PRELIMINARY DRAINAGE REPORT

FOR

CORNELIUS AND LACEY PROPERTY

MARYSVILLE, WA 98270

November 6, 2023

Parcel Nos.: APN 00590700016102, APN 00590700017700, & APN 00590700018601

Applicant/Owner: KM2 Capital, LCC
Owner Representative: Land Pro Group, Inc.
Contact Name: Mark Villwock
Address: 10515 20th St SE, Suite 202, Lake Stevens, WA 98258
Telephone: (425) 231-2718
Email: mvillwock@landprogrp.com

Project Engineer Name: Kirk Myers, P.E.
Project Engineer Address: 1000 2nd Ave, Suite 3900 Seattle, WA 98104
Project Engineer Telephone: (206) 207-4210
Project Engineer Email: kirk.myers@kimley-horn.com

PREPARED FOR:

KM2 CAPITAL, LLC
10515 20TH STREET SE, SUITE 202
LAKE STEVENS, WA 98258

PREPARED BY:

KIMLEY-HORN AND ASSOCIATES, INC.
1201 THIRD AVENUE, SUITE 2500
SEATTLE, WA 98101

BEN HUGHES, PE (WA)

Disclosure Statement:

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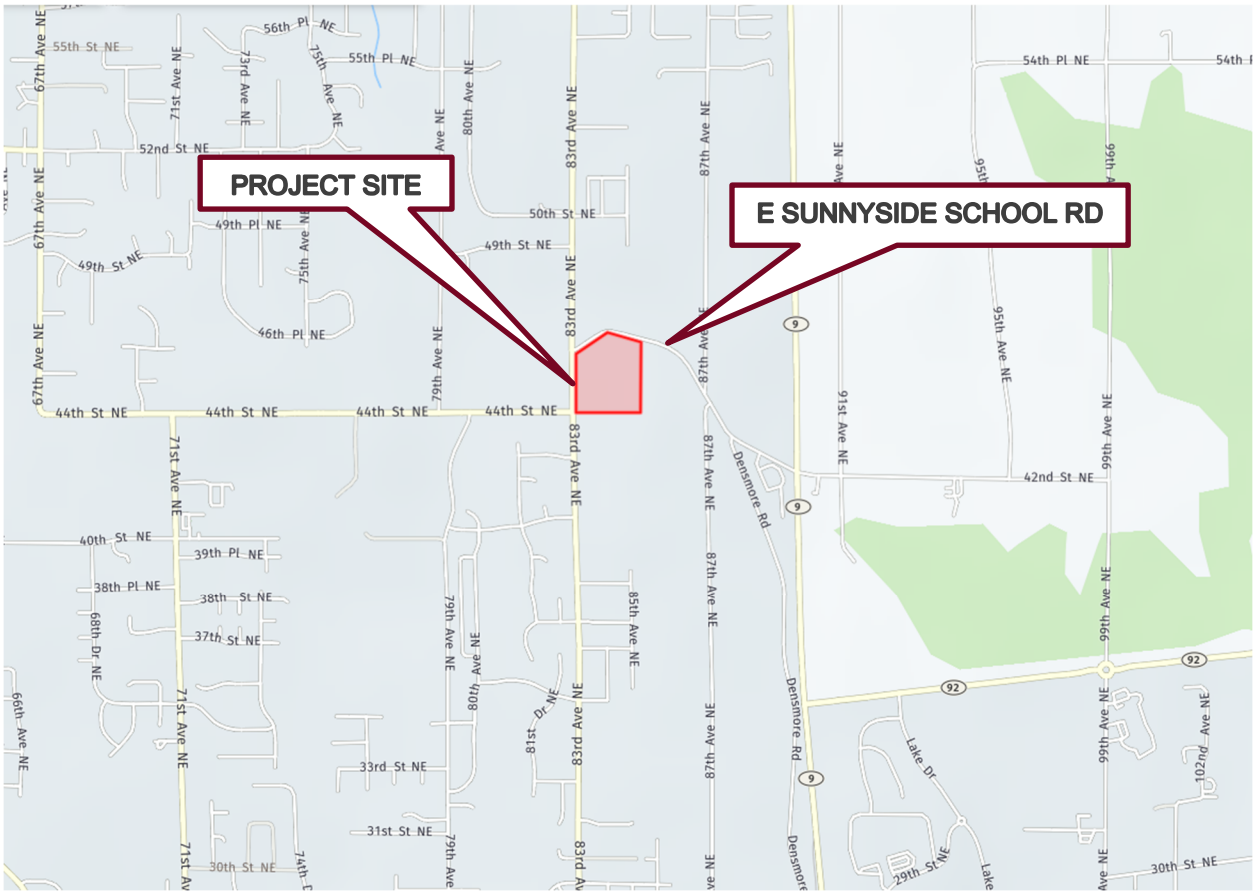
1.0 PROJECT OVERVIEW

1.1 SITE LOCATION AND DESCRIPTION

The Cornelius and Lacey Property project proposes to develop the existing 10.3 acres, WR-R-6-18 zoned property into 67 single family lots. The project site is located at 8310 East Sunnyside School Road and 4427 83rd Avenue NE, Marysville, WA within Snohomish County and consists of the following three Snohomish County Tax Parcels #005907000-16102, -17700, -18600 . The project area is bounded to the west by 83rd Avenue NE, the north by East Sunnyside School Road, and to the east and south by existing single family residential properties.

The purpose of this preliminary drainage report is to provide an explanation of the site improvements and to demonstrate how the project will meet stormwater requirements. Refer to the Vicinity Map below shows the project site location.

VICINITY MAP



1.2 EXISTING SITE CONDITIONS

The existing site currently consists of three existing single-family homes, detached garage structures, detached horse stables, and a variety of other outbuildings. The existing site pervious areas consist of pasture lawns and landscaping. The site generally slopes from southeast to northwest, with slopes of approximately 5% to 15% across the site. Stormwater flows from the existing site generally sheet flow to the north and northwest towards the intersection of 83rd Avenue NE and East Sunnyside School Road. Refer to **Figure 1 – Existing Conditions** for a layout of the existing site. Also refer to Section 2.2 of this Report for a detailed description of the downstream drainage course from the project site.

