING BUT NOT LIMITED TO 29CFR PART 1926, SUBPART P - EXCAVATIONS, TRENCHING, AND SHORING.
5. STRUCTURE EXCAVATION SHALL BE PER CDOT STANDARD SPECIFICATION 206 "EXCAVATION AND BACKFILL FOR STRUCTURES". STRUCTURE BACKFILL SHALL CONSIST OF FURNISHING, PLACING AND COMPACTING BACKFILL MATERIAL 1.5-FEET AROUND AND 2-FEET BENEATH STRUCTURES TO THE LINES DESIGNATED ON THE PLANS AND SPECIFIED OR DIRECTED BY THE ENGINEER.
6. UNSUITABLE MATERIAL IS CLASSIFIED AS SATURATED NATIVE MATERIAL AND AS MATERIAL CONTAINING ORGANIC MATTER OR DEBRIS. UNSUITABLE MATERIAL ENCOUNTERED DURING STRUCTURE EXCAVATION SHALL BE REMOVED TO A DEPTH OF 3 FEET BELOW THE BOTTOM OF THE FOOTING. IF UNSUITABLE MATERIAL EXIST 3-FEET BELOW THE BOTTOM OF THE FOOTING THE ENGINEER SHALL BE CONTACTED FOR DIRECTION.
7. 6-INCHES OF PERVIOUS AGGREGATE BASE COURSE SHALL BE PLACED IMMEDIATELY BELOW THE STRUCTURE FOOTING. AGGREGATE BASE COURSE MATERIAL SHALL CONFORM TO CDOT SUBSECTION 703.07 AND GRADATION REQUIREMENTS OF TABLE 703-11. PERVIOUS BACKFILL MATERIAL MAY CONSIST OF CRUSHED ROCK, CRUSHED GRAVEL, OR A COMBINATION OF THE TWO.
8. ENGINEERED BACKFILL MATERIAL USED WITHIN THE UPPER 2 FEET OF THE STRUCTURE SHALL BE FREE OF ROCKS AND HAVE A PARTICLE DIAMETER LESS THAN 6-INCHES.
9. BACKFILL SHALL NOT BE PLACED FOR THE OUTLET STRUCTURE UNTIL THE CONCRETE WALL CONCRETE HAS REACHED 100% OF THE MINIMUM 28 DAY CONCRETE COMPRESSIVE STRENGTH (f'c) SPECIFIED.
10. CONCRETE SHALL BE CDOT CLASS D WITH THE MINIMUM 28-DAY COMPRESSIVE STRENGTH (f'c) OF 4500 PSI. CEMENT AND CONCRETE MATERIAL PROPERTIES SHALL COMPLY WITH CDOT CLASS D PARAMETERS. ALL CONCRETE WORK SHALL CONFORM TO CDOT STANDARD SPECIFICATIONS FOR CONCRETE WORK.
11. STEEL REINFORCING SHALL COMPLY WITH ASTM A615, GRADE 60. REINFORCING SHALL BE BLACK DEFORMED BILLET BARS (UNCOATED).
12. ALL STEEL AND STEEL CONNECTING ELEMENTS SHALL BE GALVANIZED ACCORDING TO ASTM A123, (AASHTO M111) UNLESS NOTED OTHERWISE.
13. MH STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FEET - 6 INCHES AND SHALL CONFORM TO AASHTO M199.

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STRUCTURE DETAILS

Designer: NAB
Detailer: KDL
Sheet Subset: DETAILS
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Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
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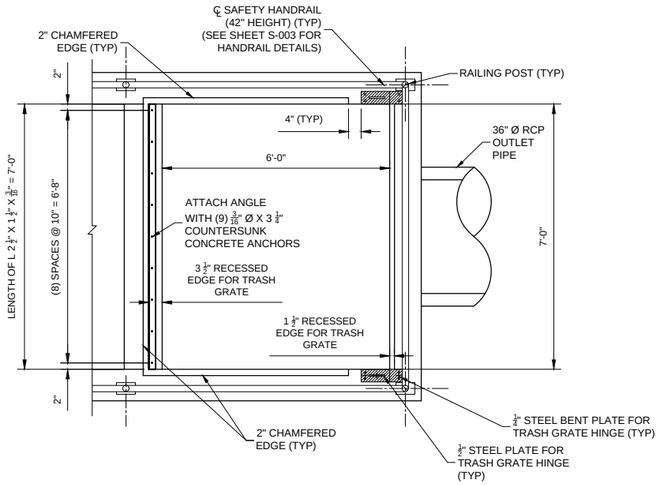
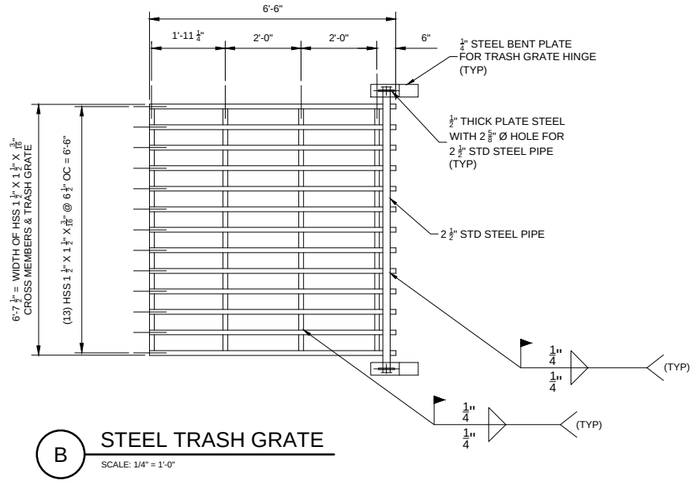


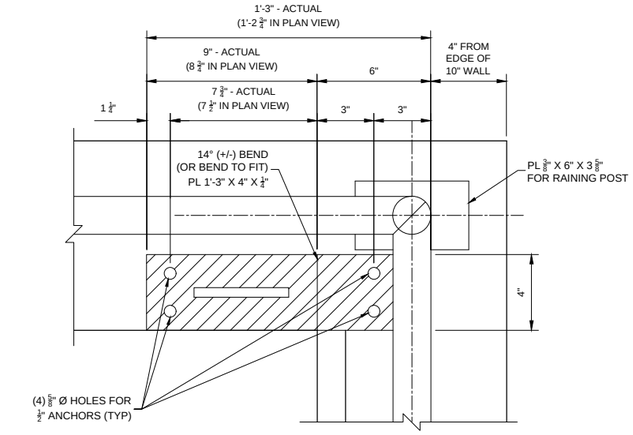
A PLAN - TRASH GRATE INLET

SCALE: 1/4" = 1'-0"



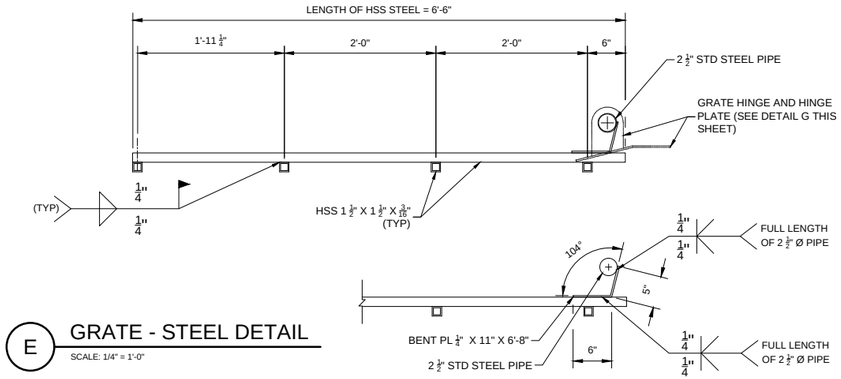
B STEEL TRASH GRATE

SCALE: 1/4" = 1'-0"



C PLAN - HINGE PLATE DETAIL

SCALE: 1 1/2" = 1'-0"

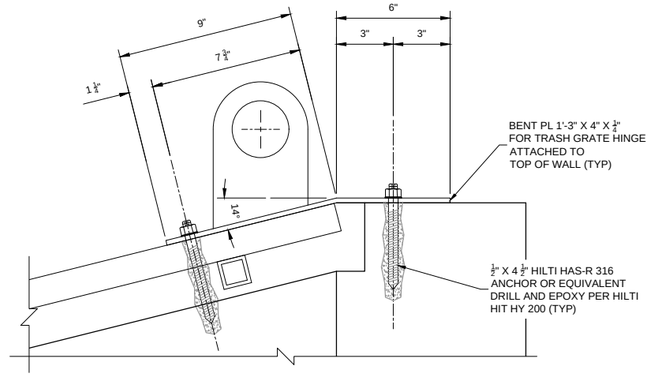


E GRATE - STEEL DETAIL

SCALE: 1/4" = 1'-0"

* TOP VIEW SHOWS TRASH GRATE WITH HINGE AND PLATE CONNECTION AT TOP OF CONCRETE WALLS, AT EITHER END.

BOTTOM VIEW SHOWS HSS TRASH GRATE WITH CONNECTION TO 2 1/2" Ø STEEL PIPE.

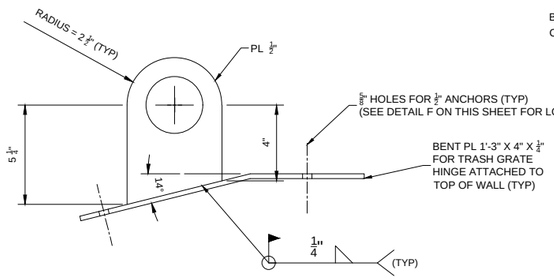


F HINGE PLATE DETAIL

SCALE: 1 1/2" = 1'-0"

D TRASH GRATE CONNECTION

SCALE: 1 1/2" = 1'-0"



G GRATE HINGE DETAIL

SCALE: 1 1/2" = 1'-0"

STRUCTURAL NOTES:

STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING:

1. HSS STEEL SHALL BE ASTM A500 GR. B, Fy = 46 KSI.
2. STEEL ANGLES, PLATES, AND FLAT BAR SHALL BE ASTM A36, Fy = 36 KSI.
3. STEEL SHALL BE DETAILED, FABRICATED AND INSTALLED IN CONFORMANCE WITH THE AISC MANUAL OF STEEL CONSTRUCTION, 14TH EDITION, INCLUDING ALL STEEL SPECIFICATIONS.
4. ALL STEEL AND STEEL CONNECTING ELEMENTS SHALL BE GALVANIZED ACCORDING TO ASTM A123, (AASHTO M111) UNLESS NOTED OTHERWISE.
5. WELDING SHALL CONFORM TO CURRENT AWS D1.1 CODE. WELDING ELECTRODES SHALL BE E70XX.
6. ANCHOR BOLTS SHALL BE HILTI-R 304 OR HAS-R 316 AND CONFORM TO ASTM F1554 OR EQUIVALENT. USE HILTI HIT HY 200 ANCHORAGE AND BONDING SYSTEM OR EQUIVALENT TO DRILL AND DOWEL ALL ANCHORS.

COLORADO LICENSED
CHANDLER MICHAEL HUDAK
0064424
11-11-2024
PROFESSIONAL ENGINEER

Print Date: November 12, 2024	Sheet Revisions		
File Name: NORTHGATE WQ POND STRUCTURE.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

Know what's below. Call before you dig.

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5755 Mark Dabling Blvd.
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Colorado Springs, CO 80919
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FAX: 719-520-0108

As Constructed	NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT		Project No./Code
No Revisions:	STRUCTURE DETAILS		CDOT Project No. C040-042 (21233)
Revised:	Designer: NAB	Structure Numbers	Sheet Number
Void:	Detailer: KDL		30 OF 58
	Sheet Subset: DETAILS	Subset Sheets: ST-2.02	

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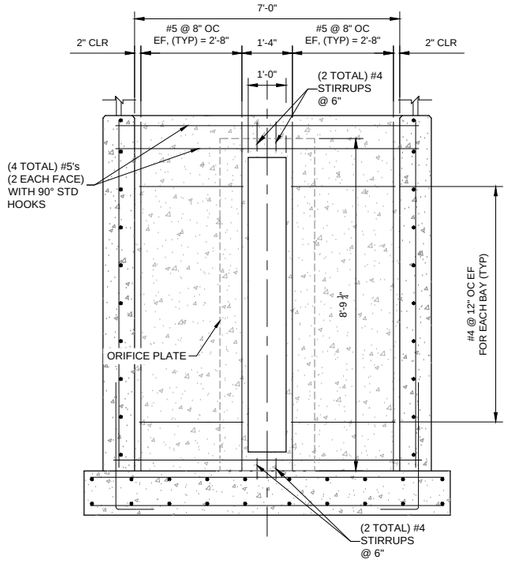
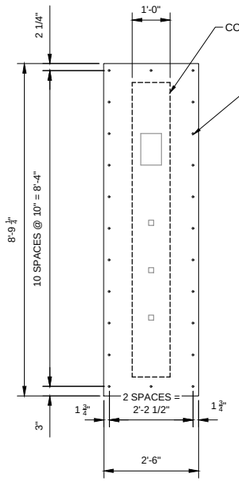


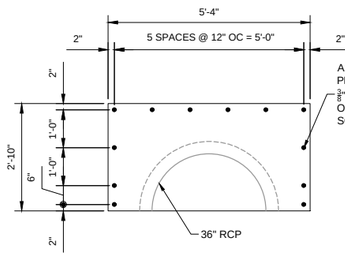
A INTERIOR WALL REINFORCING DETAILS

SCALE: 1/4" = 1'-0"



B ORIFICE PLATE

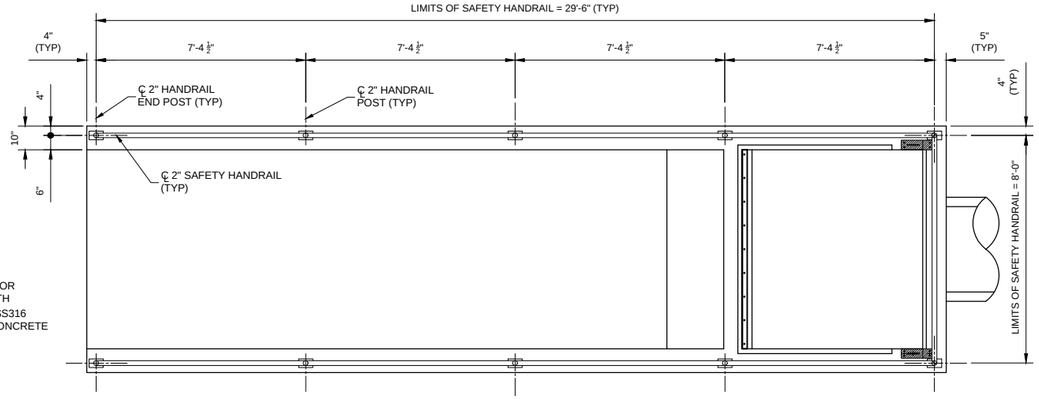
SCALE: 1/4" = 1'-0"



C RESTRICTOR PLATE

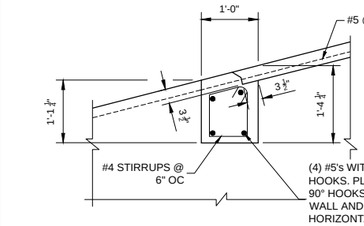
SCALE: 1/4" = 1'-0"

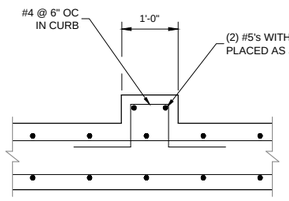
* SEE DRAINAGE DETAILS FOR RESTRICTOR PLATE LOCATION. RESTRICTOR PLATE TO BE CONNECTED AND RESTRICTING FLOW TO THE TOP HALF OF THE 36" RCP AS SHOWN.



D SAFETY HANDRAIL LAYOUT

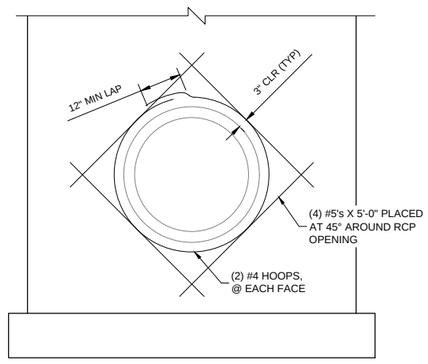
SCALE: 3/16" = 1'-0"





E CONCRETE DETAILS

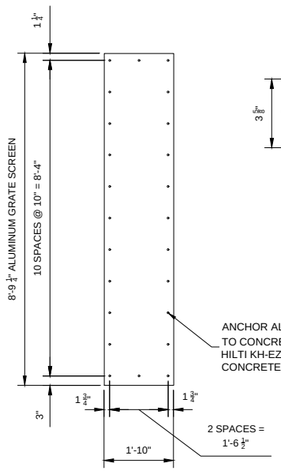
SCALE: 3/8" = 1'-0"



* TYPICAL REINFORCING NOT SHOWN

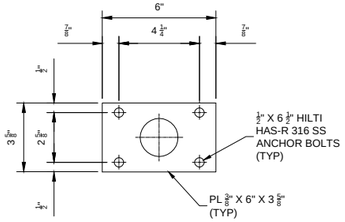
F CONCRETE OPENING DETAIL

SCALE: 1/4" = 1'-0"



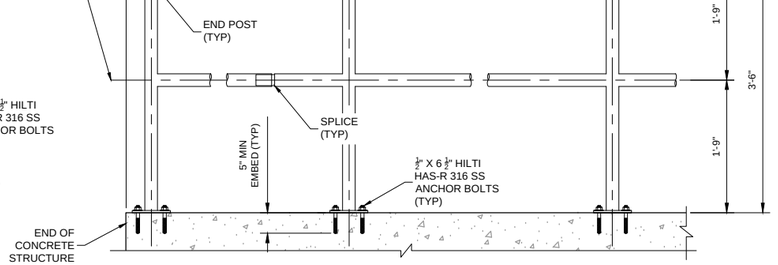
G ALUMINUM BAR GRATE

SCALE: 1/4" = 1'-0"



H BASE PLATE

SCALE: 1 1/2"" = 1'-0"



I SAFETY RAILING (HANDRAIL) DETAIL

SCALE: 1/2" = 1'-0"

HANDRAIL NOTES:

1. SAFETY HANDRAIL AND VERTICAL POST SHALL BE 2" STANDARD STEEL PIPE. PIPE SHALL BE ASTM A53 GR. B, WITH Fy = 35 KSI. VERTICAL POST SPACING SHALL BE AS SHOWN ON THE DRAWINGS.
2. ALL WELDING SHALL CONFORM TO AWS D1.1. WELDS SHALL BE A MINIMUM 1/4" CONTINUOUS FILLET WELDS UNLESS NOTED OTHERWISE.
3. AFTER ALL WELDS ARE COMPLETE, ALL SHARP EDGES SHALL BE GROUND SMOOTH AND SURFACES THOROUGHLY CLEANED.
4. THE COMPLETED HANDRAIL AND POSTS SHALL BE CLEANED TO REMOVE ALL DIRT, DEBRIS, AND ALL FOREIGN MATERIAL. THE 2" STANDARD PIPE HANDRAIL SHALL BE PAINTED BLACK. THE STEEL PIPE SHALL RECEIVE ONE COAT OF PRIMER AND TWO COATS OF INDUSTRIAL ENAMEL.
5. USE HILTI HIT-HY 200 ANCHORING AND BONDING SYSTEM OR EQUIVALENT TO INSTALL ANCHOR BOLTS.