The surrounding areas is mainly consists of single family residential land use. All the soils are classified as Tokul gravelly medial loam and the site ranges in slope from 0 to 15 percent according to the NSDA Web Soil Survey. A Geotechnical Report has been prepared by Terra Associates, Inc., dated August 7, 2023, which a copy has been provided under a separate cover. Per the Geotechnical Report, the onsite soils consist of approximately 3-6 inches of organic topsoil overlaying medium dense to dense silty sand and sandy silt deposits with varying gravel and cobble content (weathered and unweathered Glacial Till) to the bottom of the test pits which was approximately 8 feet below ground surface. Occasional sandy silt layers were typically observed within the unweather till deposits. The geotechnical engineer did not observe any groundwater within the test pits. The glacially consolidated till soils within the site have low permeability and are not a suitable receptor soil for infiltration of stormwater.

There are no critical areas on-site. There is an existing manmade pond located within the north portion of the along the south side of East Sunnyside School Road. This manmade receives upstream flows from the roadway drainage ditches and also a portion of the project site. Refer to Section 2 of this Report for a description of the upstream areas and downstream drainage system.

There are no mapped FEMA Floodway or 100-year Floodplains within the site. Per the FEMA Flood Insurance Rate Map (FIRM) Panel 53061C0736F, effective date 6/19/2020, the site is within a FEMA Zone X, outside the 0.2% annual chance floodplain. The project site is not located within a FEMA Special Flood Hazard Area (SFHA). See the FIRM Panel in Appendix A, Attachment 7.

1.3 PROPOSED SITE DESIGN

The proposed project consists of constructing 67 new single-family lots that will be accessed from 83rd Avenue NE near the intersection of 44th Street NE. The proposed project will construct a half street extension of 44th Street NE along the south side of the site, along with internal access roadways and tracts, and open space/stormwater tracts. Frontage improvements will be provided along 83rd Avenue NE, and will include roadway widening, curb and gutter, and sidewalk. Refer to **Figure 2 – Proposed Conditions** for a layout of the proposed site improvements.

In the proposed conditions, stormwater runoff from the development will be collected and routed to a underground detention vault located in the northwest portion of the site. The detention vault will discharge flows into a BayFilter Stormwater Treatment System for water quality treatment prior to routing the flow under 83rd Avenue NE and discharging into the existing vegetated swale on the west side of the roadway. Refer to Section 4 of this Report for a detailed description of the proposed stormwater facilities.

2.0 OFF-SITE ANALYSIS

A site visit was performed on October 10, 2023, to determine immediate upstream conditions and perform the downstream analysis review. Photos from this site visit can be viewed in Appendix B. Details from this analysis are described in the sections below. Also refer to **Figure 3 – Downstream Drainage Map** for a layout of the downstream drainage course and the corresponding Points noted below.

2.1 UPSTREAM ANALYSIS

There are two upstream areas that contribute flows to the proposed project. The Northeast Upstream area contributes flows to the onsite manmade pond, and the Southwest Upstream area contributes flows to the 83rd Avenue NE frontage improvements. Below is a description of each of the upstream areas.

SOUTH UPSTREAM AREA

Located to the south of the site, there is approximately 9.28 acres of offsite area, that consists of roadway flow from the east side of 83rd Avenue NE, and the adjacent properties (Parcels #005907000-20600, -20601, -21100, -21101) to the south of the project site. The South Upstream area is mainly tributary to the existing drainage ditch system along the east side of 83rd Avenue NE (**Point 1 on Figure 3**), with portions of the upstream area that sheet flow across the south property line onto the project site. These upstream flows continue north within the roadway ditch and combine with the onsite project site runoff near the intersection of 83rd Avenue NE and East Sunnyside School Road.

In the proposed conditions, the South Upstream area will be collected by the new drainage system within the 83rd Avenue NE frontage improvements and routed through the proposed detention vault and water quality facilities. Therefore the South Upstream Area has been included in the stormwater modeling calculations in Section 4 of this Report.

NORTHEAST UPSTREAM AREA

Located to the Northeast of the site, there is approximately 2.0 acres of offsite runoff that is tributary to the roadway ditch along the north side of East Sunnyside Slope Road. There is an existing 15-inch CMP culvert which conveys the upstream flows south from the north side of the road underneath the roadway and discharges into the manmade pond located within the site (**Point 2**). The inlets and outlets of the existing 15-inch culver were partially buried within the existing roadway ditches at the time of the site visit.

In the proposed conditions, the northeast upstream area will continue to drain to the existing manmade pond and will continue to the existing 15-inch CMP culvert to the north and will not be routed through the proposed detention vault. Therefore, the Northeast Upstream Area has not been included in the stormwater modeling calculations.

2.2 DOWNSTREAM ANALYSIS

The initial qualitative off-site analysis was conducted in order to assess the potential off-site water quality, erosion, slope stability, and drainage impacts associated with the project. The analysis extends along the flow path from the project discharge location, for a distance of one-quarter mile beyond the limits of the site. Refer to **Figure 3 – Downstream Drainage Map**, for a layout of the downstream flow path and contributing tributary drainage areas.

The project generally sheet flows to the north and northwest. There are two separate discharge points from the site, which include the east half and the west half of the site. Both discharge points do combine within a quarter mile downstream of the project, therefore the project is considered as one Threshold Discharge Area (TDA).

EAST SUB-BASIN DOWNSTREAM

The Eastern portion of the project site generally sheet flows to the north into the existing manmade pond located in the north portion of the site along the south side of East Sunnyside School Road (**Point 3 on Figure 3)**. As noted above the upstream flows from the Northeast Upstream Basin contribute to the manmade pond noted in Section 2.1 above. There is an existing 15-inch CMP culvert that conveys the flows north from the manmade pond underneath the East Sunnyside School Road and discharges to a grass lined swale located on the north side of the roadway **(Point 4)**. From here the flows continue west within the grass lined swale and generally following the north side of East Sunnyside School Road. At the intersection with 83rd Avenue NE, the grass lined swale continues to the north along the east side of the roadway and is eventually collected by a 18-inch culvert **(Point 5)**. The culvert conveys the flows west underneath 83rd Avenue NE and discharges into a heavily vegetated swale along west side of the roadway. The vegetated swale continues west through adjacent private property and is assumed to combine with flow from the Western Sub-basin noted below **(Point 6)**, approximately 750 feet downstream from the project site.

WEST SUB-BASIN DOWNSTREAM

The Western portion of the site project site generally sheet flows to the west and northwest into the existing drainage ditch and culvert system along the east side of 83rd Avenue NE. Near the southeast corner of the intersection of East Sunnyside School Road and 83rd Avenue NE, there is a 16-inch culvert **(Point 7)** that conveys flows west underneath 83rd Avenue NE and discharges into a vegetated swale along the west side of the roadway. The vegetated swale continues to the west through adjacent private properties and eventually combines with the flows from the East Sub-Basin noted above **(Point 6)**, approximately 300 feet downstream from the project site.

From here the combined project site flows, continue west through private properties within the vegetated swale, towards the intersection of 44th Street NE and 79th Avenue NE. At the northeast corner of the intersection, the flows from the swale are conveyed south underneath 44th Street NE within a 24-inch culvert **(Point 8)**. The culvert discharges the flows to the south within a heavy vegetated area, which continues flowing south past the quarter mile downstream drainage point from the project site. In general, the flows continue south and southeast, eventually discharging into Ebey Slough which ultimately discharges into Puget Sound.

The existing downstream drainage system from the proposed detention vault discharge, at the time of the site visit, appears to have adequate capacity to convey flows from the proposed project.

3.0 MINIMUM REQUIREMENT COMPLIANCE

The Minimum Requirements (MR) for new development sites are set forth per Figure I-3.1 of the Washington State Department of Ecology 2019 Stormwater Management Manual for Western Washington (SWMMWW). The site does not have greater than 35% existing hard surface coverage and the project exceeds 5,000 square feet in new hard surface area, therefore, all Minimum Requirements will apply to the new and replaced hard surfaces and converted vegetation areas. Refer to Table 3 in Section 4 of this Report for a breakdown of the proposed basin areas. The project compliance for each Minimum Requirement is detailed in this section.

MR1: Stormwater Site Plan Preparation

The project will comply with MR1 by submitting this report and associated plans. The contents of this Stormwater Site Plan contain all the technical information and analyses required by the city for new development stormwater compliance.

MR2: Construction Stormwater Pollution Prevention Plan (SWPPP)

The project will comply with MR2 by preparing a Construction SWPPP, which will be provided at a later submittal during final engineering. The document will explain and justify the pollution prevention decisions made for the project. Erosion will be controlled, and sediment and other pollutants will be prevented from leaving the site during the construction phase of the project. Fully functional stormwater BMPs will be developed upon completion of construction.

MR3: Source Control of Pollution

There are no applicable permanent source control BMPs for the site, since the associated activities for the site are for new residential development, which does not match the types listed within Volume IV of the 2019 SWMMWW.

MR4: Preservation of Natural Drainage Systems and Outfalls

As noted within Section 2 of this Report there are two existing discharge points from the site, which combine within a quarter mile downstream, therefore the project site is considered as a one Threshold Discharge Area (TDA). The eastern portion of the site discharges to the existing manmade pond in the north portion of the site, that discharges to the north via a 15-inch CMP culvert. The western portion of the site is generally tributary to the existing 16-inch PVC culvert in the northwest portion of the site, that flows west underneath 83rd Avenue NE and discharges to the west.

In the proposed conditions, flows from the project site will be collected and routed to a detention vault and stormwater facility located in the northwest portion of the site. The discharge from the proposed stormwater facilities will flow to the existing 16-inch culvert in 83rd Avenue NE at the northwest corner of the site, and will continue to discharge offsite to the west, matching the existing conditions accordingly. The project does not propose to discharge flows to the existing manmade pond in the north portion of the site. The existing manmade pond will remain in the proposed conditions and will continue to receive upstream flows from the northeast and will continue to drain to the north via the existing 15-inch CMP culvert in East Sunnyside School Road to remain, matching the existing conditions accordingly.

MR5: On-site Stormwater Management

Per Section I-3.4.5 of the 2019 SWMMWW, the project will be required to evaluate the use of Stormwater Management BMPs, to infiltrate, disperse and retain stormwater runoff on site to the extent feasible. Per Table I-3.1 of the 2019 SWMMWW, the project is located within the UGA, therefore BMPs from List #2 will be evaluated for all surfaces within each type of surface in List #2. Refer to Section 4 of this Report for additional information.

MR6: Runoff Treatment

This project proposes more than 5,000 square feet of new pollution-generating hard surface; therefore Basic Water Quality treatment will be required. The project proposes to provide a BayFilter Stormwater Treatment System downstream of the detention vault in the northwest corner of the site. Refer to Section 4 of this Report for more information.

MR7: Flow Control

The project will be required to provide the Flow Control Performance Standard, as per the 2019 SWMMWW for the required target surfaces associated with the project. The Flow Control Performance Standard, requires matching the developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover.

The project proposes to collect and route the flows from the site to a detention vault in the northwest portion of the site. Refer to Section 4 of this Report for more information.

MR8: Wetlands Protection

There are no wetlands located within the site and the project does not drain to wetland area, therefore wetland modeling will not be required for this project.

MR9: Operation and Maintenance (O&M)

An operation and maintenance manual for the proposed stormwater management BMPs will be provided at a later submittal during final engineering.

4.0 PERMANENT STORMWATER CONTROL

4.1 EXISTING SITE HYDROLOGY

Refer to Section 2 of this Report for a detailed description of the existing site hydrology. As noted for MR7 earlier the existing onsite area will be considered as entirely historic forested condition in the WWHM modeling. Refer to Table 1 below for the existing site areas used in the WWHM Model. The total existing project area includes the 10.3 acres of onsite area, and approximately 0.3 acres of 83rd Avenue NE for the proposed frontage improvements.

Table 1 – Existing Onsite WWHM Areas

	Impervious Area *(acre)*	Pervious Forested Area *(acre)*	**Total Area *(acre)***
Total Existing Project Area	0.00	10.61	10.61

As noted within Section 2 of this Report there is an existing South Upstream Area, that contributes flows to the existing drainage ditch system along the east side of 83rd Avenue NE. Since these flows will be collected with the new drainage system along 83rd Avenue NE, and routed through the proposed detention vault and water quality structure, the South Upstream Area has been included in the WWHM modeling. The South Upstream Area is not considered as a target surface for flow control requirements, therefore the current existing site areas have been included in both the existing (predeveloped) model and the developed (mitigated) model. Below is a breakdown of the impervious and pervious land areas for the South Upstream Area. Also refer to **Figure 3 – Downstream Drainage Map** for a layout of the South Upstream Area.