Print Date: November 12, 2024	Sheet Revisions		
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No Revisions:

Revised:

Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

STRUCTURE DETAILS

Designer: NAB
Detailer: KDL
Sheet Subset: DETAILS
Structure Numbers:
Subset Sheets: ST-2.03

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

31 OF 58

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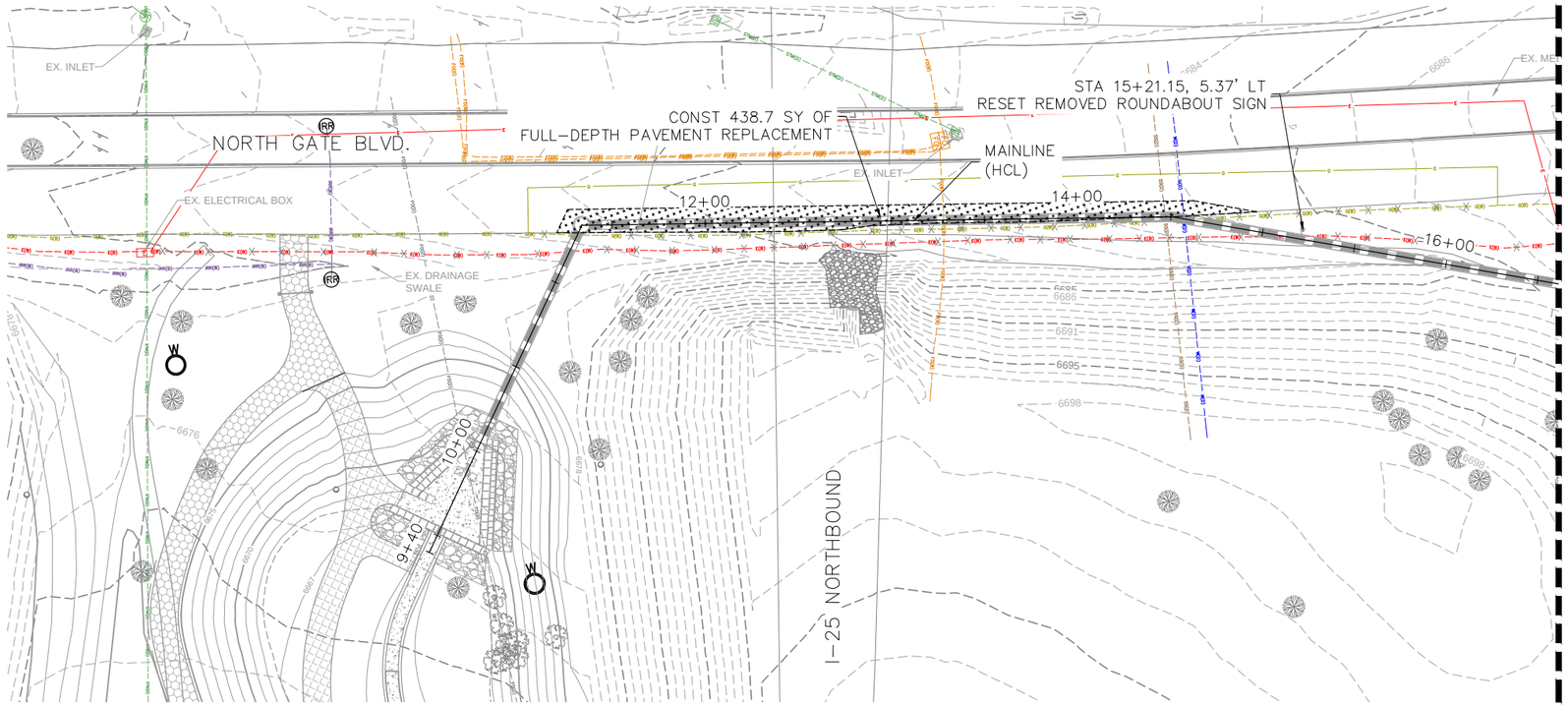

ROADWAY RECONSTRUCTION PLAN

NOTES

1. REPLACEMENT OF INFRASTRUCTURE THAT WAS REMOVED SHALL BE SCHEDULED IN A MANNER THAT MINIMIZES THE TIME BETWEEN REMOVAL AND REPLACEMENT OF THE FACILITY.
2. REMOVAL AND REPLACEMENT OF LANDSCAPE MATERIALS AND IRRIGATION COMPONENTS (IN KIND) AS REQUIRED TO CONSTRUCT THE PROJECT WILL BE CONSIDERED INCIDENTAL TO ASSOCIATED PAY ITEMS AND WILL NOT BE PAID FOR SEPARATELY.
3. THE EXTENTS AND QUANTITY OF PAVEMENT REMOVAL AND REPLACEMENT ARE BASED ON A SWATH ALONG THE MAINLINE HCL THAT EXTENDS 6' BEYOND THE OUTSIDE EDGE OF THE PIPE ON EITHER SIDE, EXCEPT WHERE THE PIPE RUNS ADJACENT TO EXISTING CURB AND GUTTER, IN WHICH CASE THE PAVEMENT SHALL BE REMOVED AND REPLACED TO THE FACE OF THE GUTTER PAN WITH THE CURB AND GUTTER BEING PROTECTED IN PLACE UNLESS OTHERWISE INDICATED.
4. SAWCUT NEAT LINE AT EDGES AND MATCH EXISTING PAVEMENT SECTION.
5. SEE DETAIL SHEET SD-2.06 FOR PAVEMENT SECTIONS.
6. ALL REPLACEMENT CURB AND GUTTER SHALL MATCH EXISTING.

40 0 40 80
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VANCEL S FOSSINGER
31972
11/12/24
PROFESSIONAL ENGINEER

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Unit Information	Unit Leader						Void:

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ROADWAY RECONSTRUCTION PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	ROADWAY	Subset Sheets:	RD-1.01

Project No./Code: CDOT Project No. C040-042 (21233)

Sheet Number: 32 OF 58

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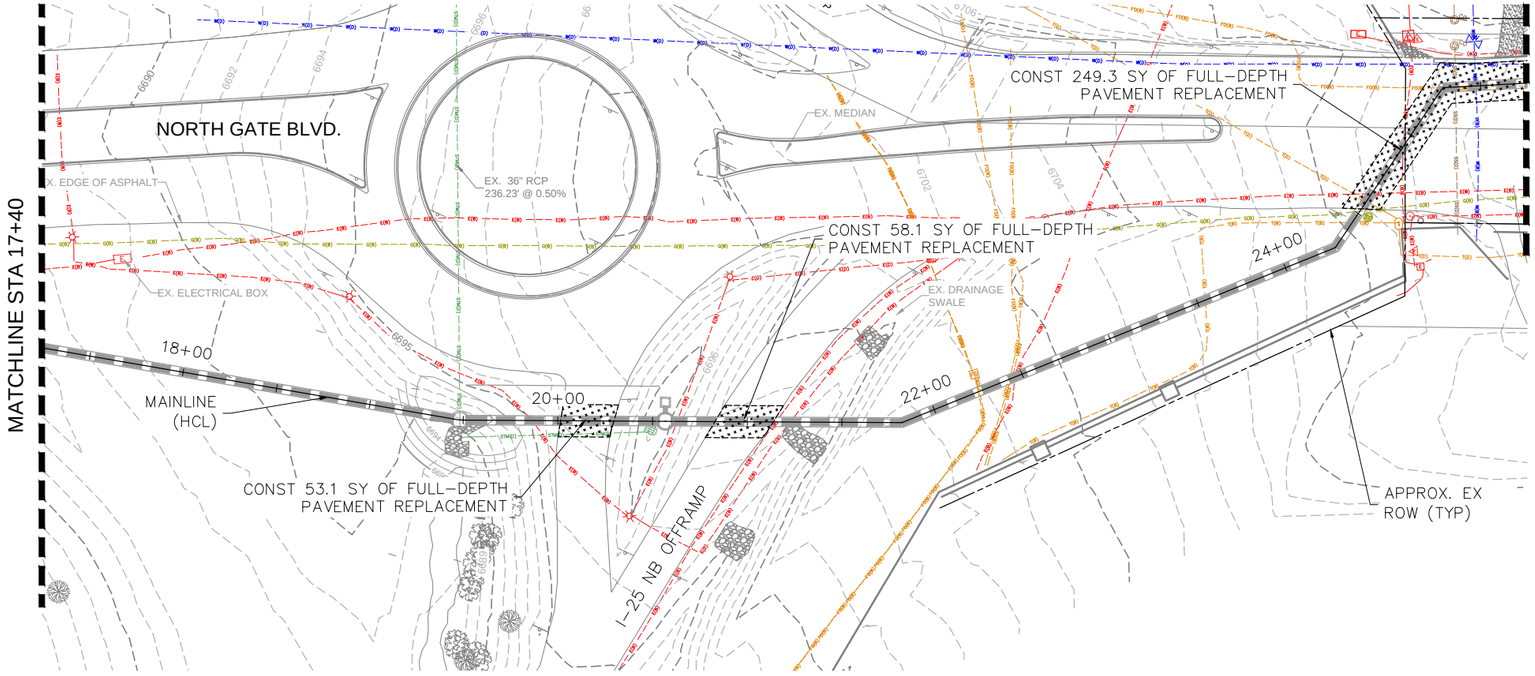

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ROADWAY RECONSTRUCTION PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	ROADWAY	Subset Sheets:	RD-1.02

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
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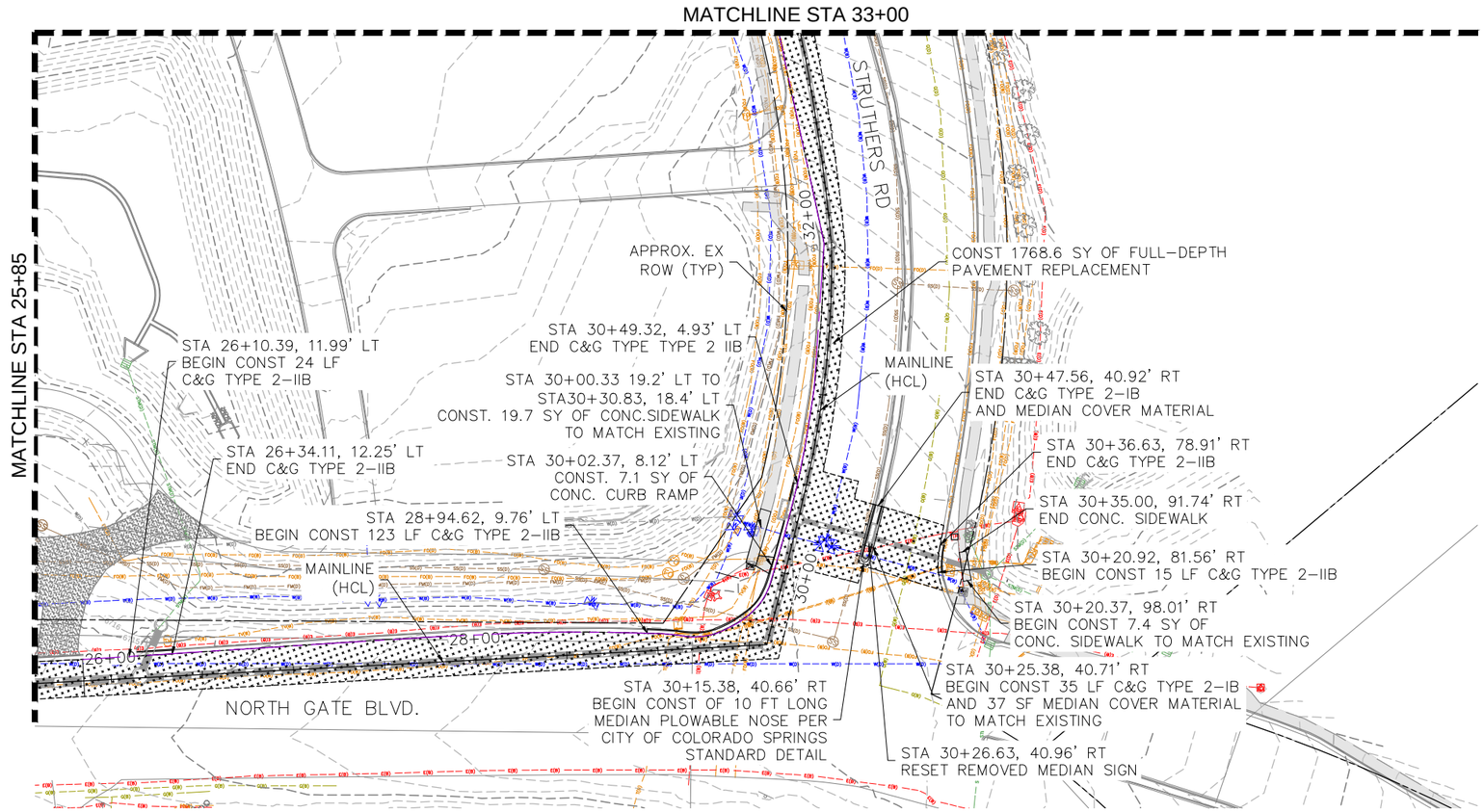

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COLORADO REGISTERED VANCEL S FOSSINGER 31972 PROFESSIONAL ENGINEER
11/12/24
Vancel Fossinger

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ROADWAY RECONSTRUCTION PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	ROADWAY	Subset Sheets:	RD-1.03

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
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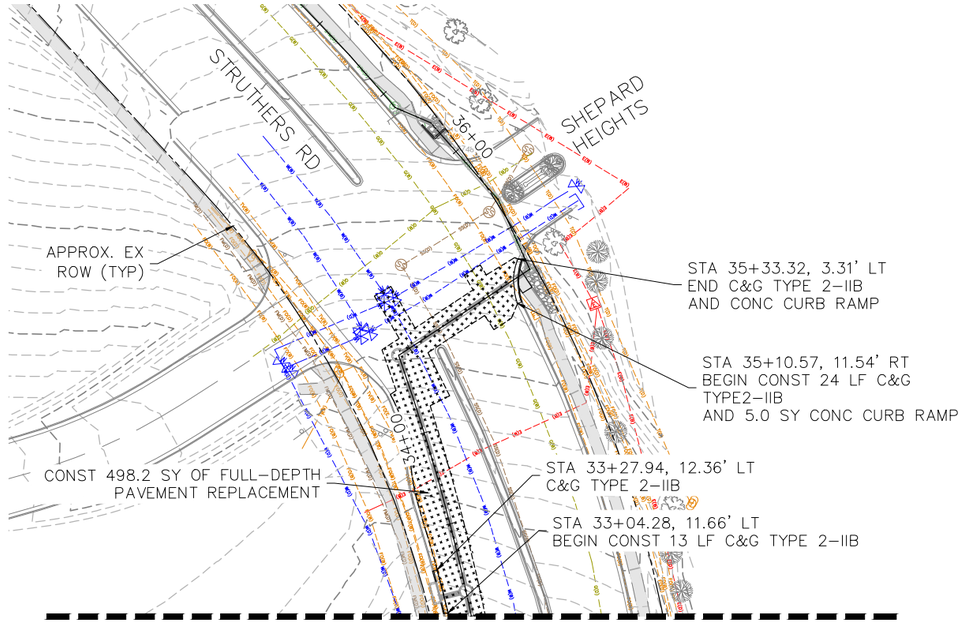

ROADWAY RECONSTRUCTION PLAN

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31972
PROFESSIONAL ENGINEER
11/12/24

Print Date: November 12, 2024
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ROADWAY RECONSTRUCTION PLAN

Designer: NAB
Detailer: KDL
Sheet Subset: ROADWAY
Structure Numbers:
Subset Sheets: RD-1.04

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

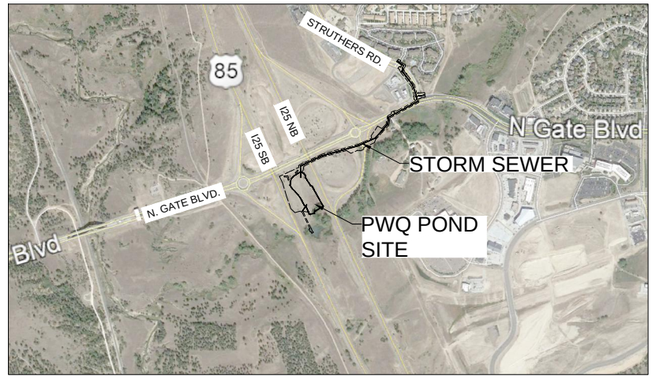
STRUTHERS RD AND NORTH GATE BLVD

CDOT PROJECT NO. C040-042 (21233)

GRADING AND EROSION CONTROL PLAN

CITY OF COLORADO SPRINGS, COUNTY OF EL PASO, STATE OF COLORADO.

INDEX OF SHEETS		
SUBSET SHEET	DRAWING DESCRIPTION	SHEET NO.
EC-3.01	GEC COVER	36
EC-3.02	GEC AND SURFACING PLAN	37
EC-3.03	GEC AND SURFACING PLAN	38
EC-3.04	GEC AND SURFACING PLAN	39
EC-3.05	GEC AND SURFACING PLAN	40
EC-3.06	GEC NOTES	41
EC-3.07	GEC DETAILS	42
EC-3.08	GEC DETAILS	43
EC-3.09	GEC DETAILS	44



VICINITY MAP
SCALE 1"=2000'

Engineer's Statement for GEC Plan within construction drawing set: These detailed plans and specifications were prepared under my direction and supervision. Said plans and specifications have been prepared according to critieria established by the County for detailed roadway, drainage, grading and erosion control plans and specifications, and said plans and specifications are in conformity with applicable master drainage plans and master transportation plans. Said plans and specifications meet the purposes for which the particular roadway and drainage facilities are designed and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of the detailed plans and specifications.

Vancel Fossinger, P.E.
Engineer of Record Signature

Date: 11/12/24

COLORADO REGISTERED
VANCEL S FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24
Vancel Fossinger

El Paso County:

County plan review is provided only for general conformance with County Design Criteria. The County is not responsible for the accuracy and adequacy of the design, dimensions, and/or elevations which shall be confirmed at the job site. The County through the approval of this document assumes no responsibility for completeness and/or accuracy of this document.

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volumes 1 and 2, and Engineering Criteria Manual as amended.

In accordance with ECM Section 1.12, these construction documents will be valid for construction for a period of 2 years from the date signed by the El Paso County Engineer. If construction has not started within those 2 years, the plans will need to be resubmitted for approval, including payment of review fees at the Planning and Community Development Directors discretion.

County Engineer / ECM Administrator Date

Print Date: November 12, 2024
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
GEC COVER

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
Subset Sheets: EC-3.01

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
36 OF 58

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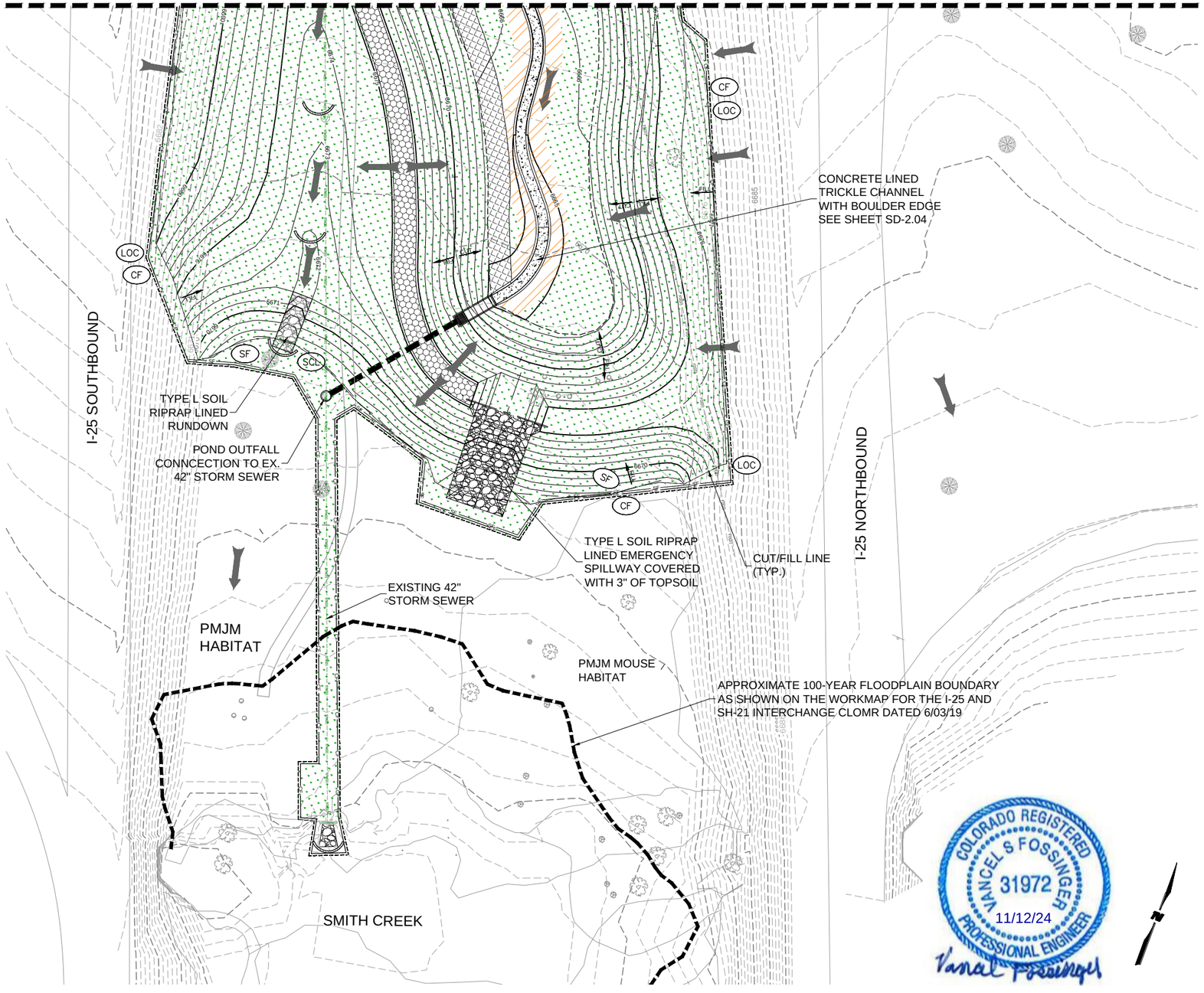
MATCH LINE SEE SHEET EC-3.03



EXISTING GROUND COVER DESCRIPTION

EXISTING GROUND COVER VARIES THROUGH THE PROJECT DISTURBANCE AREA. AT AND IMMEDIATELY ADJACENT TO SMITH CREEK THERE ARE CATTAILS AND WILLOW SHRUBS. THE I-25 MEDIAN AREA BETWEEN THE FRINGE OF SMITH CREEK AND NORTH GATE BOULEVARD IS VEGETATED WITH NATIVE GRASSES, SCATTERED WEEDS AND SPARSE SHRUBS. GROUND COVER IN THE NORTHGATE BOULEVARD PORTION OF THE DISTURBANCE AREA VARIES FROM ASPHALT PAVEMENT TO NATIVE GRASSES WITH SOME WEEDS. GROUND COVER IN THE STRUTHERS ROAD PORTION OF THE DISTURBANCE AREA IS NEARLY ALL ASPHALT PAVEMENT WITH SMALL PORTIONS OF TURF GRASS AND LANDSCAPE ROCK.