Table 2 – South Upstream WWHM Area

	Ex Impervious Area *(acre)*	Ex Forested Area *(acre)*	Ex Pasture Area *(acre)*	**Total Area *(acre)***
South Upstream Area	1.46	4.65	3.17	9.28

4.2 DEVELOPED SITE HYDROLOGY

In the developed conditions, flows from the proposed site will be collected by a new drainage system, and routed to a detention vault located in the northwest corner of the site.

There are two portions of the project site that will bypass the detention vault and water quality facility and have been included as bypass areas in the WWHM models. The first bypass area consists of the frontage improvements along 83rd Avenue NE, located to the north of Road B that will be collected separately. This separate conveyance system will bypass the detention vault and connect into the outfall catch basin system in the northwest corner of the site. The second bypass area consists of Tract 999 located along the north side of the site, that will sheet flow directly into the existing manmade pond located along the north, and not be tributary to the detention vault system.

Impervious coverage for the lot areas was assumed to the be the maximum 70% coverage allowed by Marysville Municipal Code (MMC), based upon the WR R-6-18 zoning. Areas for the roadways were delineated within AutoCAD based upon the current site plan layout. The project will utilize BMP T5.13 Post Construction Soil Quality within the project site, therefore as per Section V-11.1 of the 2019 SWMMWW the pervious grass/landscaped areas within the project site can be modeled as “pasture” land cover in WWHM. Refer to the Table 3 below for a breakdown of the proposed site areas used in the WWHM Model.

Table 3 – Proposed Onsite WWHM Areas

	Impervious Area *(acre)*	Pervious Pasture Area *(acre)*	**Total Area *(acre)***
Onsite Detained Area	6.71	2.06	8.77
North Bypass Area	0.23	1.30	1.53
83rd Avenue Bypass Area	0.24	0.07	0.31
Project Totals	**7.18**	**3.43**	**10.61**

4.3 PERFORMANCE STANDARDS AND GOALS

For flow control sizing, the project will use the Flow Control Performance Standard. Which requires matching the developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover.

For water quality sizing, the project will provide Basic Water Quality Treatment.

4.4 ON-SITE STORMWATER MANAGEMENT BMPS

Per Table I-3.2: The List Approach for MR5 Compliance of the SWMMWW, the project must apply on-site BMPs to the extent feasible as specified in List #2. The BMPs and feasibility are outlined below:

SURFACE TYPE: LAWN AND LANDSCAPED AREAS

- **BMP T5.13: Post Construction Soil Quality and Depth**
  - Feasible – Post Construction Quality and Depth BMP will be applied to all disturbed pervious areas associated with the proposed project.

SURFACE TYPE: ROOFS

- **BMP T5.30: Full Dispersion**
  - Not feasible – There is insufficient space within the site to provide the required 100-foot long native vegetated flow path.
- **BMP T5.10A: Downspout Full infiltration**
  - Not feasible – Based upon the Geotechnical Report, the onsite soils consists of glacially compacted till soils that are very low permeability and will not conducive for stormwater infiltration.
- **BMP T7.30: Bioretention**
  - Not feasible – There is insufficient space within the lots to provide bioretention areas and the onsite soils are not favorable for infiltration.
- **BMP T5.10B: Downspout Dispersion Systems**
  - Not feasible – There is in sufficient space within the site that have slopes of less than 15% to provide the required flow path for downspout dispersion.
- **BMP T5.10C: Perforated Stub-out Connections**
  - Not feasible – The onsite soils consist of glacially compacted till soils that are not favorable for infiltration.

SURFACE TYPE: OTHER HARD SURFACES

- **BMP T5.30: Full Dispersion**
  - Not feasible – There is insufficient space within the site to provide the required 100-foot long native vegetated flow path.
- **BMP T5.15: Permeable Pavements**
  - Not feasible – The onsite soils consist of glacially compacted till soils that are not favorable for infiltration. In addition, there are portions of the proposed roadways that are greater than 6% slope.
- **BMP T7.30: Bioretention**
  - Not feasible – There is insufficient space within the ROW to provide bioretention areas and the onsite soils are not favorable for infiltration.
- **BMP T5.12: Sheet Flow Dispersion**
  - Not feasible – There is in sufficient space within the site that have slopes of less than 15% to provide the required flow path for sheet flow dispersion
- **BMP T5.11: Concentrated Flow Dispersion**
  - Not feasible – There is in sufficient space within the site that have slopes of less than 15% to provide the required flow path for sheet flow dispersion

4.5 FLOW CONTROL

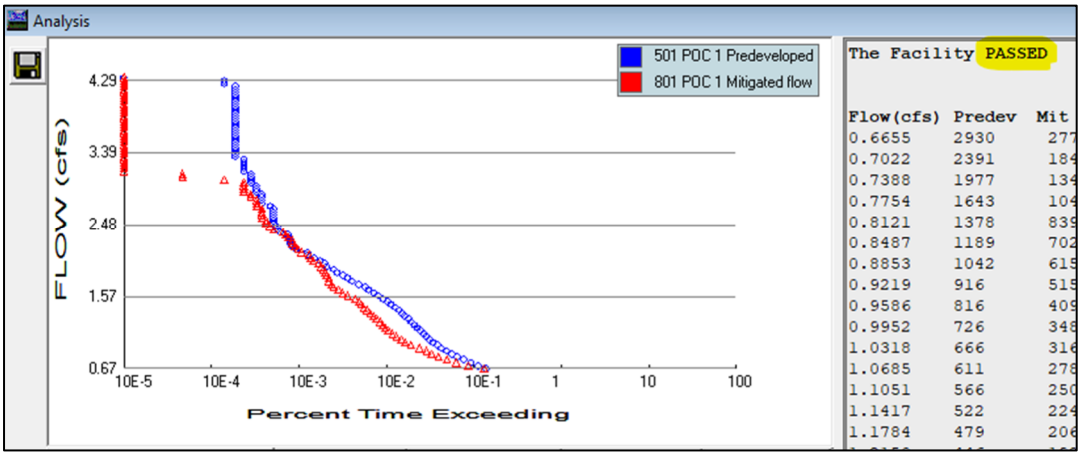
The detention vault in the northwest corner of the site, was sized using WWHM, and per the areas listed within Tables 1, 2, and 3 above. Since the South Upstream Area will be collected by the drainage system with 83rd Avenue NE and routed through the proposed detention facility it has been included in both the existing and developed conditions in the WWHM modeling for the detention vault. As per Section III-2.4 of the 2019 SWMMWW, if the existing 100-year peak flow rate from the additional area is greater than 50% of the 100-year peak flow rate (undetained) from the area requiring mitigation, then the upstream runoff must not flow to the flow control facility. Below is a comparison of the 100-year (unmitigated) peak flows between the South Upstream Area and the Onsite Detained Area from WWHM.

Table 4 – Comparison of Upstream and Onsite Flows

South Upstream Area 100-year Peak Flow Rate (cfs)	**Onsite Detained Area** 100-year (unmitigated) Peak Flow Rate (cfs)	**Percentage of Upstream flow compared to Onsite Detained Area flow (100-year)**
3.60	9.55	**37.7%**

As shown above, the South Upstream Area peak flows are less than 50% of the Onsite flows, it can be routed through the proposed detention vault system. The South Upstream Area is not considered as a target surface for flow control requirements; therefore, the current existing site areas have been included in both the existing (predeveloped) model and the developed (mitigated) model. Below are the flow duration curves from WWHM for 50% of the 2-year up to the 50-year storm events.

Flow Duration Curve Comparison from WWHM



Based upon the WWHM modeling for the detention vault sizing, the following table shows the required modeled volume of the detention vault and the size provided on the current plan set. A complete copy of the WWHM output is included in Appendix C of this Report.

Table 5 – Required and Provided Detention Sizes

	Required from WWHM Model	Provided on Civil Plans
Vault Footprint Area	12,222 SF	13,107 SF
Storage Depth	12-feet	12-feet
Storage Volume	146,668 CF	157,284 CF

4.6 RUNOFF TREATMENT SYSTEM

The project proposes to use a BayFilter Stormwater Management System to treat the detain flows, downstream of the proposed detention vault. The treated flows from the BayFilter will discharge into the proposed drainage for 83rd Avenue NE at the northwest corner of the site.

The water quality flow rate used to size the BayFilter, was the full 2-year release rate from the detention vault sizing noted above, which was determined to be 0.57 cfs. Based upon the design flow rate, it was determined that a BF-96-6 (8-foot diameter manhole) sized BayFilter Structure with six (6) filter cartridges would be required to treat the flows from the project site. Below is a summary table of the required BayFilter system.

Mitigated Peak Flows from Detention Vault

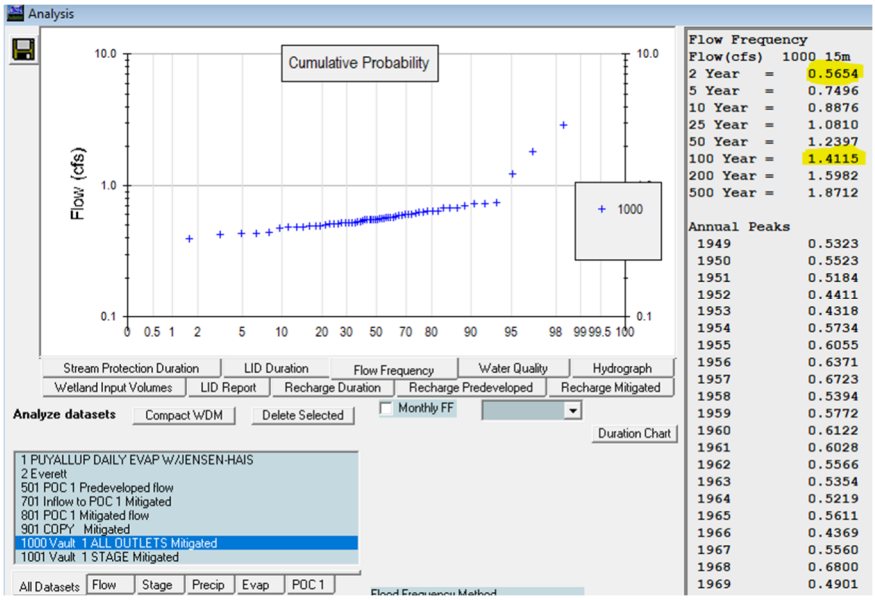


Table 6 – BayFilter Stormwater Management System Summary

2-year Release Rate (WQ Flow)	0.57 cfs
100-year Flow rate from vault	1.41 cfs
Treatment flow for 545 Filters	0.10 cfs
Number of cartridges	6 – 545 Filters
Drop through filter	2.83 feet

WQ Treatment Trade Areas

There is a portion of the new and replaced Pollution Generating Hard Surface (PGHS) associated with the 83rd Avenue NE frontage improvements that will not be able to be collected and routed through the proposed water quality structure. The new and replaced PGHS within the bypass area that will be untreated is approximately 7,820 square feet.

The project proposes to collect a compensatory area of existing PGHS that is currently not treated to makeup for the bypassed PGHS area. The project proposes to collect the South Upstream Basin, as described within Section 2 of this Report. There is approximately 7,915 square feet of existing PGHS from 83rd Avenue NE located to the south of the site, that will be collected and routed through the proposed water quality facility. This existing PGHS area is equivalent in size to the bypassed PGHS area.

4.7 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

To be provided at a later submittal during final engineering

5.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

A conveyance system analysis will be provided at a later submittal during final engineering.

6.0 SWPPP ANALYSIS AND DESIGN

For Temporary Erosion and Sediment Control Plans, see Appendix C of this Report. A CSWPPP will be provided at later submittal during final engineering.

7.0 SPECIAL REPORTS STUDIES

A Geotechnical Report has been provided under a separate cover as part of this submittal.