LEGEND		BMP INSTALLATION PHASE
LOC	CONSTRUCTION BOUNDARY/ LIMITS OF DISTURBANCE	
CF	CONSTRUCTION FENCE	(INITIAL)
SF	SILT FENCE	(INITIAL)
SSA	STABILIZED STAGING AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
SCL	SEDIMENT CONTROL LOG	(INITIAL)
RS	ROCK SOCKS	(INITIAL)
IP	INLET PROTECTION	(INITIAL) / (INTERIM)
PT	PORTABLE TOILET	(INITIAL)
SP	STOCKPILE	(INTERIM)
	FLOW ARROW	
	VEHICLE TRACTION CONTROL	(INITIAL)
	CONCRETE WASHOUT AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
	TEMP EROSION CONTROL BLANKET AND NATIVE SEEDING	(FINAL)
	MULCH AND NATIVE SEEDING	(FINAL)
	8" THICK ABC MAINTENANCE ROAD	(FINAL)
	12" THICK ABC MAINTENANCE ROAD	(FINAL)
	FULL DEPTH HMA	(FINAL)

NOTES:

1. FOLLOWING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS, THE SOIL OF ALL NON-PAVED DISTURBED AREAS SHALL BE TILLED, AMENDED, SEEDED AND MULCHED OR BLANKETED IN ACCORDANCE WITH THE LANDSCAPE PLANS.

COLORADO REGISTERED VANCE L S FOSSINGER 31972 PROFESSIONAL ENGINEER
11/12/24

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
GEC AND SURFACING PLAN

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
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Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
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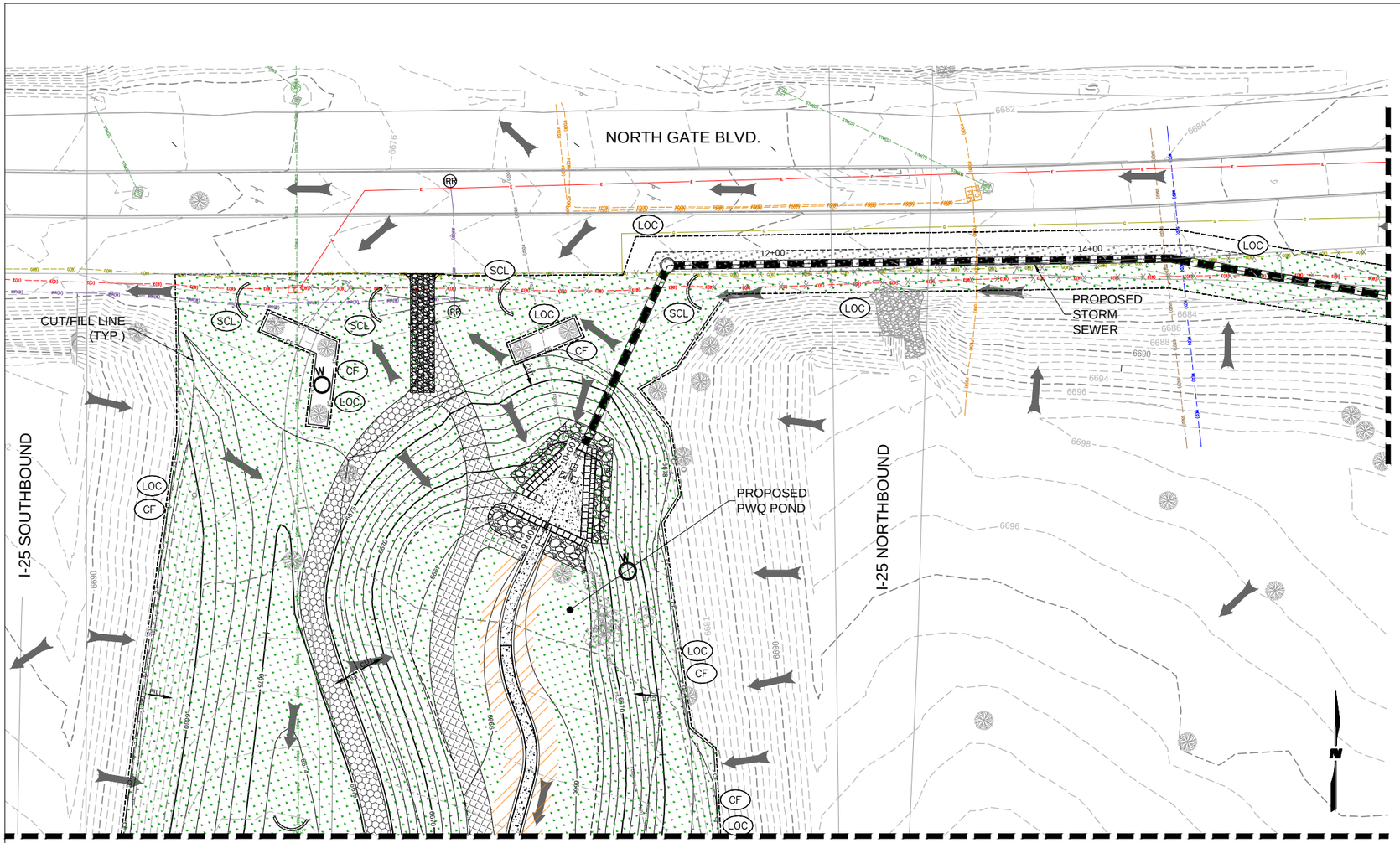

EXISTING GROUND COVER DESCRIPTION

EXISTING GROUND COVER VARIES THROUGH THE PROJECT DISTURBANCE AREA. AT AND IMMEDIATELY ADJACENT TO SMITH CREEK THERE ARE CATTAILS AND WILLOW SHRUBS. THE I-25 MEDIAN AREA BETWEEN THE FRINGE OF SMITH CREEK AND NORTH GATE BOULEVARD IS VEGETATED WITH NATIVE GRASSES, SCATTERED WEEDS AND SPARSE SHRUBS. GROUND COVER IN THE NORTHGATE BOULEVARD PORTION OF THE DISTURBANCE AREA VARIES FROM ASPHALT PAVEMENT TO NATIVE GRASSES WITH SOME WEEDS. GROUND COVER IN THE STRUTHERS ROAD PORTION OF THE DISTURBANCE AREA IS NEARLY ALL ASPHALT PAVEMENT WITH SMALL PORTIONS OF TURF GRASS AND LANDSCAPE ROCK.

LEGEND		BMP INSTALLATION PHASE
LOC	CONSTRUCTION BOUNDARY/ LIMITS OF DISTURBANCE	
CF	CONSTRUCTION FENCE	(INITIAL)
SF	SILT FENCE	(INITIAL)
SSA	STABILIZED STAGING AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
SCL	SEDIMENT CONTROL LOG	(INITIAL)
RS	ROCK SOCKS	(INITIAL)
IP	INLET PROTECTION	(INITIAL) / (INTERIM)
PT	PORTABLE TOILET	(INITIAL)
SP	STOCKPILE	(INTERIM)
	FLOW ARROW	
	VEHICLE TRACTION CONTROL	(INITIAL)
	CONCRETE WASHOUT AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
	TEMP EROSION CONTROL BLANKET AND NATIVE SEEDING	(FINAL)
	MULCH AND NATIVE SEEDING	(FINAL)
	8" THICK ABC MAINTENANCE ROAD	(FINAL)
	12" THICK ABC MAINTENANCE ROAD	(FINAL)
	FULL DEPTH HMA	(FINAL)

NOTES:

1. FOLLOWING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS, THE SOIL OF ALL NON-PAVED DISTURBED AREAS SHALL BE TILLED, AMENDED, SEEDED AND MULCHED OR BLANKETED IN ACCORDANCE WITH THE LANDSCAPE PLANS.

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FEET

COLORADO REGISTERED
VANCE L S FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24

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File Name: 3.02 - 3.05 GEC STORM.DWG		Date:	Comments	Init.			No Revisions:
Horiz. Scale:	Vert. Scale:						Revised:
Unit Information	Unit Leader						Void:

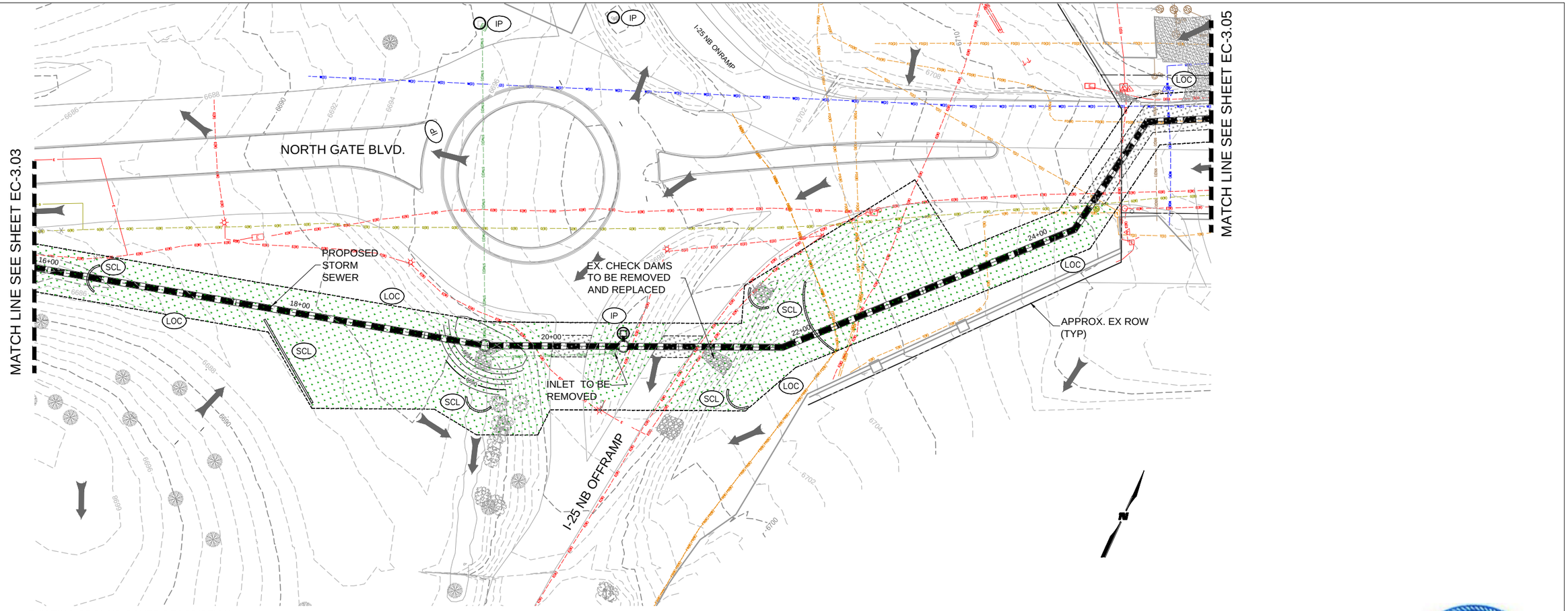
NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC AND SURFACING PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GEC	Subset Sheets:	EC-3.03

Project No./Code: CDOT Project No. C040-042 (21233)

Sheet Number: 38 OF 58



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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC AND SURFACING PLAN

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
Subset Sheets: EC-3.04

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
39 OF 58

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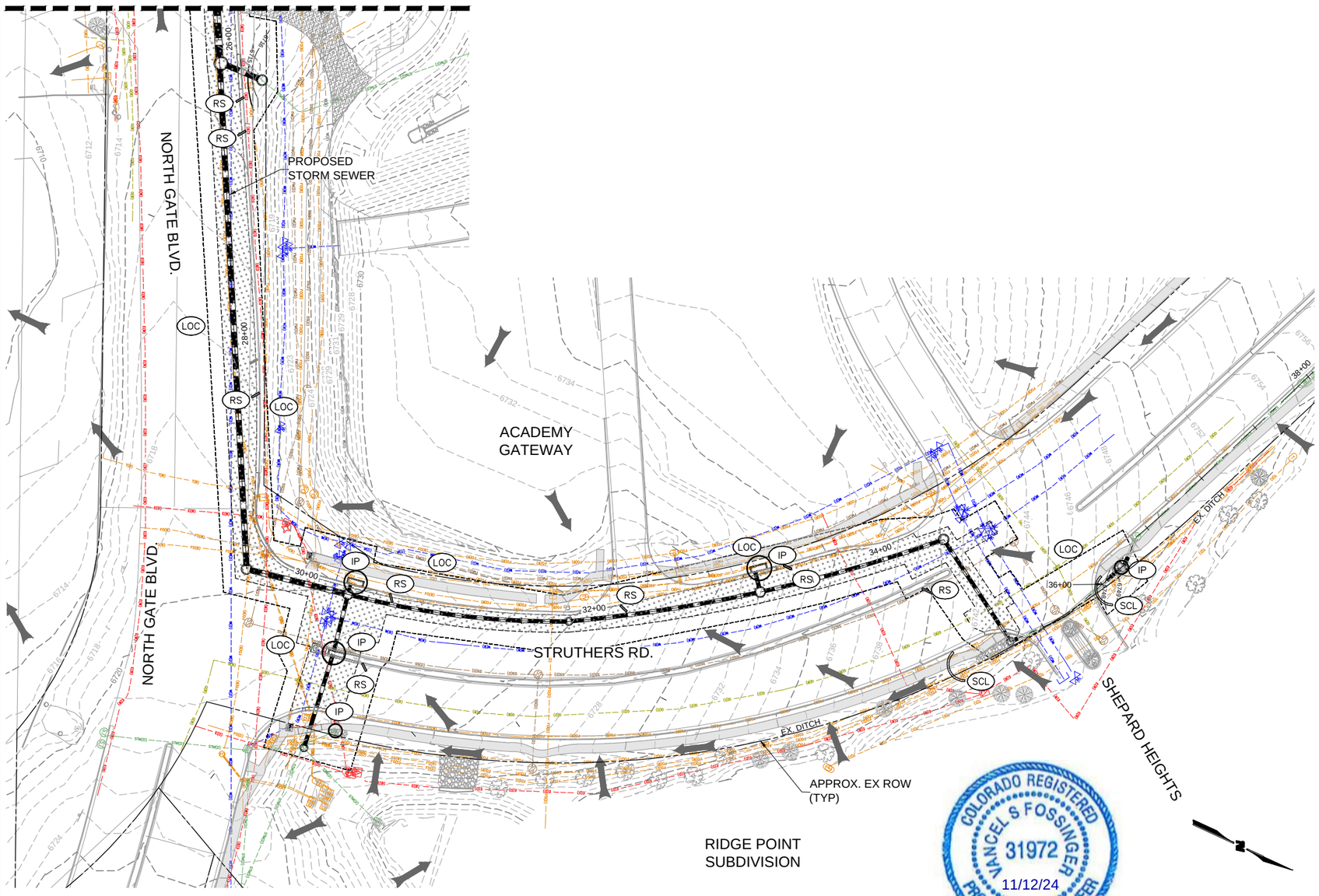

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT			Project No./Code
GEC AND SURFACING PLAN			CDOT Project No. C040-042 (21233)
Designer: NAB	Structure Numbers		Sheet Number
Detailer: KDL			40 OF 58
Sheet Subset: GEC	Subset Sheets:	EC-3.05	

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STANDARD NOTES FOR EL PASO COUNTY GRADING AND EROSION CONTROL PLANS

1. STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF-SITE WATERS, INCLUDING WETLANDS.
2. NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
3. A SEPARATE STORMWATER MANAGEMENT PLAN (SMWP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. MANAGEMENT OF THE SWMP DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGER OR CERTIFIED EROSION CONTROL INSPECTOR. THE SWMP SHALL BE LOCATED ON SITE AT ALL TIMES DURING CONSTRUCTION AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
4. ONCE THE ESQCP IS APPROVED AND A "NOTICE TO PROCEED" HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL MEASURES AS INDICATED ON THE APPROVED GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY STAFF.
5. CONTROL MEASURES MUST BE INSTALLED PRIOR TO COMMENCEMENT OF ACTIVITIES THAT COULD CONTRIBUTE POLLUTANTS TO STORMWATER. CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, AND DISTURBED LAND AREAS SHALL BE INSTALLED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
6. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REMAIN IN EFFECTIVE OPERATING CONDITION UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND FINAL STABILIZATION IS ESTABLISHED. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL ASSESS THE ADEQUACY OF CONTROL MEASURES AT THE SITE AND IDENTIFY IF CHANGES TO THOSE CONTROL MEASURES ARE NEEDED TO ENSURE THE CONTINUED EFFECTIVE PERFORMANCE OF THE CONTROL MEASURES. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED INTO THE STORMWATER MANAGEMENT PLAN.
7. TEMPORARY STABILIZATION SHALL BE IMPLEMENTED ON DISTURBED AREAS AND STOCKPILES WHERE GROUND DISTURBING CONSTRUCTION ACTIVITY HAS PERMANENTLY CEASED OR TEMPORARILY CEASED FOR LONGER THAN 14 DAYS.
8. FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN ALL GROUND DISTURBING ACTIVITIES ARE COMPLETE AND ALL DISTURBED AREAS EITHER HAVE A UNIFORM VEGETATIVE COVER WITH INDIVIDUAL PLANT DENSITY OF 70 PERCENT OF PRE-DISTURBANCE LEVELS ESTABLISHED OR EQUIVALENT PERMANENT ALTERNATIVE STABILIZATION METHOD IS IMPLEMENTED. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED UPON FINAL STABILIZATION AND BEFORE PERMIT CLOSURE.
9. ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
10. EARTH DISTURBANCES SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY MINIMIZE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME. PRE-EXISTING VEGETATION SHALL BE PROTECTED AND MAINTAINED WITHIN 50 HORIZONTAL FEET OF A WATERS OF THE STATE UNLESS SHOWN TO BE INFEASIBLE AND SPECIFICALLY REQUESTED AND APPROVED.
11. COMPACTION OF SOIL MUST BE PREVENTED IN AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES OR WHERE FINAL STABILIZATION WILL BE ACHIEVED BY VEGETATIVE COVER. AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED. IF COMPACTION PREVENTION IS NOT FEASIBLE DUE TO SITE CONSTRAINTS, ALL AREAS DESIGNATED FOR INFILTRATION AND VEGETATION CONTROL MEASURES MUST BE LOOSENED PRIOR TO INSTALLATION OF THE CONTROL MEASURE(S).
12. ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE A STABILIZED CONVEYANCE DESIGNED TO MINIMIZE EROSION AND THE DISCHARGE OF SEDIMENT OFF SITE.
13. CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO ENTER STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUTS SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY, CREEK OR STREAM.
14. DURING DEWATERING OPERATIONS OF UNCONTAMINATED GROUND WATER MAY BE DISCHARGED ON SITE, BUT SHALL NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF UNLESS AN APPROVED STATE DEWATERING PERMIT IS IN PLACE.
15. EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES STEEPER THAN 3:1.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.
17. WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. CONTROL MEASURES MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
18. TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF-SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
19. THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, SOIL, AND SAND THAT MAY ACCUMULATE IN ROADS, STORM DRAINS AND OTHER DRAINAGE CONVEYANCE SYSTEMS AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.
20. THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.
21. NO CHEMICAL(S) HAVING THE POTENTIAL TO BE RELEASED IN STORMWATER ARE TO BE STORED OR USED ONSITE UNLESS PERMISSION FOR THE USE OF SUCH CHEMICAL(S) IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING APPROVAL FOR THE USE OF SUCH CHEMICAL(S), SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
22. BULK STORAGE OF ALLOWED PETROLEUM PRODUCTS OR OTHER ALLOWED LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL REQUIRE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS ONSITE AND TO PREVENT ANY SPILLED MATERIALS FROM ENTERING STATE WATERS, ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR OTHER FACILITIES.
23. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
24. OWNER/DEVELOPER AND THEIR AGENTS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT" (TITLE 25, ARTICLE 8, CRS), AND THE "CLEAN WATER ACT" (33 USC 1344), IN ADDITION TO THE REQUIREMENTS OF THE LAND DEVELOPMENT CODE, DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (1041, NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND OTHER LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, LOCAL, OR COUNTY AGENCIES, THE MOST RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
25. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
26. PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
27. A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND SHALL BE UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
28. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY TERRACON CONSULTANTS INC. AND SHALL BE CONSIDERED A PART OF THESE PLANS.
29. AT LEAST TEN (10) DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB ONE (1) ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL DIVISION
WQCD – PERMITS
4300 CHERRY CREEK DRIVE SOUTH
DENVER, CO 80246-1530
ATTN: PERMITS UNIT

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File Name: 3.06 GEC - NOTES.DWG		Date:	Comments	Init.			No Revisions:
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Unit Information	Unit Leader						Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT			Project No./Code
GEC NOTES			CDOT Project No. C040-042 (21233)
Designer: NAB	Structure Numbers		Sheet Number
Detailer: KDL			41 OF 58
Sheet Subset: GEC	Subset Sheets: EC-3.06		

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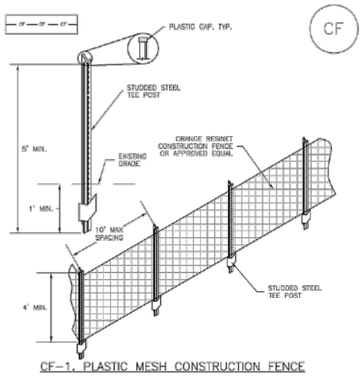


CF-1, PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

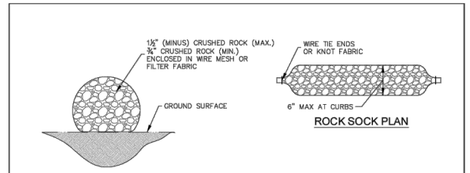
1. SEE PLAN VIEW FOR:
   -LOCATION OF CONSTRUCTION FENCE.
2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR-GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.
4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.
5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CONSTRUCTION FENCE MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

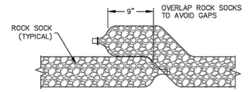
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

[EDITING ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD]



ROCK SOCK PLAN

ROCK SOCK SECTION



ROCK SOCK OVERLAP

GRADATION TABLE	
	MASS PERCENT PASSING SQUARE MESH SIEVES
	No. 4
2"	100
1½"	90–100
1"	20–55
¾"	0–15
⅜"	0–5

MATCHES SPECIFICATIONS FOR No. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M-43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES

INSTALLATION NOTES

1. CRUSHED ROCK SHALL BE BETWEEN MAX. 1½" (MINUS) IN SIZE WITH A FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON THIS SHEET AND MIN. ¾" CRUSHED ROCK.
2. WIRE MESH SHALL HAVE OPENINGS SMALLER THAN THE SMALLEST SIZE ROCK.
3. WIRE MESH SHALL BE SECURED USING 'HOG RINGS' OR WIRE TIES AT 6" CENTERS ALONG ALL JOINTS AND AT 2' CENTERS ON ENDS OF SOCKS.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ROCK SOCKS SHALL BE REPLACED IF THEY BECOME HEAVILY SOILED OR DAMAGED BEYOND REPAIR.
3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN THE DEPTH REACHES ½ OF THE HEIGHT OF THE ROCK SOCK.
4. ROCK SOCKS ARE TO REMAIN IN PLACE UNTIL DISTURBED AREA IS STABILIZED.
5. PERMANENTLY STABILIZE AREA AFTER ROCK SOCKS HAVE BEEN REMOVED.

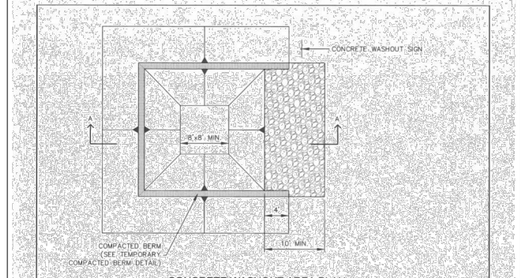
RS

STORMWATER ENTERPRISE

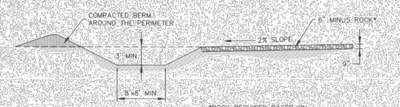
ROCK SOCK

APPROVED:
CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		500-RS



CONCRETE WASHOUT AREA PLAN



SECTION A-A

*ROCK REQUIRED BASED ON SITE CONDITIONS AT THE DISCRETION OF THE QEC INSPECTOR

CWA

STORMWATER ENTERPRISE

CONCRETE WASHOUT AREA

APPROVED:
CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	500-CWA-1

INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   -LOCATION OF CONCRETE WASHOUT AREA
2. LOCATE AT LEAST 50' AWAY FROM STATE WATERS, MEASURED HORIZONTALLY.
3. AN IMPERMEABLE LINER (16 MIL. MINIMUM THICKNESS) IS REQUIRED IF CONCRETE WASH AREA IS LOCATED WITHIN 400' OF STATE WATERS OR 1000' OF WELLS OR DRINKING WATER SOURCES.
4. DO NOT LOCATE IN AREAS WHERE SHALLOW GROUNDWATER MAY BE PRESENT.
5. THE CONCRETE WASH AREA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
6. CONCRETE WASH AREA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8' BY 8'.
7. BERM SURROUNDING SIDES AND BACK OF CONCRETE WASH AREA SHALL HAVE A MINIMUM HEIGHT OF 2 FEET.
8. CONCRETE WASH AREA ENTRANCE SHALL BE SLOPED 2% TOWARDS THE CONCRETE WASH AREA.
9. SIGNS SHALL BE PLACED AT THE CONCRETE WASH AREA.
10. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. THE CONCRETE WASH AREA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS ACCUMULATED IN THE PIT SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF ½ THE HEIGHT OF THE CONCRETE WASH AREA.
3. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE, AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER-TIGHT CONTAINER, AND DISPOSED OF PROPERLY.
4. THE CONCRETE WASH AREA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
5. PERMANENTLY STABILIZE AREA AFTER CONCRETE WASH AREA IS REMOVED.

CWA

STORMWATER ENTERPRISE

CONCRETE WASHOUT AREA

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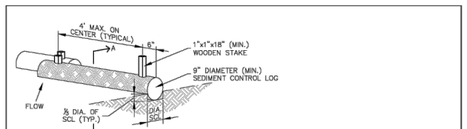
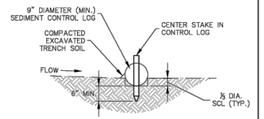
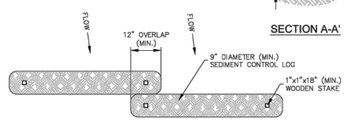


SEDIMENT CONTROL LOG



SECTION A-A'



SEDIMENT CONTROL LOG JOINTS

INSTALLATION NOTES

1. ALL SEDIMENT CONTROL LOGS MUST BE EMBEDDED TO ⅓ OF THE HEIGHT OF THE LOG.
2. LARGER DIAMETER SEDIMENT CONTROL LOGS NEED TO BE EMBEDDED DEEPER.
3. PLACE SEDIMENT CONTROL LOG AGAINST SIDEWALK OR BACK OF CURB WHEN ADJACENT TO THESE FEATURES.
4. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE FROM ANY NOXIOUS WEED SEEDS OF DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
5. IF USING AS SLOPE PROTECTION, INSTALL SEDIMENT CONTROL LOGS ALONG THE CONTOUR.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
3. PERMANENTLY STABILIZE AREA AFTER SEDIMENT CONTROL LOGS HAVE BEEN REMOVED.

SCL

STORMWATER ENTERPRISE

SEDIMENT CONTROL LOGS

APPROVED:
CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		500-SCL

Print Date: November 12, 2024		Sheet Revisions			
File Name: 3.06 GEC - DETAILS.DWG		Date:	Comments	Init.	
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Unit Information Unit Leader					

Know what's below. Call before you dig.

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As Constructed

No Revisions:

Revised:

Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC DETAILS

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GEC	Subset Sheets:	EC-3.07

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

42 OF 58

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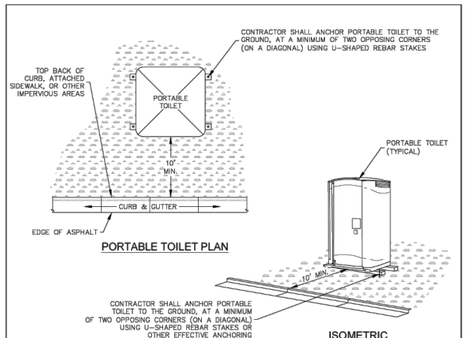


PORTABLE TOILET PLAN

ISOMETRIC

INSTALLATION NOTES

1. PORTABLE TOILETS SHALL BE PLACED A MINIMUM OF 10 FEET BEHIND ALL CURBS, SIDEWALKS, AND OTHER IMPERVIOUS AREAS; 50 FEET FROM STORM INLETS, AND 100 FEET FROM WATERWAYS.
2. PORTABLE TOILETS IN THE RIGHT-OF-WAY ARE REQUIRED TO BE PLACED ON MOBILE TRAILERS AND MUST BE ANCHORED OR WEIGHTED DOWN. PORTABLE TOILETS MAY BE INSTALLED IN ACCORDANCE WITH NOTE #1 IN STAGING AREAS/YARDS.
3. PORTABLE TOILETS SHALL BE SECURELY ANCHORED TO THE GROUND USING U-SHAPED REBAR STAKES, OR OTHER EFFECTIVE ANCHORING.
4. ANCHORING SHALL BE POSITIONED ON AT LEAST TWO OPPOSING (DIAGONAL) CORNERS.

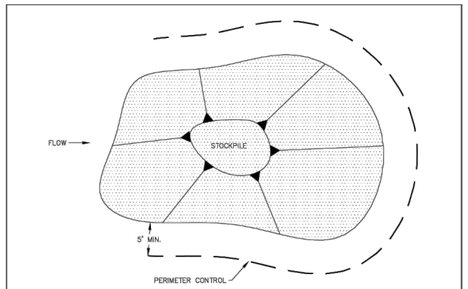
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. PORTABLE TOILETS SHALL BE SERVICED AT THE NECESSARY INTERVALS TO ELIMINATE THE POSSIBILITY OF OVERFLOW.
3. WHEN THE PORTABLE TOILETS ARE REMOVED, ANY DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE TOILETS MUST BE PERMANENTLY STABILIZED.

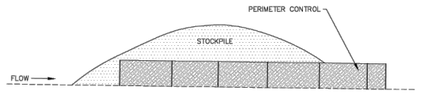
PT

PORTABLE TOILET

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 2/19/19 | REVISED: 10/7/19 | DRAWING NO. 900-PTM



STOCKPILE PROTECTION PLAN



STOCKPILE PROTECTION ELEVATION

INSTALLATION NOTES

1. INSTALL PERIMETER CONTROL AROUND STOCKPILE ON DOWNGRADIENT SIDE. PERIMETER CONTROL MUST BE SUITABLE TO SITE CONDITIONS AND INSTALLED ACCORDING TO THE RELEVANT DETAIL.
2. FOR STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS INCLUDING PERIMETER CONTROL ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. IF PERIMETER CONTROLS MUST BE MOVED TO ACCESS STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORK DAY.
3. ACCUMULATED SEDIMENT MUST BE REMOVED ACCORDING TO PERIMETER CONTROL DETAIL.

SP

STOCKPILE PROTECTION

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-SP

SEEDING & MULCHING

ALL SOIL TESTING, SOILS AMENDMENT AND FERTILIZER DOCUMENTATION, AND SEED LOAD AND BAG TICKETS MUST BE ADDED TO THE CSWMP.

SOIL PREPARATION

1. IN AREAS TO BE SEEDED, THE UPPER 6 INCHES OF THE SOIL MUST NOT BE HEAVILY COMPACTED, AND SHOULD BE IN FRIABLE CONDITION. LESS THAN 85% STANDARD PROCTOR DENSITY IS ACCEPTABLE. AREAS OF COMPACTION OR GENERAL CONSTRUCTION ACTIVITY MUST BE SCARIFIED TO A DEPTH OF 6 TO 12 INCHES PRIOR TO SPREADING TOPSOIL TO BREAK UP COMPACTED LAYERS AND PROVIDE A BLENDING ZONE BETWEEN DIFFERENT SOIL LAYERS.
2. AREAS TO BE PLANTED SHALL HAVE AT LEAST 4 INCHES OF TOPSOIL SUITABLE TO SUPPORT PLANT GROWTH.
3. THE CITY RECOMMENDS THAT EXISTING AND/OR IMPORTED TOPSOIL BE TESTED TO IDENTIFY SOIL DEFICIENCIES AND ANY SOIL AMENDMENTS NECESSARY TO ADDRESS THESE DEFICIENCIES. SOIL AMENDMENTS AND/OR FERTILIZERS SHOULD BE ADDED TO CORRECT TOPSOIL DEFICIENCIES BASED ON SOIL TESTING RESULTS.
4. TOPSOIL SHALL BE PROTECTED DURING THE CONSTRUCTION PERIOD TO RETAIN ITS STRUCTURE AVOID COMPACTION, AND TO PREVENT EROSION AND CONTAMINATION. STRIPPED TOPSOIL MUST BE STORED IN AN AREA AWAY FROM MACHINERY AND CONSTRUCTION OPERATIONS, AND CARE MUST BE TAKEN TO PROTECT THE TOPSOIL AS A VALUABLE COMMODITY. TOPSOIL MUST NOT BE STRIPPED DURING UNDESIRABLE WORKING CONDITIONS (E.G. DURING WET WEATHER OR WHEN SOILS ARE SATURATED). TOPSOIL SHALL NOT BE STORED IN SWALES OR IN AREAS WITH POOR DRAINAGE.

SEEDING

1. ALLOWABLE SEED MIXES ARE INCLUDED IN THE CITY OF COLORADO SPRINGS STORMWATER CONSTRUCTION MANUAL. ALTERNATIVE SEED MIXES ARE ACCEPTABLE IF INCLUDED IN AN APPROVED LANDSCAPING PLAN.
2. SEED SHOULD BE DRILL-SEEDED WHENEVER POSSIBLE
   - SEED DEPTH MUST BE ¼ TO ½ INCHES WHEN DRILL-SEEDING IS USED
3. BROADCAST SEEDING OR HYDRO-SEEDING WITH TACKIFIER MAY BE SUBSTITUTED ON SLOPES STEEPER THAN 3:1 OR ON OTHER AREAS NOT PRACTICAL TO DRILL SEED.
   - SEEDING RATES MUST BE DOUBLED FOR BROADCAST SEEDING OR INCREASED BY 50% IF USING A BRILLION DRILL OR HYDRO-SEEDING
   - BROADCAST SEEDING MUST BE LIGHTLY HAND-RAKED INTO THE SOIL

MULCHING

1. MULCHING SHOULD BE COMPLETED AS SOON AS PRACTICABLE AFTER SEEDING, HOWEVER PLANTED AREAS MUST BE MULCHED NO LATER THAN 14 DAYS AFTER PLANTING.
2. MULCHING REQUIREMENTS INCLUDE:
   - HAY OR STRAW MULCH
     - ONLY CERTIFIED WEED-FREE AND CERTIFIED SEED-FREE MULCH MAY BE USED. MULCH MUST BE APPLIED AT 2 TONS/ACRE AND ADEQUATELY SECURED BY CRIMPING AND/OR TACKIFIER.
     - CRIMPING MUST NOT BE USED ON SLOPES GREATER THAN 3:1 AND MULCH FIBERS MUST BE TUCKED INTO THE SOIL TO A DEPTH OF 3 TO 4 INCHES.
     - TACKIFIER MUST BE USED IN PLACE OF CRIMPING ON SLOPES STEEPER THAN 3:1.
   - HYDRAULIC MULCHING
     - HYDRAULIC MULCHING IS AN OPTION ON STEEP SLOPES OR WHERE ACCESS IS LIMITED.
     - IF HYDRO-SEEDING IS USED, MULCHING MUST BE APPLIED AS A SEPARATE, SECOND OPERATION.
     - WOOD CELLULOSE FIBERS MIXED WITH WATER MUST BE APPLIED AT A RATE OF 2,000 TO 2,500 POUNDS/ACRE, AND TACKIFIER MUST BE APPLIED AT A RATE OF 100 POUNDS/ACRE.
   - EROSION CONTROL BLANKET
     - EROSION CONTROL BLANKET MAY BE USED IN PLACE OF TRADITIONAL MULCHING METHODS.

SEE LANDSCAPING PLANS FOR SEE MIXTURE

SM

SEEDING & MULCHING

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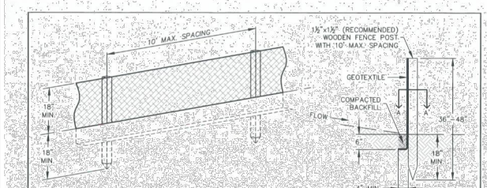


SILT FENCE

J-HOOK INSTALLATION

SECTION A-A'

INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED ON A FLAT SURFACE 2'-5' AWAY FROM TOE OF THE SLOPE TO ALLOW FOR PONDING AND DEPOSITION.
2. COMPACT THE TRENCH USING A JUMPING JACK OR WHEEL ROLLING TO THE POINT THAT THE FENCE RESISTS BEING PULLED OUT OF THE GROUND BY HAND.
3. SILT FENCE SHALL BE TAUT WITH NO SAGS AFTER IT HAS BEEN ANCHORED.
4. FABRIC SHALL BE ATTACHED TO POSTS WITH 1" HEAVY DUTY STAPLES OR 1" NAILS. THESE SHOULD BE PLACED VERTICALLY DOWN THE POST, 3" APART.
5. THE PREFERRED INSTALLATION METHOD USES A TRENCHER OR SILT FENCE INSTALLATION DEVICE.
6. INSTALL SILT FENCE ALONG THE CONTOUR OF THE SLOPES OR IN A MANNER TO AVOID CREATING CONCENTRATED FLOW (SUCH AS A "J-HOOK" INSTALLATION).

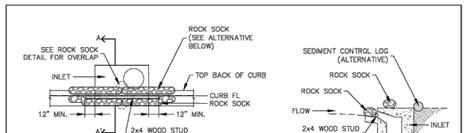
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN HEIGHT OF THE SILT FENCE.
3. SILT FENCE MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AFTER SILT FENCE IS REMOVED.

SF

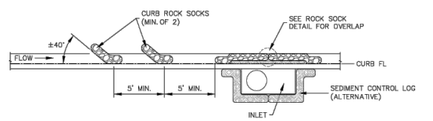
SILT FENCE

STORMWATER ENTERPRISE | APPROVED: (CHIEF ENGINEER) | ISSUED: 10/7/19 | REVISED: 8/19/2020 | DRAWING NO. 900-SF



CURB INLET PROTECTION PLAN

SECTION A-A'



CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. PLACEMENT OF THE ROCK SOCK SHALL BE APPROXIMATELY 40 DEGREES FROM THE CURB.
3. ROCK SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5' APART.
4. AT LEAST TWO CURB ROCK SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON-GRADIENT INLETS.
5. ADDITIONAL ROCK SOCKS MAY BE REQUIRED AT GEC INSPECTOR'S DISCRETION.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA BEHIND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

IP-1

ON-GRADE INLET PROTECTION

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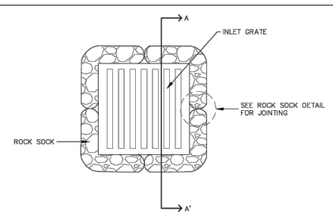
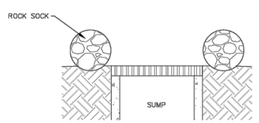


ROCK SOCK SUMP INLET PROTECTION PLAN



SECTION A-A'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF ROCK SOCKS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AROUND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

IP-2

SUMP INLET PROTECTION

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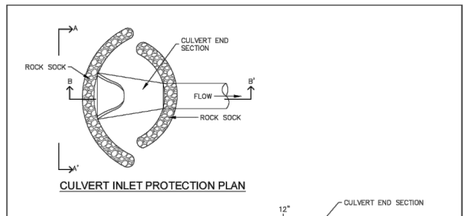
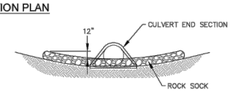
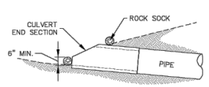


CULVERT INLET PROTECTION PLAN



SECTION A-A'



SECTION B-B'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS ½ HEIGHT OF THE ROCK SOCK.
3. CULVERT INLET PROTECTION SHALL REMAIN UNTIL THE UPSTREAM AREA IS PERMANENTLY STABILIZED.

CIP

CULVERT INLET PROTECTION

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-CIP

Street Sweeping and Vacuuming (SS) SM-7

Description

Street sweeping and vacuuming remove sediment that has been tracked onto roadways to reduce sediment transport into storm drain systems or a surface waterway.

Photograph SS-1. A street sweeper removes sediment and potential pollutants along the curb line at a construction site. Photo courtesy of Tom Gore.

Appropriate Uses

Use this practice at construction sites where vehicles may track sediment offsite onto paved roadways.

Design and Installation

Street sweeping or vacuuming should be conducted when there is noticeable sediment accumulation on roadways adjacent to the construction site. Typically, this will be concentrated at the entrance/exit to the construction site. Well-maintained stabilized construction entrances, vehicle tracking controls and tire wash facilities can help reduce the necessary frequency of street sweeping and vacuuming.

On smaller construction sites, street sweeping can be conducted manually using a shovel and broom. Never wash accumulated sediment on roadways into storm drains.

Maintenance and Removal

- Inspect paved roads around the perimeter of the construction site on a daily basis and more frequently, as needed. Remove accumulated sediment, as needed.
- Following street sweeping, check inlet protection that may have been displaced during street sweeping.
- Inspect area to be swept for materials that may be hazardous prior to beginning sweeping operations.

Street Sweeping/ Vacuuming	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	Yes

Print Date: November 12, 2024	Sheet Revisions		
File Name: 3.07 GEC - DETAILS.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

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

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No Revisions:

Revised:

Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC DETAILS

Designer: NAB
Detailer: KDL
Structure Numbers:
Sheet Subset: GEC
Subset Sheets: EC-3.08

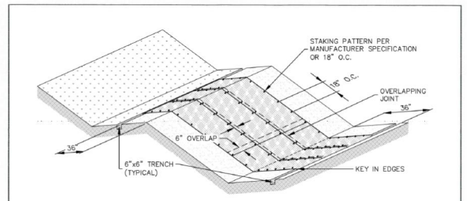
Project No./Code

CDOT Project No. C040-042 (21233)

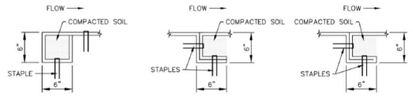
Sheet Number

43 OF 58

11/12/2024 C:\users\mgrater\appdata\local\bentley\projectwise\wcl_projects\d0411886\3.07 GEC - DETAILS.dwg



EROSION CONTROL BLANKET



ECB

STORMWATER ENTERPRISE — EROSION CONTROL BLANKET

APPROVED: DIRECT SUPERVISOR

ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	900-ECB-1

INSTALLATION NOTES

1. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE REQUIRED FOR EROSION CONTROL BLANKETS. TRM PRODUCTS MAY ME USED WHERE APPROPRIATE AS DESIGNATED BY THE ENGINEER.
2. IN AREAS WHERE EROSION CONTROL BLANKETS ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO EROSION CONTROL BLANKET INSTALLATION, AND THE EROSION CONTROL BLANKET SHALL BE IN FULL CONTACT WITH THE SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.
3. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.
4. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF EROSION CONTROL BLANKETS TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL EROSION CONTROL BLANKETS.
5. INTERMEDIATE CHECK SLOT OR STAPLE CHECK SHALL BE INSTALLED EVERY 15' DOWN SLOPES. IN DRAINAGEWAYS, INSTALL CHECK SLOTS EVERY 25' PERPENDICULAR TO FLOW DIRECTION.
6. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF EROSION CONTROL BLANKETS TOGETHER FOR EROSION CONTROL BLANKETS ON SLOPES.
7. MATERIAL SPECIFICATIONS OF EROSION CONTROL BLANKETS SHALL CONFORM TO TABLE ECB–1.
8. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING EROSION CONTROL BLANKETS SHALL BE RESEEDED AND MULCHED.
9. STRAW EROSION CONTROL BLANKETS SHALL NOT BE USED WITHIN STREAMS AND DRAINAGE CHANNELS.
10. COMPACT ALL TRENCHES.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. EROSION CONTROL BLANKETS SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE. TRM MUST BE REMOVED AT THE DISCRETION OF THE GEC INSPECTOR.
3. ANY EROSION CONTROL BLANKET PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW GEOTEXTILE THAT HAVE ERODED TO CREATE A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE EROSION CONTROL BLANKET REINSTALLED.