8.0 OTHER PERMITS

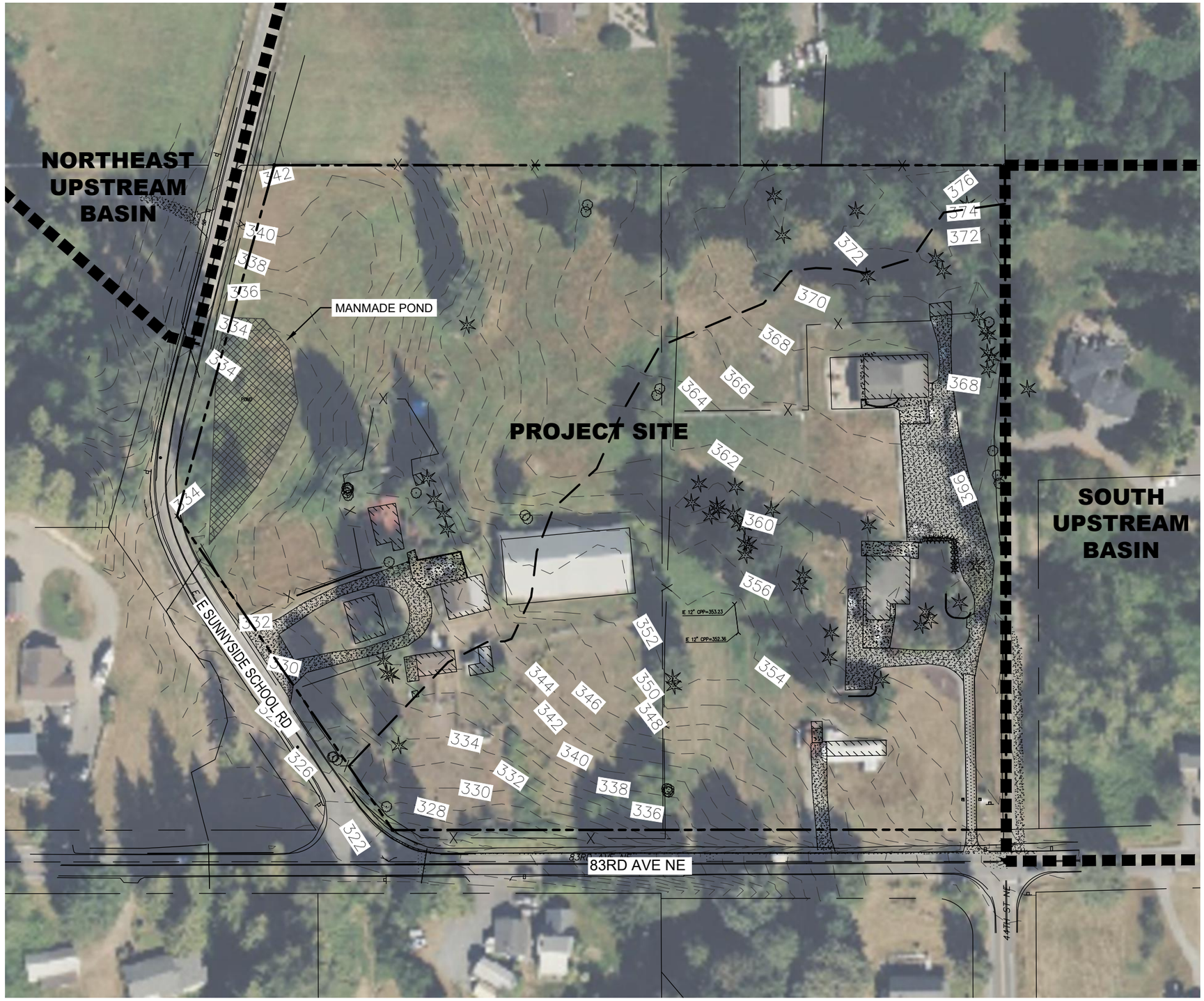
A construction stormwater general permit (CSWGP) through the Department of Ecology (DOE) will be required, since the project will disturb more than one acre. The CSWGP will be obtained during final engineering.

9.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual for the proposed stormwater facilities will be provided at a later submittal during final engineering.