TABLE ECB–1, EROSION CONTROL BLANKET MATERIAL SPECIFICATIONS

TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING
STRAW	–	100%	–	DOUBLE/ NATURAL
STRAW–COCONUT	30% MIN.	70% MAX.	–	DOUBLE/ NATURAL
COCONUT	100%	–	–	DOUBLE/ NATURAL
EXCELSIOR	–	–	100%	DOUBLE/ NATURAL

ECB

STORMWATER ENTERPRISE — EROSION CONTROL BLANKET

APPROVED: DIRECT SUPERVISOR

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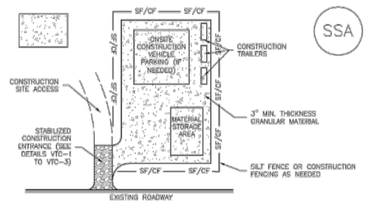
10/7/19	8/19/2020	900-ECB-2



SSA–1, STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF STAGING AREA(S).
   –CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.
3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.
4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.
5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.
6. ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

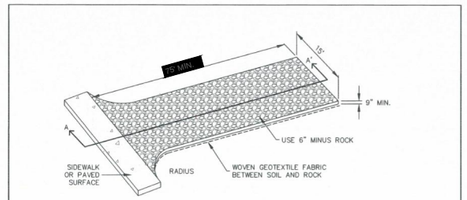
STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
6. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE, AND THE AREA COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

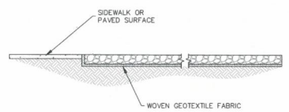
NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE–ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)



AGGREGATE VEHICLE TRACKING CONTROL



SECTION A-A'

INSTALLATION NOTES

1. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHOULD BE LOCATED AT ALL POINTS WHERE VEHICLES EXIT THE CONSTRUCTION SITE TO ADJACENT ROADWAY.
2. STABILIZED CONSTRUCTION ENTRANCE/EXITS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. RADIUS MUST BE ADEQUATE FOR INTENDED CONSTRUCTION VEHICLE TURNING.
4. ROCK SHOULD CONSIST OF 6" MINUS ROCK.
5. INSTALL CONSTRUCTION FENCE ON BOTH SIDES OF VEHICLE TRACKING CONTROL PAD WHEN NEEDED OR REQUIRED BY INSPECTOR.

MAINTENANCE NOTES

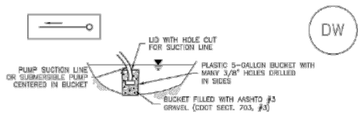
1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. SEDIMENT TRACKED ONTO THE ADJACENT ROAD SHALL BE REMOVED DAILY, BY SWEEPING OR SHOVELING, AND NEVER WASHED DOWN STORM DRAINS.
3. ROUGHEN, REPLACE AND/OR ADD ROCK AS NEEDED TO MAINTAIN CONSISTENT DEPTH AND TO PREVENT SEDIMENT TRACKING ONTO ADJACENT STREET.
4. PERMANENTLY STABILIZE AREA AFTER VEHICLE TRACKING CONTROL IS REMOVED.

VTC

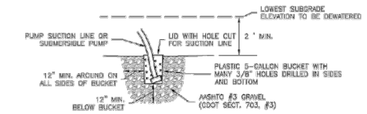
STORMWATER ENTERPRISE — VEHICLE TRACKING CONTROL

APPROVED: DIRECT SUPERVISOR

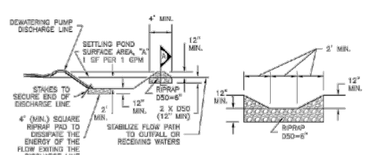
ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	900-VTC



DW–1. DEWATERING POND ALREADY FILLED WITH WATER

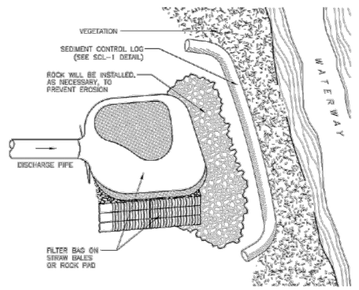


DW–2. DEWATERING SUMP FOR SUBMERSED PUMP



DW–3. SUMP DISCHARGE SETTLING BASIN

SETTLING BASIN SECTION A



DW–4. DEWATERING FILTER BAG

DEWATERING INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF DEWATERING EQUIPMENT.
   –TYPE OF DEWATERING OPERATION (DW–1 TO DW–4).
2. THE OWNER OR CONTRACTOR SHALL OBTAIN A CONSTRUCTION DISCHARGE (DEWATERING) PERMIT FROM THE STATE PRIOR TO ANY DEWATERING OPERATIONS DISCHARGING FROM THE SITE. ALL DEWATERING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE PERMIT.
3. THE OWNER OR OPERATOR SHALL PROVIDE, OPERATE, AND MAINTAIN DEWATERING SYSTEMS OF SUFFICIENT SIZE AND CAPACITY TO PERMIT EXCAVATION AND SUBSEQUENT CONSTRUCTION IN DRY CONDITIONS AND TO LOWER AND MAINTAIN THE GROUNDWATER LEVEL A MINIMUM OF 2–FEET BELOW THE LOWEST POINT OF EXCAVATION AND CONTINUOUSLY MAINTAIN EXCAVATIONS FREE OF WATER UNTIL BACK–FILLED TO FINAL GRADE.

DEWATERING INSTALLATION NOTES

4. DEWATERING OPERATIONS SHALL USE ONE OR MORE OF THE DEWATERING SUMPS SHOWN ABOVE, WELL POINTS, OR OTHER MEANS APPROVED BY THE LOCAL JURISDICTION TO REDUCE THE PUMPING OF SEDIMENT, AND SHALL PROVIDE A TEMPORARY SEDIMENT BASIN OR FILTRATION BMP TO REDUCE SEDIMENT TO ALLOWABLE LEVELS PRIOR TO RELEASE OFF SITE OR TO A RECEIVING WATER. A SEDIMENT BASIN MAY BE USED IN LIEU OF SUMP DISCHARGE SETTLING BASIN SHOWN ABOVE IF A 4–FOOT–SQUARE RIPRAP PAD IS PLACED AT THE DISCHARGE POINT AND THE DISCHARGE END OF THE LINE IS STAKED IN PLACE TO PREVENT MOVEMENT OF THE LINE.

DEWATERING MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. DEWATERING BMPs ARE REQUIRED IN ADDITION TO ALL OTHER PERMIT REQUIREMENTS.
5. TEMPORARY SETTLING BASINS SHALL BE REMOVED WHEN NO LONGER NEEDED FOR DEWATERING OPERATIONS. ANY DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

Print Date: November 12, 2024		Sheet Revisions			Know what's below. Call before you dig.	As Constructed	NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
File Name: 3.07 GEC – DETAILS.DWG		Date:	Comments	Init.		No Revisions:	GEC DETAILS
Horiz. Scale: Vert. Scale:					WILSON & COMPANY 5755 Mark Dabling Blvd. Suite 100 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108	Revised:	Designer: NAB / Detailer: KDL / Sheet Subset: GEC
Unit Information Unit Leader						Void:	Structure Numbers / Subset Sheets: EC-3.09

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
44 OF 58

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UTILITY CONTACTS

UTILITY COMPANY	CONTACT NAME	TELEPHONE	E-MAIL
ACADEMY DISTRICT 20	ZACH MATHER	719-234-1502	TBD
AT&T	ALEX CORNETT	918-232-0877	AC4957@ATT.COM
COLORADO SPRINGS UTILITIES (CSU) - ELECTRIC/GAS	JIM BRADBURY	719-668-3243	JBRADBURY@CSU.ORG
COLORADO SPRINGS UTILITIES (CSU) - ELECTRIC/GAS	TIMOTHY WENDT	719-668-4962	TWENDT@CSU.ORG
COLORADO SPRINGS UTILITIES (CSU) - WATER/SANITARY	ROCKIE WILEY	719-668-4675	RWILEY@CSU.ORG
COLORADO SPRINGS UTILITIES (CSU) - FIBER	CHANCE DAVES	719-668-3913	CDAVES@CSU.ORG
COLORADO SPRINGS TRAFFIC	BRYAN CURTIS	719-385-7603	BRYAN.CURTIS@COLORADOSPRINGS.GOV
COMCAST	JOHN ETTER	N/A	JOHN_ETTER@COMCAST.COM
DONALA WATER & SANITATION DISTRICT	RONNY WRIGHT	719-499-8256	RONNYW@DONALAWATER.COM
FALCON BROADBAND/STRATUS IQ	MARK KINMAN	719-678-1055	MKINMAN@STRATUSIQ.COM
LUMEN	DIANE MURPHY	719-597-1452	DIANE.MURPHY@LUMEN.COM
LUMEN	ROBERT MCLEOD	303-949-2187	RMCLEOD@CONGRUEX.COM
MCI	N/A	N/A	VZ.CSP.BAU.ENGINEERING@VERIZON.COM
SPRINT	RUSSELL MIX	TBD	RUSSELL.MIX@T-MOBILE.COM
ZAYO GROUP	R.D. BISHOP	801-897-2503	RDBISHOP@COBBFENDLEY.COM
ZAYO GROUP	N/A	N/A	ZAYO.RELO.COLORADO.COM

UTILITY GENERAL NOTES

1. UTILITIES ARE DEPICTED ON THESE PLANS IN ACCORDANCE WITH THEIR ACHIEVED QUALITY LEVELS AS DEFINED IN THE AMERICAN SOCIETY OF CIVIL ENGINEERS/UTILITY ENGINEERING & SURVEYING INSTITUTE/CONSTRUCTION INSTITUTE (ASCE/UESI/CI) 38-22, "STANDARD GUIDELINE FOR INVESTIGATING AND DOCUMENTING EXISTING UTILITIES." LOCATION OF EXISTING UTILITIES IS DEPICTED ACCORDING TO THE BEST AVAILABLE INFORMATION AND REPRESENT CONDITIONS AT THE TIME OF DATA COLLECTION.

2. THE CONTRACTOR SHALL COMPLY WITH ARTICLE 1.5 OF TITLE 9, CRS ("EXCAVATION REQUIREMENTS") WHEN EXCAVATING OR GRADING IS PLANNED IN THE AREA OF UNDERGROUND UTILITY FACILITIES. THE CONTRACTOR SHALL CONTACT COLORADO 811 AT LEAST THREE (3) BUSINESS DAYS, NOT INCLUDING THE ACTUAL DAY OF NOTICE, PRIOR TO COMMENCING SUCH OPERATIONS. THESE PLANS DO NOT RELIEVE THE CONTRACTOR FROM FOLLOWING ALL APPLICABLE UTILITY DAMAGE STATUTES AND PROCEDURES DURING EXCAVATION.

3. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL CONTACT ALL UTILITIES TO COORDINATE SCHEDULING AT NO ADDITIONAL COSTS TO EL PASO COUNTY. SHOULD ANY CONFLICTS, RECONSTRUCTION, OR OTHER INTERRUPTIONS BE REQUIRED, THE CONTRACTOR SHALL COORDINATE UTILITY SCHEDULING.

4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXAMINE THE SITE FOR EVIDENCE OF FAILURES OR DEFICIENCIES IN UTILITY COMPANY FACILITIES AND TO IMMEDIATELY CALL ANY SUCH EVIDENCE OF PRE-EXISTING DAMAGE TO THE ATTENTION OF THE UTILITY COMPANY ALONG WITH PROPER DOCUMENTATION. THE CONTRACTOR HEREBY AGREES THAT THE REPAIR OF ANY AND ALL DAMAGES (DIRECT OR INDIRECT) THAT MAY BE SUBSEQUENTLY DISCOVERED AND PROVEN TO HAVE BEEN CAUSED BY THE CONSTRUCTION ACTIVITIES, IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR WITHOUT SUCH EVIDENCE OF PRE-EXISTING DAMAGE. THE CONTRACTOR HEREBY AGREES THAT DAMAGE WITHIN SIX FEET OF UTILITY COMPANY FACILITIES (DIRECT OR INDIRECT), UP UNTIL THE TIME THE PROJECT HAS BEEN ACCEPTED BY THE ENGINEER, WERE CAUSED BY THE CONSTRUCTION ACTIVITIES. FURTHERMORE, THE REPAIR IS AGREED TO BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ALL UTILITY COMPANY FACILITIES WITHIN THE AREA OF CONSTRUCTION. THIS INCLUDES ALL STEPS NECESSARY TO PREVENT SUBSIDENCE OF THE SOIL ADJACENT TO OR NEAR UTILITY COMPANY FACILITIES.

5. ALL COSTS ASSOCIATED WITH FIELD VERIFICATION OF UTILITIES FOR DAMAGE PREVENTION SHALL BE BORNE BY THE CONTRACTOR AND SHALL BE COMPLETED PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

6. LOCATING EXISTING UTILITIES WILL BE PAID FOR AS POTHOLING. USE OF THE TERM "POTHOLING" SHALL NOT BE CONSTRUED TO IMPLY ANY PARTICULAR METHOD OF PROSPECTING. IT IS ESTIMATED THAT 100 HOURS OF ITEM 203-01597 POTHOLING WILL BE NEEDED AS PART OF THIS PROJECT. POTHOLING OF AN AREA SHALL TAKE PLACE AT LEAST 10 DAYS PRIOR TO COMMENCEMENT OF CONSTRUCTION OPERATIONS IN THAT AREA. HOURS APPROVED FOR PAYMENT UNDER THIS PAY ITEM SHALL BE AT THE DISCRETION OF THE ENGINEER.

7. UTILITIES ARE DEPICTED ON THESE PLANS BASED ON THE SUBSURFACE UTILITY ENGINEERING (SUE) INVESTIGATION CONDUCTED BETWEEN DECEMBER 2022 AND JUNE 2023 BY GOODBEE & ASSOCIATES. SEE SUE PLANS FOR MORE INFORMATION.

8. ADDITIONAL UTILITY SERVICE LINES MAY BE ENCOUNTERED DURING CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO RECONNECT ALL EXISTING SERVICES FOR WATER AND SANITARY LINES. THE CONTRACTOR SHALL COORDINATE WITH THE RESPECTIVE UTILITY OWNER OR AGENCY ON THEIR SERVICE LINES.

9. THE CONTRACTOR SHALL ADJUST ALL MANHOLES AND VALVES TO FINAL GRADE. THE CONTRACTOR SHALL CLEAN ALL VALVE BOXES.

10. ALL EXCAVATIONS FOR UTILITY LINES, CULVERTS, TRENCHES, OR TUNNELS SHALL MEET THE REQUIREMENTS OF OSHA OR CDOT, WHICHEVER APPLIES.

11. ALL NEW UNDERGROUND FACILITIES, INCLUDING LATERALS UP TO THE STRUCTURE OR BUILDING BEING SERVED, INSTALLED AS PART OF THIS PROJECT MUST BE ELECTRONICALLY LOCATABLE WHEN INSTALLED, IN COMPLIANCE WITH COLORADO REVISED STATUTES, TITLE 9, ARTICLE 1.5-103(10).

12. ALL UTILITIES SHALL BE PROTECTED IN PLACE UNLESS OTHERWISE IDENTIFIED ON THESE PLANS.

UTILITY LEGEND

QUALITY LEVEL D

- ELECTRIC
- FIBER OPTIC
- FIBER OPTIC (ABND)
- GAS
- SANITARY FORCE MAIN
- SANITARY SEWER
- STORM
- TELEPHONE
- WATER
- WATER (ABND)

QUALITY LEVEL B

- CABLE TV
- ELECTRIC
- FIBER OPTIC
- GAS
- IRRIGATION
- TELEPHONE
- WATER

ABOVE GROUND SURVEY FEATURES

- CELL TOWER
- ELECTRIC LIGHT POLE
- ELECTRIC METER
- ELECTRIC STUB
- ELECTRIC TRANSFORMER
- ELECTRIC VAULT
- FIBER OPTIC BOX
- FIBER OPTIC MANHOLE
- FIBER OPTIC PEDESTAL
- FIBER OPTIC VAULT
- FIRE HYDRANT
- GAS TEST POINT
- GUYWIRE
- IRRIGATION MH
- SANITARY MANHOLE
- SANITARY SEWER CLEANOUT
- STORM FLARED END SECTION
- STORM INLET
- STORM INLET STRUCTURE
- STORM MANHOLE
- TELEPHONE CABINET
- TELEPHONE PEDESTAL
- TELEVISION PEDESTAL
- TRAFFIC BOX
- TRAFFIC SIGN
- TRAFFIC SIGNAL POLE
- WATER VALVE
- WATER WELL

QUALITY LEVEL A

- TEST HOLE

PROPOSED

- ELECTRIC
- GAS
- REMOVAL

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Print Date: NOVEMBER 1, 2024			
File Name: UTIL-UGN01.DWG			
Horiz. Scale:	Vert. Scale:		
Unit Information	Unit Leader		

GOODBEE & ASSOCIATES, INC.

Sheet Revisions		
Date:	Comments	Init.

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

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 220
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

As Constructed

No Revisions:

Revised:

Void:

NORTH GATE / STRUTHERS
PWQ POND
UTILITY CONTACTS, NOTES, LEGEND

Designer:	DB	Structure Numbers	
Detailer:	GB		
Sheet Subset:	UTILITY	Subset Sheets:	UGN-01

Project No./Code: 176103

Sheet Number: 45 OF 58

UTILITY TEST HOLE SUMMARY TABLE

Test Hole	Utility Owner	Type	Material	Size (in)	DirectBuryConduit	Surface Elevation	Depth to TOP (ft)	TOP Elevation	Aprx. Depth to BOP (ft)	BOP Elevation	Northing	Easting	Notes
TH1A	CSU	Electric	CONC DUCT	31x17	Duct Bank	6677.8	1.8	6676.0	3.3	6674.5	435649.38	190551.70	W 31" x 17" L conc duct
TH1B	CSU	Electric	PVC	4	Conduit	6677.8	1.9	6675.9	2.2	6675.6	435649.74	190551.45	
TH1C	CSU	Electric	DBC	0.5	Direct Bury	6677.8	2.7	6675.1	2.7	6675.1	435650.25	190551.19	0.5" x 2
TH2	ZAYO	Fiber	PE	2	Multi Conduit	-	7.7	-	8.0	-	-	-	2" x 3; hole collapsed. Could not measure utility size, approx 2" utility size
TH3	CSU	Electric	CONC DUCT	36x23	Duct Bank	6683.8	1.2	6682.6	3.1	6680.7	435813.44	190895.94	W 36" x 23" L
TH4	CDOT	Electric	PVC	2	Conduit	6694.9	2.4	6692.5	2.6	6692.3	435947.24	191353.88	
TH5	CDOT	Electric	PVC	2	Conduit	6695.3	2.3	6693.0	2.5	6692.8	435978.66	191423.77	
TH6A	CSU	Electric	CONC DUCT	33x12	Duct Bank	6698.2	2.6	6695.6	3.6	6694.6	436000.34	191473.41	W 33" x 12" L
TH6B	CSU	Electric	PVC	4	Multi Conduit	6698.2	2.0	6696.2	2.3	6695.9	436000.34	191473.77	4" x 2
TH7	CDOT	Electric	PVC	2	Conduit	6697.8	2.1	6695.7	2.2	6695.6	435994.25	191474.77	
TH8	StratusIQ	Fiber	PE	1.5	Multi Conduit	6703.5	3.2	6700.3	3.5	6700.0	436060.56	191561.68	1.5" x 2
TH9	Lumen	Fiber	STL	4	Conduit	6704.0	5.3	6698.7	5.7	6698.3	436073.69	191573.54	STL was rusted
TH10	Falcon Broadband	Fiber	PE	2	Conduit	6704.4	3.5	6700.9	3.7	6700.7	436078.67	191577.50	
TH11	CSU	Electric	PVC	2	Conduit	6704.5	2.2	6702.3	2.4	6702.1	436085.42	191582.96	
TH11A	CSU	Electric	DNF	DNF	N/A	6704.5	DNF	DNF	DNF	DNF	436085.43	191582.97	DNF; Trench approximately 25' wide by 6' deep
TH11B	UNK	Fiber	DBC	1	Direct Bury	6704.1	1.7	6702.4	1.8	6702.3	436073.74	191573.92	UNK utility found while searching for CSU E
TH12	Lumen	Telephone	PE	2	Conduit	6707.1	2.1	6705.0	2.3	6704.8	436155.97	191649.44	
TH13	Lumen	Telephone	DBC	1	Direct Bury	6710.1	2.0	6708.1	2.1	6708.0	436225.06	191702.20	
TH14	CSU	Gas	PE	4	N/A	6710.3	2.8	6707.5	3.1	6707.2	436231.93	191702.79	
TH15	Lumen	Telephone	DNF	DNF	N/A	6711.0	DNF	DNF	DNF	DNF	436238.83	191703.42	DNF- could not measure due to ground collapsing. Trenched from the pedestal to the test hole and could not find the line.
TH16A	Donala	Water	DNF	DNF	N/A	6712.4	DNF	DNF	DNF	DNF	436316.54	191728.71	Cleared to 12.2'
TH16B	UNK	Fiber	PE	2	Conduit	6712.4	4.2	6708.2	4.4	6708.0	436327.44	191713.33	UNK FO conduit found in the same hole as 16A
TH17	Lumen	Telephone	Cable	0.75	Direct Bury	6718.1	2.5	6715.6	2.6	6715.5	436486.84	192046.11	Direct bury
TH18	CSU	Electric	PVC	2	Conduit	6718.4	1.0	6717.4	1.2	6717.2	436494.55	192061.96	
TH19	District 20	Fiber	PVC	2	Conduit	6719.2	3.1	6716.1	3.2	6716.0	436504.46	192080.32	
TH21	Sprint	Fiber	DNF	DNF	DNF	6719.5	DNF	DNF	DNF	DNF	436506.21	192084.67	
TH22	District 20	Fiber	PVC	3	Conduit	6719.8	4.3	6715.5	4.6	6715.2	436526.92	192091.75	
TH23	CSU	Electric	PVC	4	Multi Conduit	6719.9	2.9	6717.0	3.5	6716.4	436554.90	192085.66	2" x 4
TH24	Donala	Fiber	PVC	2	Conduit	6719.9	4.2	6715.8	4.3	6715.6	436558.34	192085.32	
TH25	Donala	Water	Pvc	8	N/A	6720.0	5.3	6714.7	5.9	6714.1	436572.40	192081.99	
TH26	District 20	Fiber	PVC	3	Conduit	6720.2	4.1	6716.1	4.4	6715.8	436579.48	192068.14	
TH27	Comcast	Television	PE	2.5	Multi Conduit	6720.1	3.1	6717.0	3.5	6716.6	436580.28	192072.33	2.5" x 2
TH28	Donala	Water	DNF	DNF	DNF	6720.9	DNF	DNF	DNF	DNF	436584.18	192097.95	DNF CLEARED TO 3.8'; Concrete in hole could not find edges. Added TH28.1 approximately 10' north to clear concrete.
TH28.1	Donala	Water	PVC	12	N/A	6721.0	5.5	6715.5	6.5	6714.5	436593.95	192095.25	
TH29	CSU	Electric	PE	2	Multi Conduit	6721.7	2.8	6718.9	3.0	6718.7	436590.26	192131.86	2" and 2.25"
TH30	CSU	Gas	PE	6	N/A	6721.8	4.1	6717.7	4.6	6717.2	436591.83	192143.97	
TH31	MCI	Fiber	PE	2.25	Conduit	6722.5	3.5	6719.0	3.7	6718.8	436594.82	192163.79	
TH32	Lumen	Fiber	DNF	DNF	N/A	6722.8	DNF	DNF	DNF	DNF	436594.64	192168.12	DNF Cleared to 3.5'; large rocks and barrier material encountered.
TH33	CSU	Electric	PVC	2	Conduit	6722.8	1.0	6721.8	1.2	6721.6	436595.48	192172.26	
TH34	Comcast	Fiber	DNF	DNF	DNF	6723.1	DNF	DNF	DNF	DNF	436597.07	192179.44	Cleared to 9.5. 12"+ diameter riprap present 6+ feet into surface
TH35	Comcast	Fiber	DNF	DNF	DNF	6723.7	DNF	DNF	DNF	DNF	436597.26	192181.31	Cleared to 9.5. 12"+ diameter Rip rap 6+ feet into surface
TH36	Comcast	Fiber	PE	2	N/A	6724.5	0.0	6724.5	0.2	6724.3	436598.09	192182.73	Fiber on Surface. Concrete from storm structure approx 1' below fiber line
TH37	CSU	Electric	PE	6	N/A	6726.4	3.5	6722.9	4.0	6722.4	436598.97	192198.77	
TH38	Lumen	Fiber	PVC	4	Conduit	6724.4	3.8	6720.6	4.1	6720.3	436714.31	192038.33	
TH39	CSU	Electric	PVC	4	Conduit	6735.6	8.5	6727.1	8.9	6726.7	436882.10	191920.72	
TH40	Comcast	Fiber	PE	2	Multi Conduit	6738.7	4.2	6734.5	4.4	6734.3	436902.14	191879.55	2" x 2; May be FO and TV lines, expected to have further separation based on 811 marks and SUE QLB designation. Found approx 6ft from curb to the west. 811 marks present closer to the curb, excavated to 8ft and swept 3'+ either side.
TH41	Donala	Water	PVC	12	N/A	6739.6	5.3	6734.3	6.3	6733.3	436929.80	191895.25	
TH42	CSU	Gas	PE	6	N/A	6742.8	3.9	6738.9	4.4	6738.4	436980.58	191905.57	
TH43	Donala	Water	PVC	10	N/A	6743.9	9.4	6734.5	10.2	6733.7	436996.80	191896.73	
TH44	Donala	Water	PVC	8	N/A	6744.4	8.5	6735.9	9.1	6735.3	437001.95	191889.97	
TH45	CSU	Gas	PE	4	N/A	6746.0	N/A	N/A	N/A	N/A	437019.20	191867.92	4" gas observed in TH 45 offset 3.2' to S. Added TH 45.1 for accurate depth
TH45.1	CSU	Gas	PE	4	N/A	6745.7	4.5	6741.3	4.8	6740.9	437017.42	191871.31	
TH46	Comcast	Fiber	PE	2	Conduit	6746.2	2.0	6744.2	2.2	6744.0	437022.94	191867.13	
TH47	CDOT	Storm	RCP	42	N/A	6666.7	6.4	6660.3	10.6	6656.1	435068.09	190574.89	Estimated depth based on RCP pipe thickness
TH 48	CSU	Electric	PE	6	Direct Bury	6711.9	6.2	6705.7	6.7	6705.2	436279.47	191706.99	STL was rusted

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NORTH GATE / STRUTHERS
PWQ POND
UTILITY TEST HOLE SUMMARY

Designer: DB
Detailer: GB
Sheet Subset: UTILITY
Structure Numbers:
Subset Sheets: UTH-01

Project No./Code
176103

Sheet Number
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UTILITY TEST HOLE SUMMARY TABLE

Test Hole	Utility Owner	Type	Material	Size (in)	DirectBuryConduit	Surface Elevation	Depth to TOP (ft)	TOP Elevation	Aprx. Depth to BOP (ft)	BOP Elevation	Northing	Easting	Notes
TH101	CDOT	Storm	CONC	42	N/A	6657.2	N/A	N/A	70.5	70.5	434798.99	190695.51	Measured to bottom of headwall
TH102	CDOT	Storm	CONC	42	N/A	6673.9	12.0	6661.9	16.3	6657.6	435369.84	190433.20	Estimated depth based on RCP pipe thickness
TH103	CSU	Electric	DNF	DNF	N/A	6711.2	DNF	DNF	DNF	DNF	436243.45	191704.00	DNF - cleared to 12'. Designated line from MHs just east of roundabout to just pass struthers blvd. Average electronic depth was between 4-6'.
TH104	CSU	Electric	DNF	DNF	N/A	6714.3	DNF	DNF	DNF	DNF	436364.69	191794.30	DNF - added TH104.1 and found in new TH
TH104.1	CSU	Electric	PE	4	Direct Bury	6714.5	4.2	6710.3	4.5	6709.9	436369.01	191791.30	
TH105	CSU	Electric	DNF	DNF	N/A	6719.6	DNF	DNF	DNF	DNF	436517.78	192092.49	DNF - added TH105.1 and found in new TH
TH105.1	CSU	Electric	PE	2.75	Direct Bury	6719.7	4.4	6715.3	4.6	6715.1	436525.43	192090.34	

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NORTH GATE / STRUTHERS
PWQ POND
UTILITY TEST HOLE SUMMARY

Designer: DB
Detailer: GB
Sheet Subset: UTILITY
Structure Numbers:
Subset Sheets: UTH-02

Project No./Code
176103

Sheet Number
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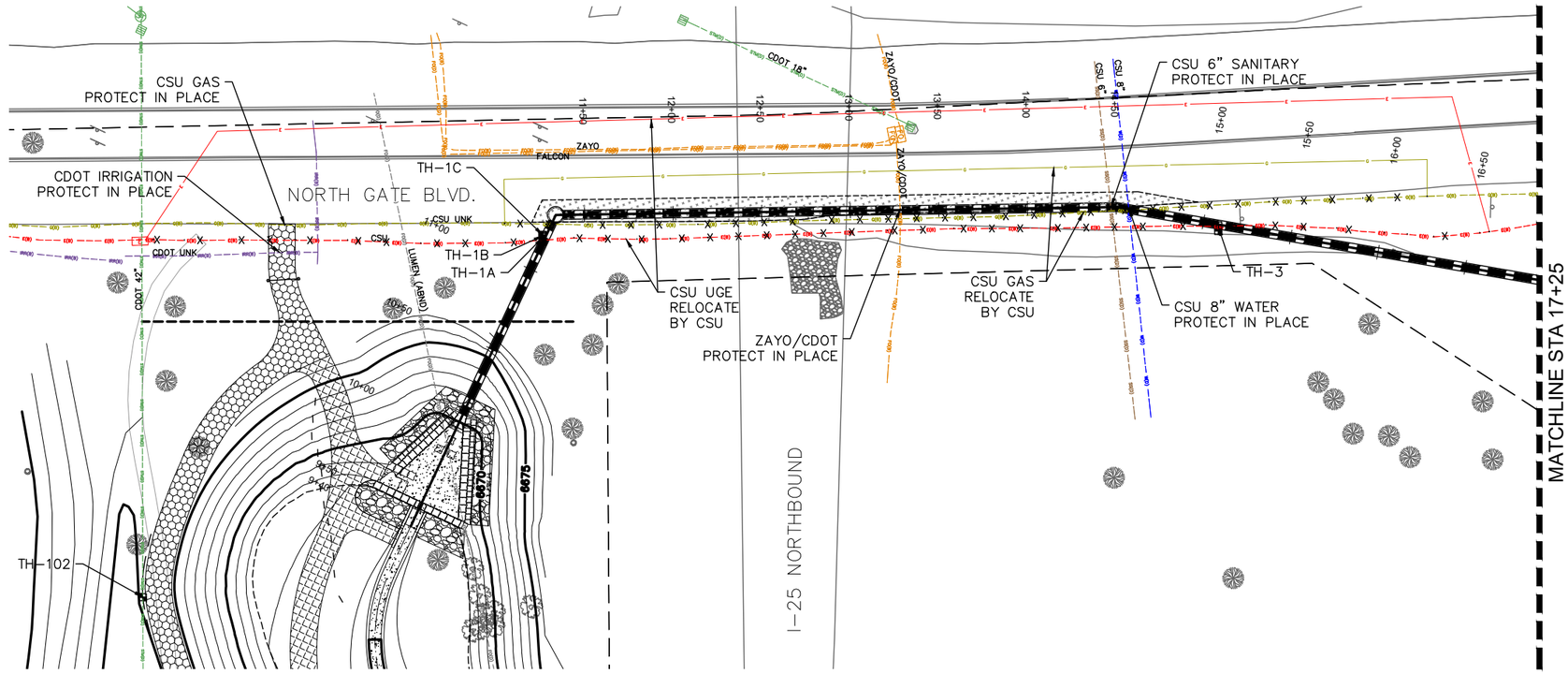

NOTES:
1. SEE DRAINAGE PLANS FOR STORM SEWER DETAILS.
2. SEE POND OUTLET PLANS FOR POND DETAILS.
3. SEE UT-05 FOR UTILITY RELOCATION DETAILS IN POND FOOTPRINT.

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No Revisions:				176103
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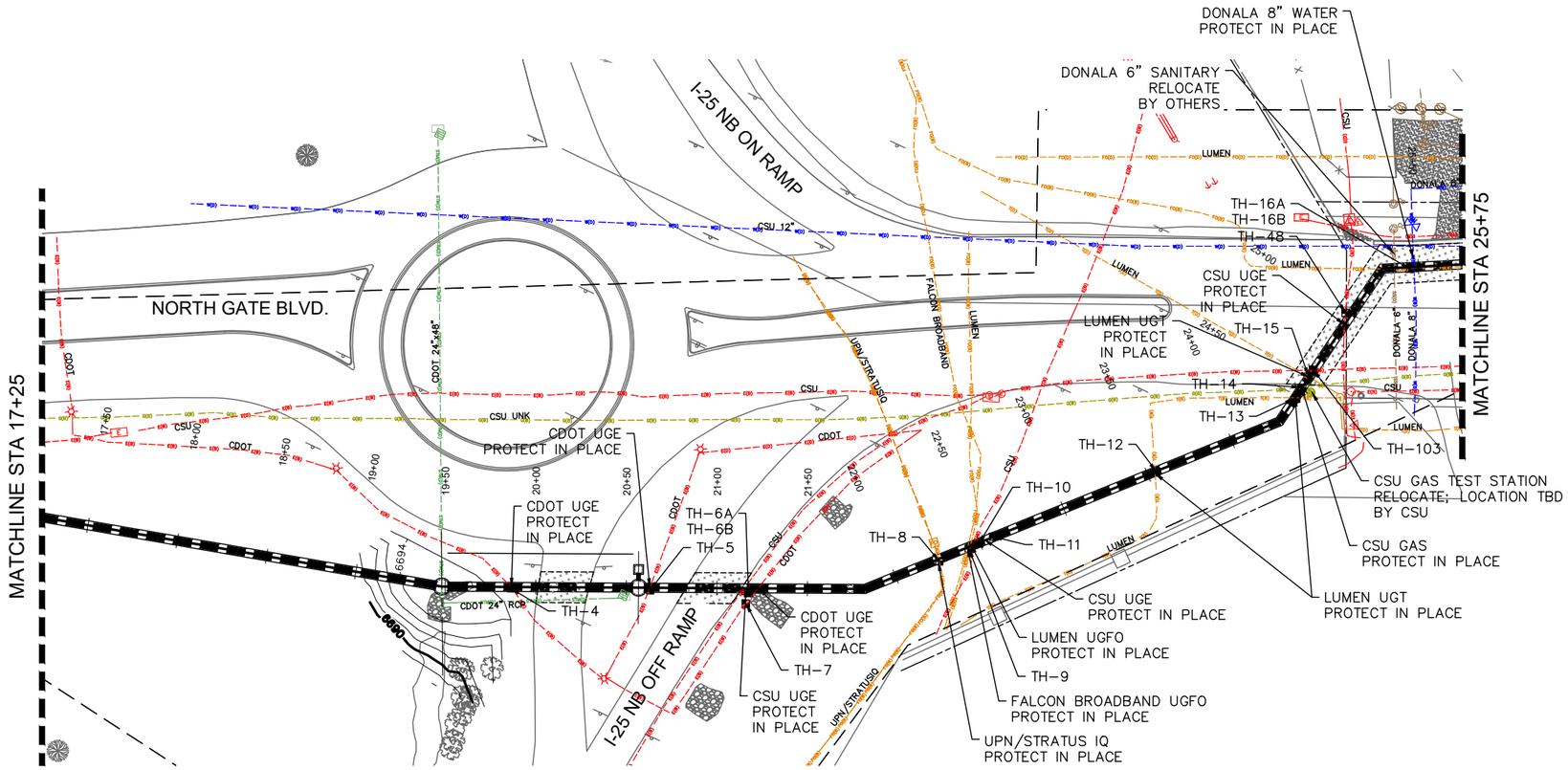

NOTES:
1. SEE DRAINAGE PLANS FOR STORM SEWER DETAILS.

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No Revisions:				176103
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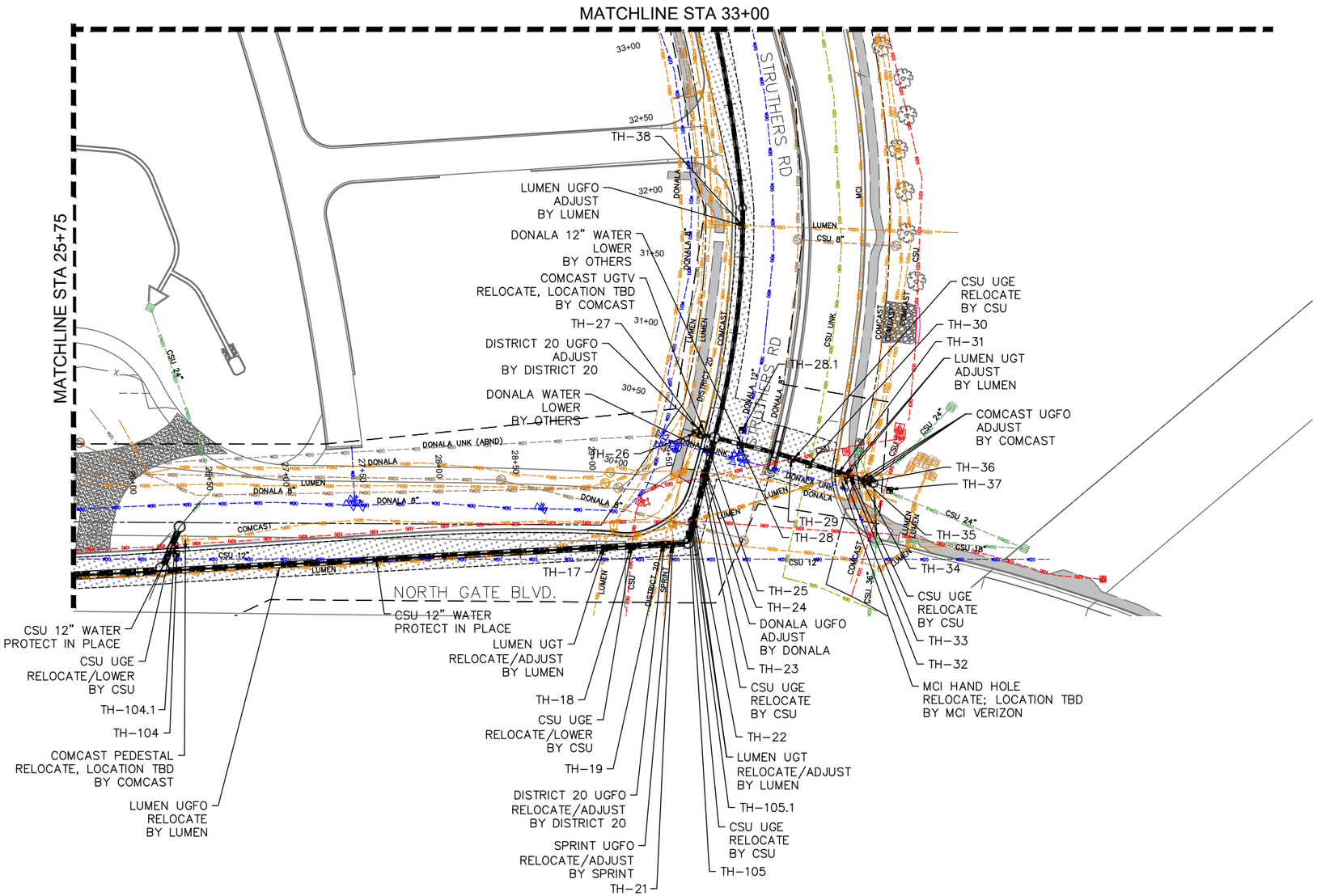
Void:	Detailer: GB			49 OF 58
	Sheet Subset: UTILITY	Subset Sheets:	UT-02	



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NORTH GATE / STRUTHERS
PWQ POND
UTILITY PLAN

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Sheet Subset:	UTILITY	Subset Sheets:	UT-03

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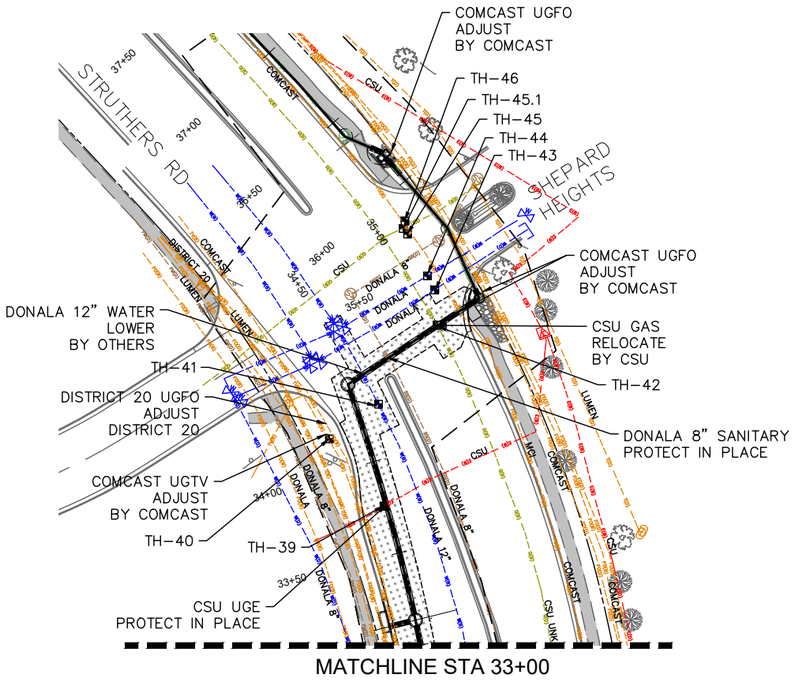

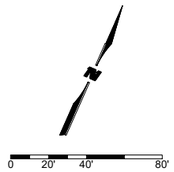

NOTES:
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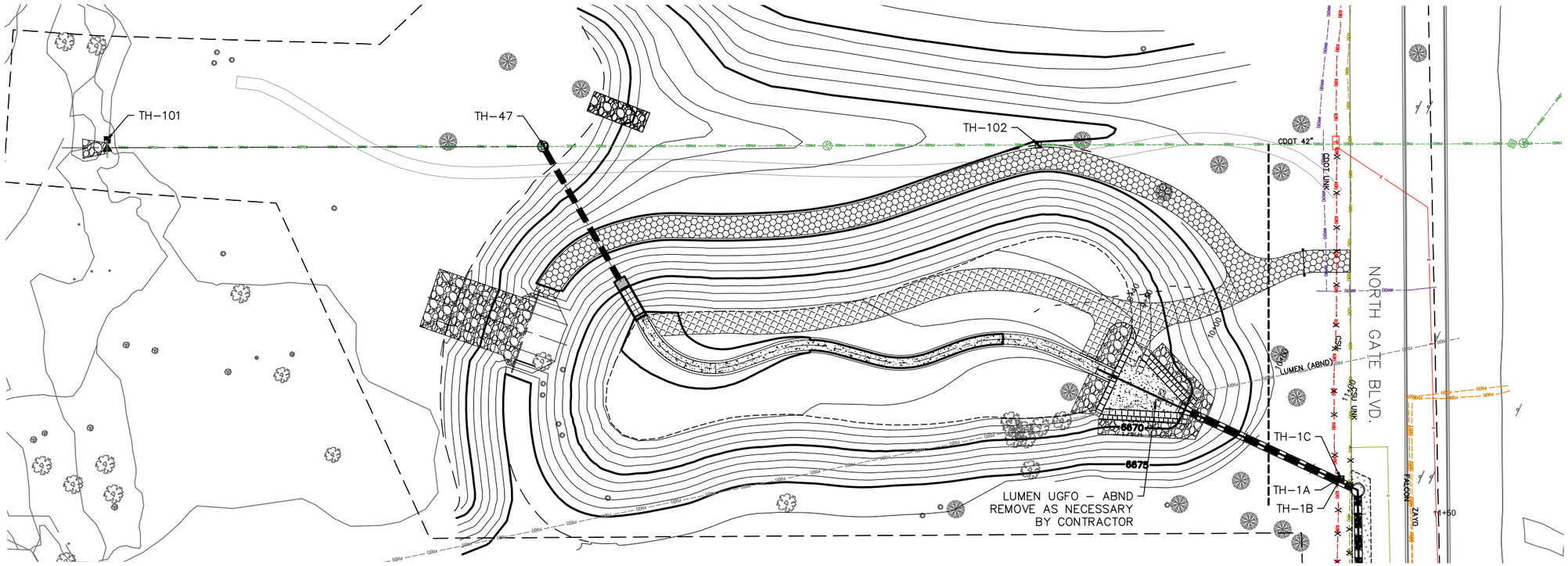

OUTLET POND

NOTES:
1. SEE DRAINAGE PLANS FOR STORM SEWER DETAILS.
2. SEE SHEET UT-01 FOR UTILITY RELOCATION DETAILS ALONG NORTH GATE BLVD.