FIGURES

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON



NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

LEGEND

- PROPERTY LINE
- CENTER LINE
- EASEMENT OR SETBACK LINE
- SUBBASIN

EXISTING CONDITIONS EXHIBIT

CORNELIUS AND LACEY – MARYSVILLE SNOHOMISH COUNTY, WA

FIGURE #1

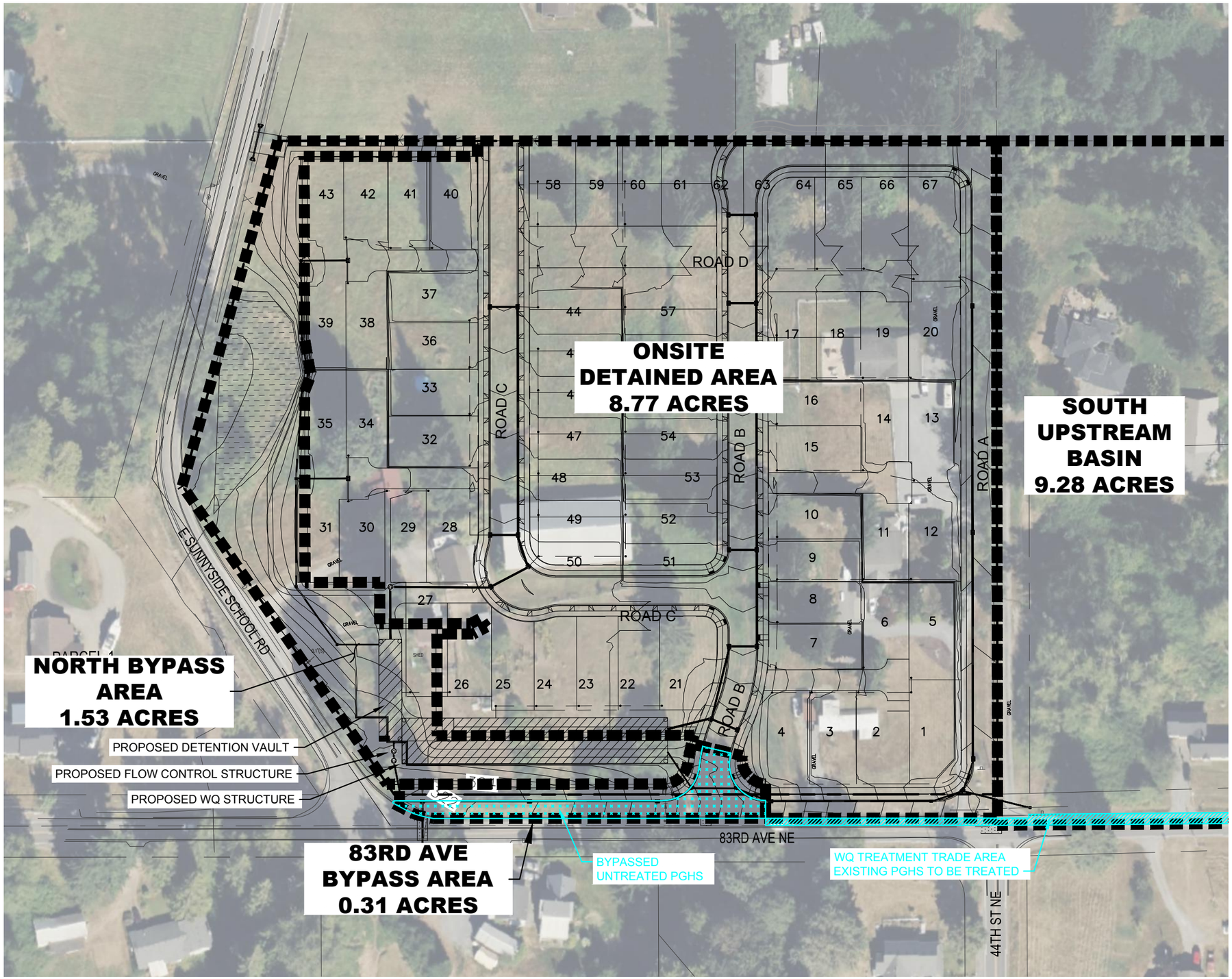
NOVEMBER 2023

PROJECT NO. 090144000

SCALE: AS NOTED

Kimley»Horn
1201 3RD AVE, SUITE 2500,
SEATTLE, WA 98101
PHONE: 206 607 2600

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON



NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

LEGEND

- PROPERTY LINE
- BASIN AREA
- UNTREATED BYPASSED PGHS
- WQ TREATMENT TRADE AREA EXISTING PGHS TO BE TREATED

PROPOSED CONDITIONS EXHIBIT

CORNELIUS AND LACEY – MARYSVILLE SNOHOMISH COUNTY, WA

SCALE: AS NOTED | PROJECT NO. 090144000 | NOVEMBER 2023 | FIGURE #2

Kimley»Horn
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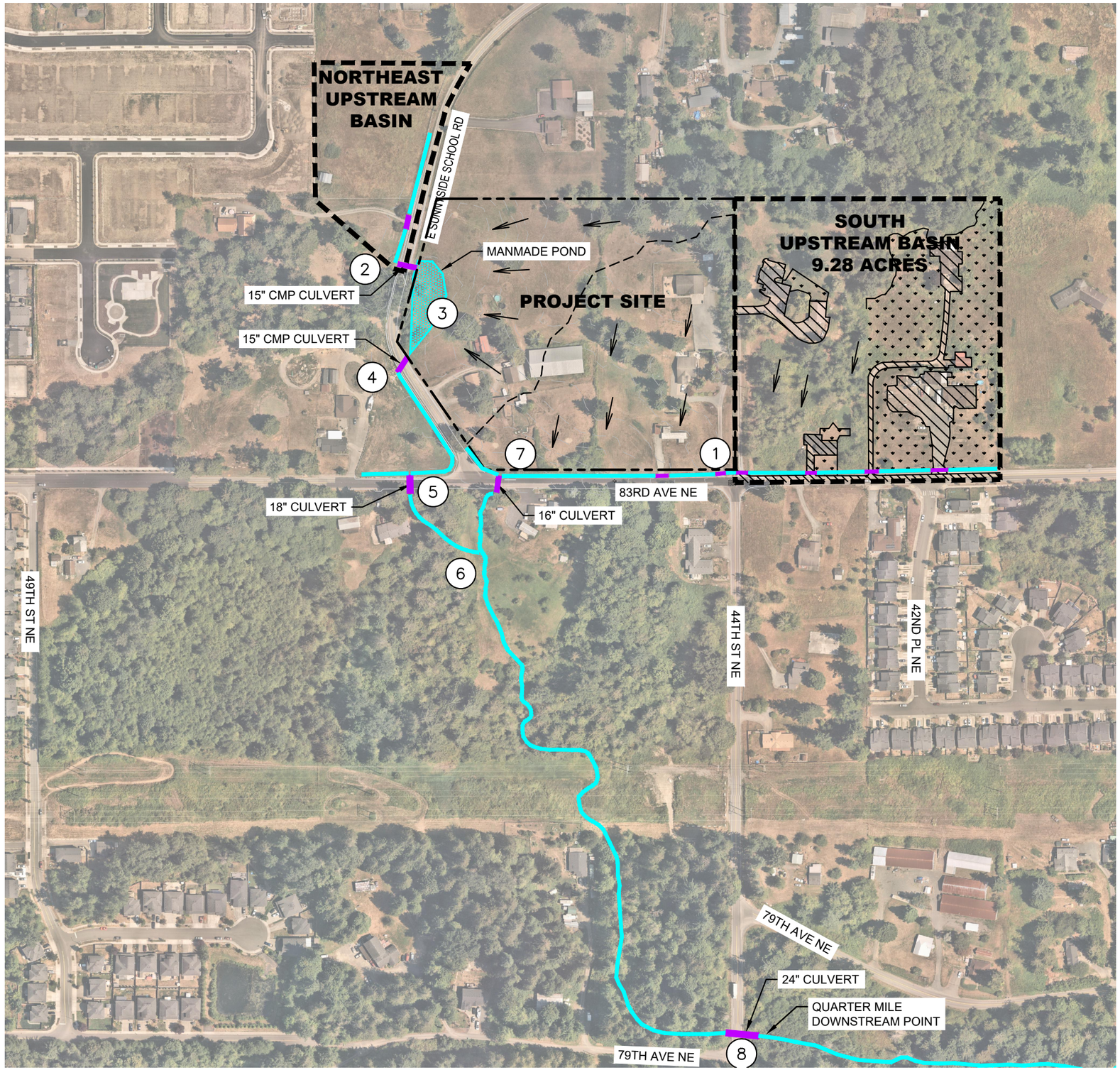
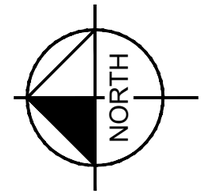
1201 3RD AVE, SUITE 2500,
SEATTLE, WA 98101
PHONE: 206 607 2600

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON





GRAPHIC SCALE IN FEET
0 125 250 500

LEGEND

- PROPERTY LINE
- CULVERT / PIPE
- OPEN CHANNEL / DITCH
- EX IMPERVIOUS UPSTREAM AREA
- EX PASTURE UPSTREAM AREA
- (1) POINT ID - REFER TO DOWNSTREAM ANALYSIS IN DRAINAGE REPORT