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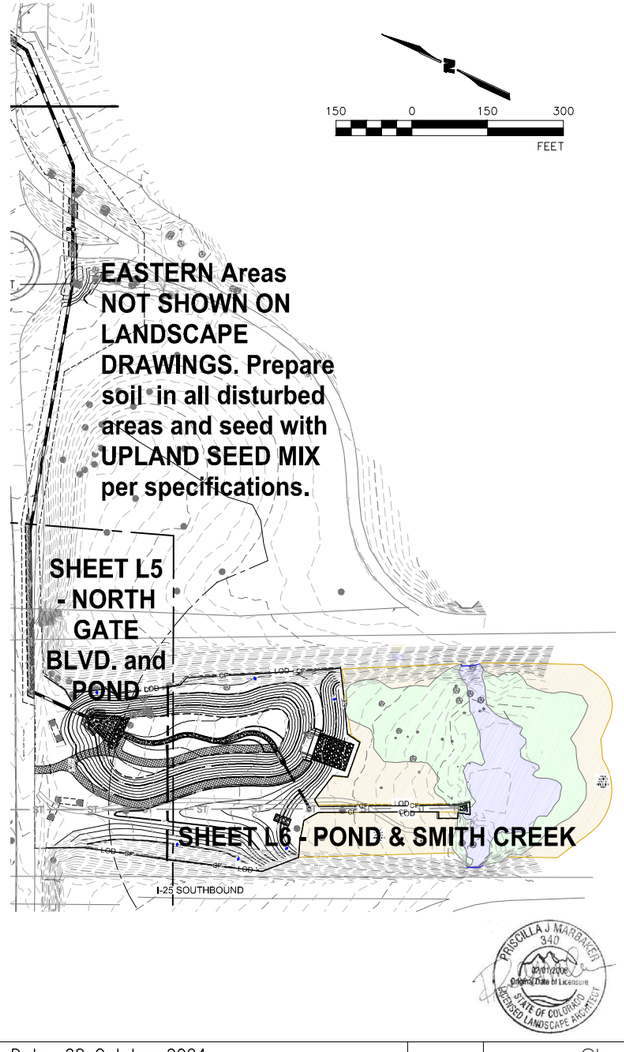
LANDSCAPE SHEET LEGEND

LANDSCAPE SHEET LAYOUT



GENERAL RESTORATION NOTES

1. Vegetative cover at the end of the warranty period will be consistent with the surrounding undisturbed habitats.
2. EROSION MITIGATION GUIDELINES FOR THE LANDSCAPE CONTRACTOR
   - 2.1. The contractor shall limit areas where bare ground exists.
     - 2.1.1. When these areas are temporary impacts, reseeding will be promptly initiated. Revegetate all temporarily impacted areas with specified native seed mixes to reduce erosion.
   - 2.2. Erosion, stormwater, and pollution control BMPs will be implemented during construction to minimize direct impacts to wetlands, streams and riparian areas through erosion and sediment discharge.
     - 2.2.1. Erosion and sediment control measures shall strictly adhere to the erosion control plans. Including but not limited to:
       - 2.2.1.1. Utilize vehicle tracking control devices at the site entrance(s).
       - 2.2.1.2. Placement of concrete washout areas, equipment refueling, and staging areas in upland areas at least 100 feet away from wetlands, creeks, and riparian areas. These areas will be located outside any Preble's habitat. The contractor will have a spill prevention plan.
       - 2.2.1.3. All stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing if/as required by the Stormwater Management Plan.
3. NOXIOUS WEED CONTROL DURING CONSTRUCTION
   - 3.1. Noxious weeds will be controlled by the contractor in all disturbed areas and will be implemented from mobilization through the contracted warranty period.
   - 3.2. Noxious weeds will be controlled by the contractor in all impacted habitat areas until 0 percent of Colorado Noxious Weed Act (Colorado Revised Statutes [CRS] 35-5.5-1011-119) List A species and less than 5 percent of List B or 10 percent of list C species are found in overall plant cover from transects or plot data.
     - 3.2.1. To avoid the continued spreading of noxious weeds, all discrete populations of Colorado List A, B, or C noxious weeds found in or within 100 feet of the restoration area will be sprayed with the appropriate herbicide(s) prior to construction. Always follow all label recommendations, precautions and restrictions when using any herbicide. Read and comply with all herbicide labels, organic or non-organic, for application rates, mixing instructions, protective equipment, re-entry period, grazing or harvest restrictions and other safety information. Herbicides should be applied only by responsible, licensed applicators.
4. PREBLE'S MOUSE HABITAT
   - 4.1. A qualified ecologist or landscape architect shall provide a briefing to the contractor prior to ground disturbance to discuss the project and ensure understanding of avoidance and minimization measures. Conservation measures are thoroughly described on page 11-12 of the biological assessment.
   - 4.2. Construction access in Preble's mouse habitat will be confined to areas identified as impact areas on the plans or by the qualified ecologist or landscape architect.
     - 4.2.1. Habitat areas, specifically high-quality Preble's mouse habitat such as dense willow areas, will be identified and impacts to these areas will be fully minimized.
     - 4.2.2. No construction staging will be allowed in high-quality Preble's mouse habitat.
     - 4.2.3. Preble's mouse habitat adjacent to construction zones will be fenced to prevent construction equipment and other disturbances from occurring in these areas.
     - 4.2.4. Access for mitigation work in Preble's Mouse Habitat will be by foot. No ATVs, pickups or large equipment are permitted.
5. Follow requirements of all specifications. Review and resolve any discrepancies with the Owners Representative prior to starting work with the USAFA Revegetation and Erosion Control Standards, Sept 2024.
6. Contractor and Owner's Representative shall verify the correct location of all underground utilities in the field prior to commencing work.
6. Contractor and Owner's Representative shall verify the requirements of the Biological Assessment prior to commencing work.
7. Contractor shall not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Owner's Representative for a decision. The Contractor shall assume full responsibility for all necessary revision due to failure to give such notification.
8. Construction materials, equipment, fuels, lubricants, and other petroleum distillates should not be stored or stockpiled within 100 horizontal feet of the creek or other aquatic habitats such as ponds and wetlands. Equipment fueling and servicing should occur only within approved designated areas.
9. Refer to notes for staking method, soil preparation, plant pit dimensions and backfill requirements.

GENERAL PERFORMANCE MONITORING NOTES

The objective of monitoring is to ensure that the Preble's mitigation measures have been properly implemented, to evaluate the success of the efforts by identifying issues that could prevent or interfere with the establishment of self-sustaining restoration and enhancement areas, and to suggest remedial activity recommendations to remedy these issues. Monitoring evaluates the status of the restoration and enhancement measures, including plant composition, density, and site hydrology.

1. Annual mitigation monitoring will be conducted by El Paso County during the growing season.
2. An annual mitigation monitoring report will be written by El Paso County and submitted by El Paso County to USAFA and USFWS (Project stakeholders or regulators) before December 1 of each year and will extend for five (5) years after completion of the mitigation installation or until Project regulators determine that the success criteria have been met.
   - 2.1. Problems that could prevent or interfere with the establishment of the mitigation area will be brought to the attention of the Owner, designated oversight team, and Project regulators.
   - 2.2. The Owner or Project Engineer will review and approve alterations to mitigation area design necessary for successful mitigation.
   - 2.3. All recommended remedial actions will be communicated to the Owner and designated oversight team and will be implemented after they have been approved by the Project regulators.
   - 2.4. The Owner and/or designated oversight team will annually assess results of the vegetation monitoring efforts to determine the success of Preble's habitat restoration.
3. Success criteria for the Preble's mouse habitat restoration and mitigation includes:
   - 3.1. Site preparation for seeding and planting will use a high-quality amendments consistent with the USAFA Revegetation and Erosion Control Standards, September 2024 and the Biological Assessment.
   - 3.2. Plant Survival shall be in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
     - 3.2.1. At least 80% of planted shrubs in each planting bed or pod will survive.
     - 3.2.2. At least 80% of the willow stakes in each planting bed or pod will survive.
     - 3.2.3. 100% of planted trees will survive.
     - 3.2.4. Throughout the planted mitigation area, at least 70 percent of the total cover is established with native plant species and growing without showing signs of stress or the continued need for irrigation. This requirement is independent of the stormwater construction permit.
   - 3.3. Noxious weeds and other invasive species will be controlled in restored and enhanced areas and weed control will be conducted for five years or until it is considered successful when 0 percent of Colorado Department of Agriculture (CDA) designated List A species and less than 5 percent of List B species and 10 percent of list C species are found in overall plant cover from ocular estimates.
   - 3.4. Final vegetative cover will be consistent with the surrounding undisturbed habitat.

PRISCILLA J MARBAUGH 340 10/31/2024 Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

Landscape Cover Sheet

Print Date: 28 October 2024	Sheet Revisions			As Constructed	Project No./Code
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.	No Revisions:	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE
Horiz. Scale: Vert. Scale:				Revised:	176103
Unit Information Unit Leader				Void:	Designer: PJM / Detailer: PJM / Sheet Subset: Landscape / Structure Numbers / Subset Sheets: L1
TAPS associates 540 Buckeye, Terrace Level Colorado Springs, CO 80919 phone: 719.593.1540					Sheet Number 53 OF 58

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SOIL AMENDMENT and FINISH GRADING NOTES

1. No work should be done when soil is frozen, snow covered, wet, or muddy.
2. Contractor to verify positive drainage in all areas to be planted or seeded.
3. Before soil amendment is imported, placed, and incorporated, till subsoil in areas to be planted and seeded with the Loamy/Clayey Foothills Seed Mix (Upland Mix) to a depth of 12” and in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.

   3.1. SUBSOIL SOIL TESTING
   3.2. After subsoil tilling per note #3 above, follow soil testing procedures in the USAFA Revegetation and Erosion Control Standards, September 2024.

4. COMPOST and SOIL AMENDMENT
   4.1. Amend areas to be planted and seeded with Upland Seed Mix per soil test results and the USAFA Revegetation and Erosion Control Standards, September 2024.
   4.2. The minimum amount of compost to be applied is 3cy/1,000sf.
   4.3. Before seeding and mulch application, compost, soil humates and/or fertilizers should be mixed as needed per soil-nutrient testing results.
   4.4. Incorporate soil amendments to a depth of 6" in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
   4.5. Grade amended soil to eliminate rough, low, or soft areas and to insure positive drainage.
   4.6. Shrubs in On-site Upland Mitigation Areas: Scarify each shrub planting pit. Backfill each shrub planting pit with mixture of 1/3 compost and ⅔ native soil.

5. FINISH GRADE
   5.1. For all areas where drill seeding is not feasible, finished grades shall be left rough and natural with soil clods no greater than 3 inches in diameter, no smooth surfaces.
   5.2. For drill seeded areas, grades will be flat and smooth to allow for even seeding.

PRISCILLA J MARBAKER 340 10/01/2006 Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

WARRANTY NOTES

1. Contractor shall provide a 2-year warranty on all plant material, willow stakes, seeding, and workmanship.
2. WARRANTY PERIOD (Landscape Establishment Period)
   2.1. The beginning of the warranty period depends upon receipt of the written Notice of Substantial Landscape Completion from the Engineer.
   2.2. If the Notice of Substantial Landscape Completion is issued during the spring planting season, the Landscape Establishment period begins immediately and lasts for a period of 24 months. If the Notice of Substantial Landscape Completion is issued at any other time, the Landscape Establishment period begins at the start of the next spring planting season and lasts for a period of 24 months.

3. WARRANTY MAINTENANCE (Landscape Establishment)
   During the Warranty/ Landscape Establishment period, the Contractor shall water, cultivate, and prune the plants and repair, replace, or readjust guy material, stakes, and posts as required or directed by the Engineer. Contractor shall reshape plant saucers, repair washouts and gullies, replace lost wood chip mulch, keep all planting sites free from weeds and do other work necessary to maintain the plants in a healthy and vigorous growing condition. This includes seasonal spraying or deep root watering with approved insecticides or fungicides as required. The Contractor shall remove all guying wire, straps, and stakes at the end of the Warranty/Landscape Establishment period.
   3.1. PLANTS: Replacement plant material shall be of the same species and size as the stressed, decayed, or dead plant material as the condition is observed.
   3.2. WATERING: The contractor will provide a work plan that details how water volume is measured or estimated to ensure each plant receives the specified quantity.
      3.2.1. Trees planted shall be watered twice per month by the Contractor at the rate of 30 gallons per tree per watering for the months May through October, and once per month at the rate of 30 gallons per tree for the months November through April of all time following planting and the warranty period.
      3.2.2. Shrubs planted in Northgate Boulevard upland area shall be watered twice per month by the Contractor at the rate of 10 gallons per shrub per watering for the months May through October and shall be watered once per month at the rate of 10 gallons per shrub for the months November through April of all time following planting and the warranty period.
      3.2.3. Shrubs planted in PMJM habitat areas shall be watered twice per month by the Contractor at the rate of 3 gallons per shrub per watering for the months May through October and shall be watered once per month at the rate of 3 gallons per shrub for the months November through April of all time following planting and the warranty period.
   3.3. SEEDED AREAS: The Contractor shall restore and reseed eroded areas and areas of poor establishment per Sections 212 and 213 of the CDOT specifications.
4. Vegetative cover at the end of the warranty period will be consistent with the surrounding undisturbed habitats.
5. During warranty period, Contractor shall mow or cut riparian vegetation in the “permanent impact” areas (the graded areas) to a height of 4-6 inches above the ground during the active season, while Preble's mice are still active and can move away (May-August). This will create a less desirable habitat for hibernation, which usually starts by late September.

6. NOXIOUS WEED CONTROL During the Warranty Period
   6.1. Noxious weeds will be controlled by the contractor in all impacted habitat areas until 0 percent of Colorado Noxious Weed Act (Colorado Revised Statutes [CRS] 35-5.5-1011-119) List A species and less than 5 percent of List B or 10 percent of list C species are found in overall plant cover from transects or plot data.
   6.2. Noxious weed control will be implemented through the contracted warranty period.

GENERAL PLANTING and SEEDING NOTES

1. All plant material shall conform to the sizes given in the plant list and shall be nursery grown in accordance with the "American Standard for Nursery Stock", latest edition. www.anla.org
2. All planting shall be in accordance with standard American Association of Nurserymen procedures and specifications, and in accordance with the USAFA Revegetation and Erosion Control Standards, Sept 2024.
3. Contractor and Owner's Representative shall verify the correct location of **all** underground utilities in the field prior to installation of any plant materials.
4. Contractor shall be responsible for the safety of those associated with the work, pedestrians and the general public throughout the duration of the contract.
5. Obtain approval from Architect's or Owner's Representative before making any substitutions or changes.
6. Quantities shown on the plant list are for the Contractor's convenience only and are not guaranteed to be accurate. In the event of a discrepancy between quantities shown on the plan and quantities shown on the plant list, the quantities on the plan shall apply.
7. Contractor shall not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Owner's Representative for a decision. The Contractor shall assume full responsibility for all necessary revision due to failure to give such notification.
8. Contractor is responsible for installing all landscape shown on this plan.

9. QUALIFIED ECOLOGIST WILL DIRECT AND SUPERVISE ALL PLANTINGS
   9.1. Contractor is responsible for contacting the ecologist or landscape architect for all required inspections. Provide at least 48 hours' notice to schedule inspections.
   9.2. After the site has been staked, but prior to clearing, grubbing, and earthwork activities, the contractor, engineer, and ecologist shall walk the site to evaluate and locate existing plant material to be protected and identify plant material that may be salvaged within the designated limits of construction.
   9.3. Planting locations will be field fit based on the appropriate hydrology at the time of restoration.
10. No equipment will be allowed in the restoration area immediately following seeding until establishment.
11. The use of chemicals such as soil stabilizers, dust palliatives, herbicides, growth inhibitors, deicing salts, etc., should be in accordance with the manufacturer's recommended application rates, frequency, and instructions. These chemicals should not be used, stored, or stockpiled within 100 horizontal feet of flowing water or other aquatic habitats such as ponds and wetlands.
12. Refer to specifications and notes for staking method, soil preparation, plant pit dimensions and backfill requirements.
13. WATERING: Water in newly planted nursery stock and unrooted cuttings in non-irrigated areas. Contractor shall furnish and supply the correct amount of water to the area receiving unrooted cuttings and nursery stock to keep the plants in a healthy and vigorous condition. All plantings shall be watered within four (4) hours of placement. All plant material shown on the plans (excluding seeded areas) shall be watered to ensure successful establishment. Rate of flow shall allow the water to soak into the soil adjacent to the planting. At no time shall watering operations be applied at a rate or intensity that causes surface run off.
14. MAINTENANCE DURING CONSTRUCTION. Landscape maintenance and watering shall start immediately upon placement of first permanent landscaping and continue until the Notice of Substantial Landscape Completion has been received. The Contractor shall maintain the seeded areas, nursery stock and unrooted cuttings in a healthy and vigorous growing condition to ensure successful establishment.

15. CONSTRUCTION TIMING
   15.1. Any trees or shrubs to be removed for the project will be removed during the non-nesting season for migratory birds (between September 1 and March 31)
   15.2. Seeding shall be performed in unfrozen ground in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
   15.3. Planting shall be performed between September 1 and when the ground freezes, and when the ground thaws and May 15.
   15.4. Sandbar willow (Salix exigua) and peach leaf willow (Salix amygdaloides) stakes must be harvested from within the limits of construction or other legally accessible sites nearby while dormant (Nov - after leaf drop to April - prior to bud break).

Landscape Notes

Print Date: 28 October 2024	Sheet Revisions		
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			
TAPS associates 540 Buckeye, Terrace Level Colorado Springs, CO 80919 phone: 719.593.1540			

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As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE		Project No./Code
No Revisions:			176103
Revised:	Designer: PJM	Structure Numbers	Sheet Number
Void:	Detailer: PJM		54 OF 58
	Sheet Subset: Landscape	Subset Sheets: L2	

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SEEDING NOTES

1. No work should be done when soils are frozen, snow covered, wet, or muddy.
2. Complete ALL soil amendment and finish grading work prior seeding.
3. After soil amendment, and finish grading is completed in the restoration area, seeding will take place within 48 hours (or sooner as required by the erosion control plan).

4. SEEDING
   - 4.1. Drill seeding will be the required seeding method; however, where terrain doesn't allow drill seeding, hand-broadcast method at double the rate is acceptable.
     - 4.1.1. Prior to seed purchase, all areas to be hand broadcast must be approved by the project ecologist or landscape architect.
     - 4.1.2. In drill seeded areas, grades will be flat to allow for even seeding.
     - 4.1.3. In hand broadcast areas, grades will be rough (plus or minus 3 inches), not smooth or flattened.
   - 4.2. Drill seeding
     - 4.2.1. Seed should be pre-purchased and stored in a cool, dry, rodent free location until ready for use.
     - 4.2.2. All seed bags found onsite should be tagged and labeled. Seed bag tags should have the following information: project name, total pounds pure live seed (PLS), and the scientific names and seeding rate for each species.
     - 4.2.3. Apply an appropriate amount of seed throughout the site using a drill seeding method at the rates specified. Adjust as necessary to ensure even and complete coverage of varied seed sizes.
     - 4.2.4. Adjust drill depth to ensure good seed to soil contact and that most seeds have ~1/4 to ½ inch coverage.
   - 4.3. Hand Broadcast Seeding
     - 4.3.1. Where hand broadcasting is approved, apply an appropriate amount of seed throughout the site using a hand broadcast method at double the drill seed rate, seed bags should be divided into two equal parts prior to application. Similarly, divide the application area into two zones (loosely, or using field measurements). Apply half the stock of seed to the half of the project area carefully, keeping track of percent used vs. percent of area still needing to be covered. Adjust as necessary to ensure even and complete coverage.
     - 4.3.2. After hand-broadcast seeding, rake the area using a sturdy metal bow rake to ensure good seed to soil contact and that most seeds have ~1/4 to ½ inch coverage.
     - 4.3.3. All finished grades will be left rough and natural with soil clods no greater than 3 inches in diameter, no smooth surfaces or straight edges.
   - 4.4. Seeded areas must be delineated (e.g., flagged) for avoidance from heavy equipment.

5. SEEDED AREA MULCHING
   - 5.1. Place erosion control blankets as designated on the civil plans within 24 hours of seeding.
   - 5.2. All areas not covered by erosion control blankets shall be hydromulched with mechanically defibrated virgin wood fiber at a rate of 2,500 lbs/acre with 150 lbs/acre of organic psyllium derived tackifier. Hydromulching must take place within 24 hours of seeding.

6. RECOMMENDED SEED VENDORS
   - 6.1. Arkansas Valley Seed 4333 Hwy. 66 Longmont, CO 80504 (877) 907-3337 www.avseeds.com
   - 6.2. Pawnee Buttes Seed 605 25th St. Greeley, CO 80632 (800) 782-5947 www.pawneebuttesseed.com
   - 6.3. Western Native Seed P.O. Box 188 Coaldale, CO 81222 (719) 942-3935 www.westernnativeseed.com

PLANTING NOTES

1. All plant beds and planting areas to be mulched with shredded aspen mulch to a depth of 3" unless otherwise noted on drawings or specifications.

2. LIVE WILLOW STAKE HARVEST AND INSTALLATION
   - 2.1. Sandbar willow (Salix exigua) and peach leaf willow (Salix amygdaloides) stakes must be harvested from within the limits of construction or other legally accessible sites nearby while dormant (Nov - after leaf drop to April - prior to bud break). All areas for harvest shall be approved by the ecologist prior to cutting and the ecologist will oversee the willow stake harvest operation.
     - 2.1.1. Avoid harvesting and installing crack willow (Salix fragilis), which resembles peach leaf willow but is non-native and invasive in Colorado.
     - 2.1.2. When harvesting outside of the limits of construction, remove no more than 20% of the branches from any single willow clump, do not remove more than 30% of the overall canopy cover from any willow stand and harvest stems evenly through the stand.
   - 2.2. Stakes shall be 3-feet in length and ½ to 1 inch diameter at the base. The stem shall be pruned of all branches with the bottom end cut at a 45-degree angle and the top end cut at a 90-degree angle.
   - 2.3. As stakes are cut, the bottom end shall be immediately placed into water. Once harvested, stakes shall be completely submerged in cold water-for at least 72 hours, but not more than 14 days, prior to planting. The storage location shall be shaded to maintain a cold-water temperature. The stakes will be kept wet until placed into the ground and will not be stored out of water for more than 10 minutes prior to planting.
   - 2.4. Stake planting spacing shall be 1.5-foot on center, located 1-2.5 feet above water surface level. Stakes shall be installed to a depth of 24-inches ensuring that the bottom end is placed in or at the top of the water table.
   - 2.5. All cuttings should be trimmed after installation to ensure that no more than 1/4 of their length is left above ground, to avoid unnecessary desiccation (drying).
   - 2.6. Pilot holes should be backfilled by stamping/stepping down around the installed cutting, or pouring a thick mud-slurry mix, to remove any air pockets. Willow "air prune" and will not grow roots if air pockets remain in the pilot hole.
   - 2.7. Willow staking will occur where they have the best chance of survival.

3. CONTAINERIZED PLANT MATERIAL INSTALLATION
   - 3.1. All containerized plant material must be inspected for health, size, and species upon arrival onsite, notify the ecologist at least 3 business days prior to delivery. Alternatively, local nursery inspection of plants may be arranged prior to delivery. Please notify the ecologist at least 3 business days prior to scheduled delivery.
   - 3.2. All plant material should be watered prior to transport and covered during transport. Water plant material once it arrives onsite and store in a shaded location.
   - 3.3. The contractor will mark all planting locations for adjustment and approval by the ecologist prior to installation.
     - 3.3.1. Containerized plantings will occur where they have the best chance of survival.
     - 3.3.2. Planting locations will be field fit based on the appropriate hydrology at the time of restoration.
   - 3.4. When installing shrubs, dig each planting hole 1.5 to 2 times the width of the rootball.
   - 3.5. Shrubs shall be deep planted, when necessary and as plant material size allows to ensure placement of the rootball in the capillary fringe (moist soil) immediately above the water table.
   - 3.6. Per the planting plan, plant 2 species per planting pod (group), with roughly 15-20 containers of each those species, totaling roughly 30-40 plants per planting pod.
     - 3.6.1. Mark the approximate center of each planting pod with a 4' stake - to easily identify the location for watering
   - 3.7. Create watering basins for all shrubs (except willow stakes). All 60 cubic inch (ci) shrub bed watering dishes shall be 3 inches deep by 2 feet in diameter.
   - 3.8. Once planted, all shrubs shall be watered so that the entire rootball and soil around the rootball are inundated. Water thoroughly on the day of planting.
   - 3.9. Shrubs will be watered from time of planting through the warranty period. See Warranty Notes.

4. RECOMMENDED CONTAINERIZED PLANT MATERIAL VENDORS:
   - 4.1. Aquatic and Wetland Nursery Heidi Windell heidi@aquaticandwetland.com Phone: 303-442-4766 ext. "115" https://aquaticandwetlandnursery.com
   - 4.2. North Fork Native Plants 1499 South 6000 West Rexburg, ID 83440 Phone: 208-354-3691 info@northforknativeplants.com http://www.northforknativeplants.com

PRISCILLA J MARBAUGH 340 — Registered Landscape Architect — State of Colorado

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Landscape Notes

Print Date: 28 October 2024	Sheet Revisions		
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As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE			Project No./Code
No Revisions:				176103
Revised:	Designer: PJM	Structure Numbers		Sheet Number
Void:	Detailer: PJM			55 OF 58
	Sheet Subset: Landscape	Subset Sheets:	L3	

PLANT LIST

QUANTITY	SYM	SCIENTIFIC NAME	COMMON NAME	GROWTH FORM	SIZE	SPACING (O.C.)
PREBLE'S MOUSE HABITAT PLANTINGS near SMITH CREEK						
40	af	Amorpha fruticosa	Leadplant	Shrub	60 ci	3'
40	cs	Cornus sericea	Redosier Dogwood	Shrub	60 ci	3'
40	pa	Prunus americana	American Plum	Shrub	60 ci	3'
60	pv	Prunus virginiana	Chokecherry	Shrub	60 ci	3'
40	ra	Ribes aurem	Golden Currant	Shrub	60 ci	3'
40	rw	Rosa woodsii	Woods' Rose	Shrub	60 ci	3'
10	sa	Salix amygdaloides	Peach leaf willow	Stakes	36" long	10'
850	se	Salix exigua	Sand bar willow	Stakes	36" long	3'
60	so	Symphoricarpos occidentalis	Western Snowberry	Shrub	60 ci	3'
		O.C. = On center; ci = Cubic inch; A 60 ci Deepot 60 = 2.5" diameter x 14"deep				
NORTH GATE BOULEVARD PLANTING						
20	ac	Amorpha canescens	Silvery Leadplant	Shrub	5 gal	3'
9	cm	Cercocarpus montanus	Mountain Mahogany	Shrub	5 gal	4'
29	en	Ericameria nauseosa	Rubber Rabbitbrush (Chrysothamnus nauseosus)	Shrub	5 gal	3'
8	fp	Fallugia paradoxa	Apache Plume	Shrub	5 gal	5'
2	JS	Juniperus scopulorum	Rocky Mountain Juniper	Tree	5 gal	8'
6	PE	Piñon Pine	Pinus edulis	Tree	5 gal	15'
3	PP	Pinus ponderosa	Ponderosa Pine	Tree	5 gal	30'
14	pb	Prunus besseyi	Western Sandcherry	Shrub	5 gal	4'
59	rt	Rhus trilobata	Skunkbush Sumac	Shrub	5 gal	3'
7	rc	Ribes cereum	Wax Currant	Shrub	5 gal	3'
26	wrw	Rosa woodsii	Western Wild Rose	Shrub	5 gal	3'
13	QG	Quercus gambelii	Gambel Oak	Tree	5 gal	12'
12	yg	Yucca glauca	Plains Yucca	Shrub	5 gal	2'

SEEDING MIXES

Table 3: Riparian Seed Mix

Riparian Mix						
Scientific Name	Variety*	Common Name	PLS lbs/ac	% by Weight	PLS/ sq ft	% of PLS/sq ft
Graminoids						
Carex nebrascensis	vns.	Nebraska sedge	1.50	4	18	12
Distichlis spicata	vns.	inland saltgrass	1.20	3	14	9
Elymus canadensis	vns.	Canada wildrye	6.30	16	17	11
Elymus lanceolatus ssp. lanceolatus	vns.	thickspike wheatgrass	4.00	10	14	9
Elymus trachycaulus	San Luis or White River	slender wheatgrass	3.00	8	11	7
Juncus arcticus ssp. littoralis	vns.	mountain rush	0.06	0	15	10
Panicum virgatum	vns.	switchgrass	3.00	8	18	11
Pascopyrum smithii	Arriba	western wheatgrass	1.00	3	3	2
Sporobolus airoides	Salado	alkali sacaton	0.25	1	10	6
Sporobolus cryptandrus	vns.	sand dropseed	0.08	0	10	6
Triticum aestivum x Secale cereale	vns.	Quickguard	10.00	26	3	2
		Graminoid Totals	30.39	78	133	85
Forbs						
Asclepias speciosa	vns.	showy milkweed	4.50	12	7	5
Cleome serrulata	vns.	Rocky Mountain beeplant	3.00	8	5	3
Helianthus maximiliani	vns.	Maxmilian sunflower	0.90	2	4	3
Rudbeckia hirta	vns.	blackeyed susan	0.12	0	5	3
Verbena hastata	vns.	swamp verbena	0.08	0	3	2
		Forb Totals	8.60	22	24	15
		Total	**38.99**	**100**	**157**	**100**

*vns. = variety not specified

Table 5: Loamy/Clayey Foothills Seed Mix (UPLAND MIX)

Loamy/Clayey Foothills Mix						
Scientific Name	Variety*	Common Name	PLS lbs/ac	% by Weight	PLS/ sq ft	% of PLS/sq ft
Graminoids						
Andropogon gerardii	vns.	big bluestem	2.00	4	6	4
Bouteloua curtipendula	vns.	sideoats grama	3.20	6	14	10
Bouteloua dactyloides	vns.	buffalograss	7.20	14	9	6
Bouteloua gracilis	CO Native	blue grama	0.85	2	16	11
Elymus elymoides	vns.	bottlebrush squirreltail	2.50	5	11	8
Hesperostipa comata ssp. comata	vns.	needle and thread	2.60	5	7	5
Koeleria macrantha	Sims Mesa	prairie junegrass	0.29	1	15	11
Nassella viridula	vns.	green needlegrass	3.10	6	13	9
Pascopyrum smithii	Arriba	western wheatgrass	6.50	13	16	11
Schizachyrium scoparium	Cimarron	little bluestem	2.00	4	12	8
Triticum aestivum x Secale cereale	vns.	Quickguard	15.00	30	5	3
		Graminoid Totals	45.24	90	125	85
Forbs						
Artemisia frigida	vns.	prairie sagewort	0.03	0	3	2
Dalea purpurea var. purpurea	vns.	purple prairie clover	1.20	2	6	4
Ratibida columnifera	vns.	upright prairie coneflower	0.30	1	5	3
Sphaeralcea coccinea	vns.	scarlet globemallow	0.50	1	6	4
Vicia americana	vns.	American vetch	3.00	6	2	2
		Forb Totals	5.03	10	22	15
		Total	**50.27**	**100**	**147**	**100**

*vns. = variety not specified

PRISCILLA J MARBAKER 340 Registered Professional Landscape Architect STATE OF COLORADO

Plant List and Details

Print Date: 28 October 2024
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG
Horiz. Scale: Vert. Scale:
Unit Information Unit Leader

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540 Buckeye, Terrace Level
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Sheet Revisions

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NORTH GATE / STRUTHERS
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LANDSCAPE

Designer: PJM
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Sheet Subset: Landscape
Structure Numbers:
Subset Sheets: L4

Project No./Code
176103

Sheet Number
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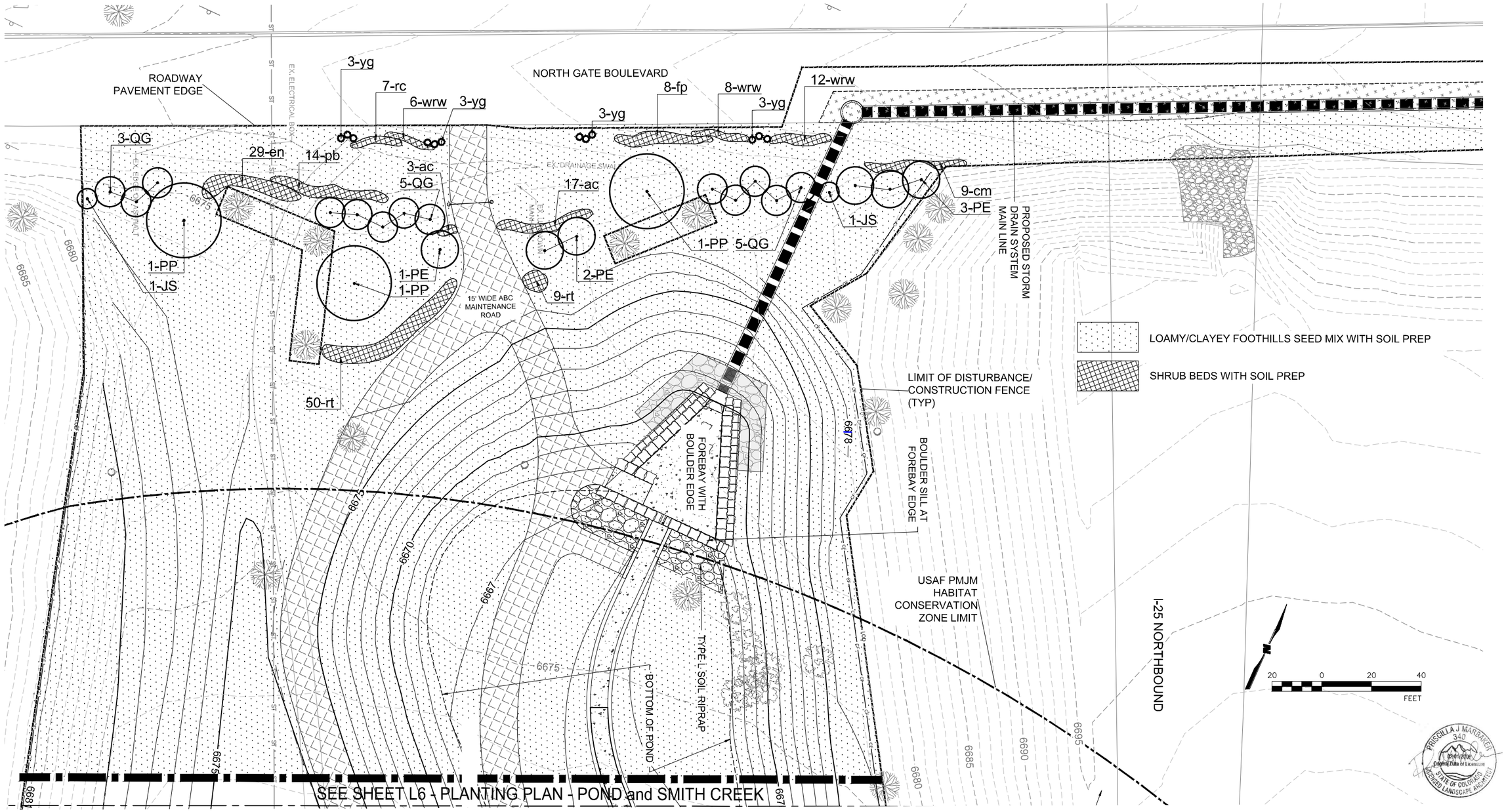

PLANTING PLAN - NORTH GATE BOULEVARD and POND

1" = 20'-0"

Planting Plan - North Gate Blvd. and Pond

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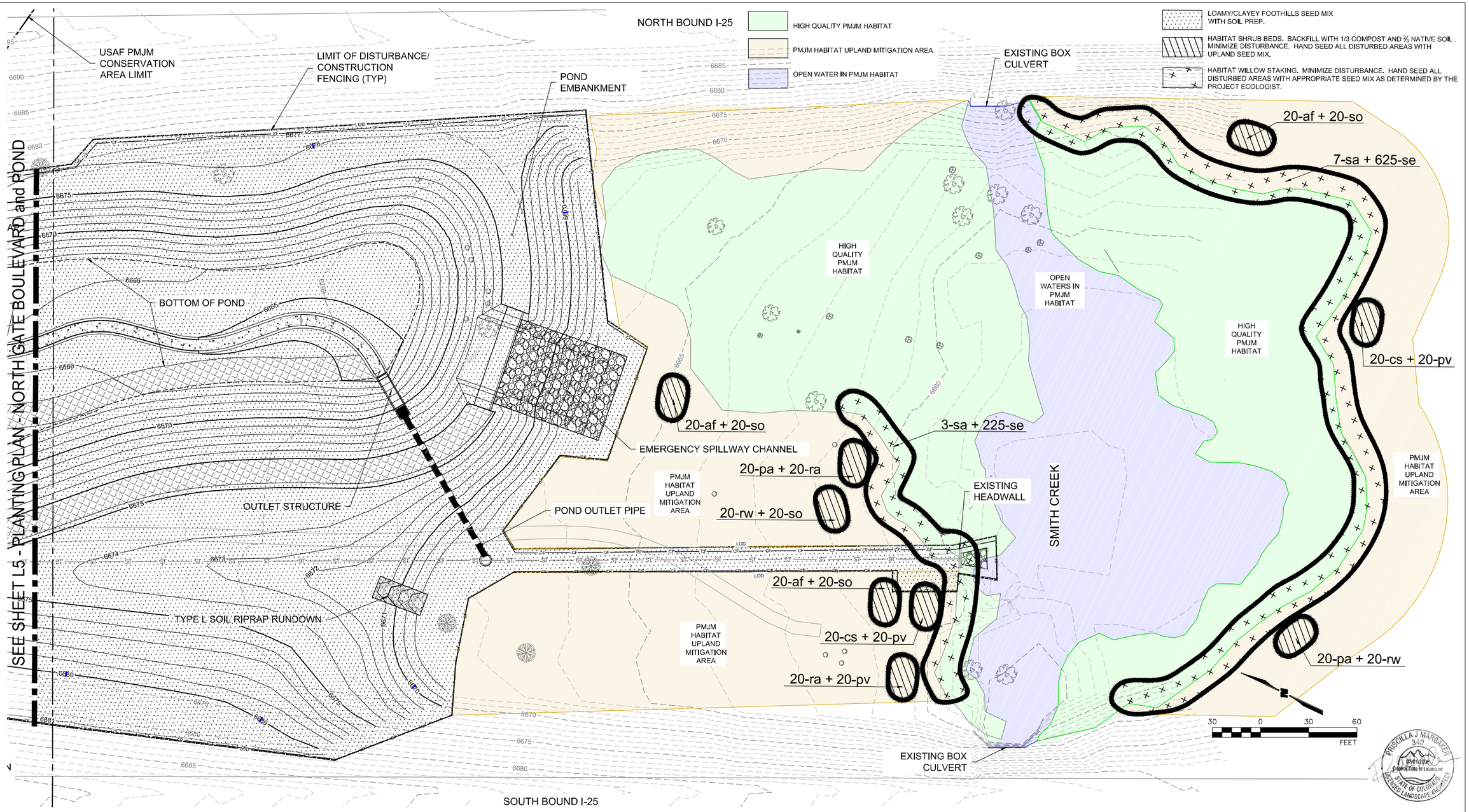
As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE			Project No./Code
No Revisions:				176103
Revised:	Designer: PJM	Structure Numbers		Sheet Number
Void:	Detailer: PJM			57 OF 58
	Sheet Subset: Landscape	Subset Sheets:	L5	

PRISCILLA J MARBAKER 340 LANDSCAPE ARCHITECT Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

10/28/2024 C:\Users\twoba\TAPS\PROJECTS\Northgate STRUTHERS Stormwater\24.10.28_Struthers Landscape.dwg



PLANTING PLAN - POND and SMITH CREEK

1" = 20'-0"

Planting Plan - Pond and Smith Creek

Print Date: 28 October 2024	Sheet Revisions		
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

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PRISCILLA J MARBAKER 940 Registered Professional Landscape Architect STATE OF COLORADO

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