DOWNSTREAM DRAINAGE MAP

CORNELIUS AND LACEY – MARYSVILLE SNOHOMISH COUNTY, WA

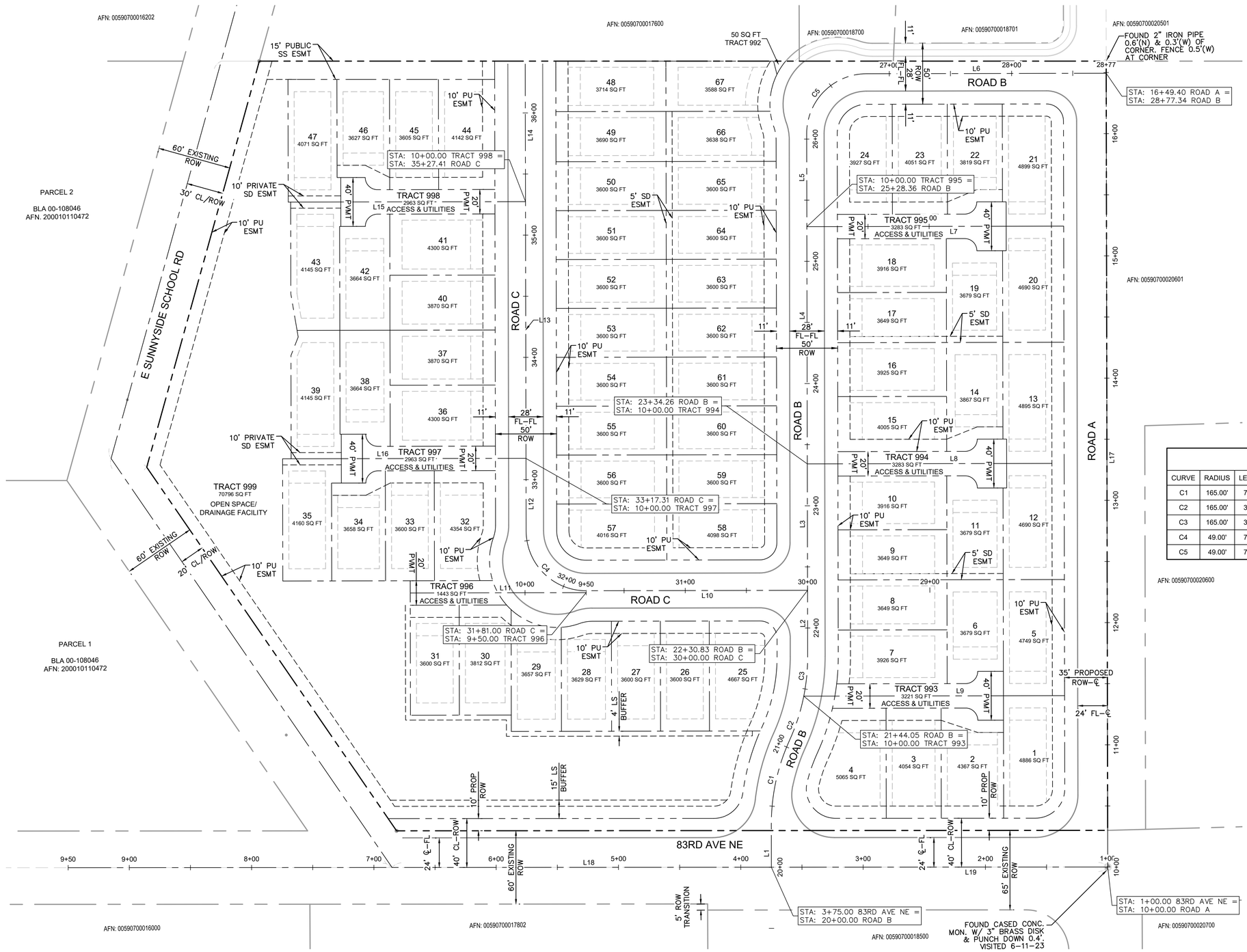
SCALE: AS NOTED | PROJECT NO. 090144000 | NOVEMBER 2023 | FIGURE #3

Kimley»Horn

1201 3RD AVE, SUITE 2500,
SEATTLE, WA 98101
PHONE: 206 607 2600

APPENDIX A: DESIGN DRAWINGS

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON

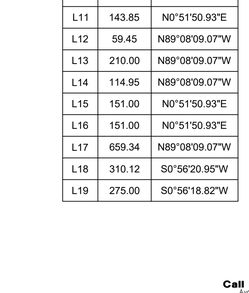


CURVE TABLE

CURVE	RADIUS	LENGTH	CHORD BEARING	CHORD	DELTA	TANGENT
C1	165.00'	70.90'	S76°49'33"E	70.36'	24°37'12"	36.01'
C2	165.00'	38.14'	S71°08'19"E	38.06'	13°14'45"	19.16'
C3	165.00'	32.76'	S83°26'55"E	32.70'	11°22'27"	16.43'
C4	49.00'	76.97'	S45°51'51"W	69.30'	90°00'00"	49.00'
C5	49.00'	76.97'	S44°08'09"E	69.30'	90°00'00"	49.00'

LINE TABLE

LINE	LENGTH	BEARING
L1	35.00	S89°08'09.07"E
L2	54.02	S89°08'09.07"E
L3	103.43	S89°08'09.07"E
L4	194.10	S89°08'09.07"E
L5	76.01	S89°08'09.07"E
L6	196.00	S0°51'50.93"W
L7	163.00	N0°51'50.93"E
L8	163.00	S0°51'50.93"W
L9	163.26	S0°51'50.93"W
L10	181.00	S0°51'50.93"W
L11	143.85	N0°51'50.93"E
L12	59.45	N89°08'09.07"W
L13	210.00	N89°08'09.07"W
L14	114.95	N89°08'09.07"W
L15	151.00	N0°51'50.93"E
L16	151.00	N0°51'50.93"E
L17	659.34	N89°08'09.07"W
L18	310.12	S0°56'20.95"W
L19	275.00	S0°56'18.82"W



TYPICAL LOT DIMENSION DETAIL
NTS

UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-424-5555
WASHINGTON UTILITY LOCATES

No.	REVISIONS	DATE	BY

Kimley»Horn

1201 THIRD AVENUE, SUITE 2800
SEATTLE, WA 98101

LICENSED PROFESSIONAL ENGINEER
PATRICK A. MAYERS
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
DATE: 2/9/2024

KHA PROJECT 090014000
DATE 2/9/2024
SCALE AS SHOWN
DESIGNED BY HEK
DRAWN BY DAM
CHECKED BY KPM

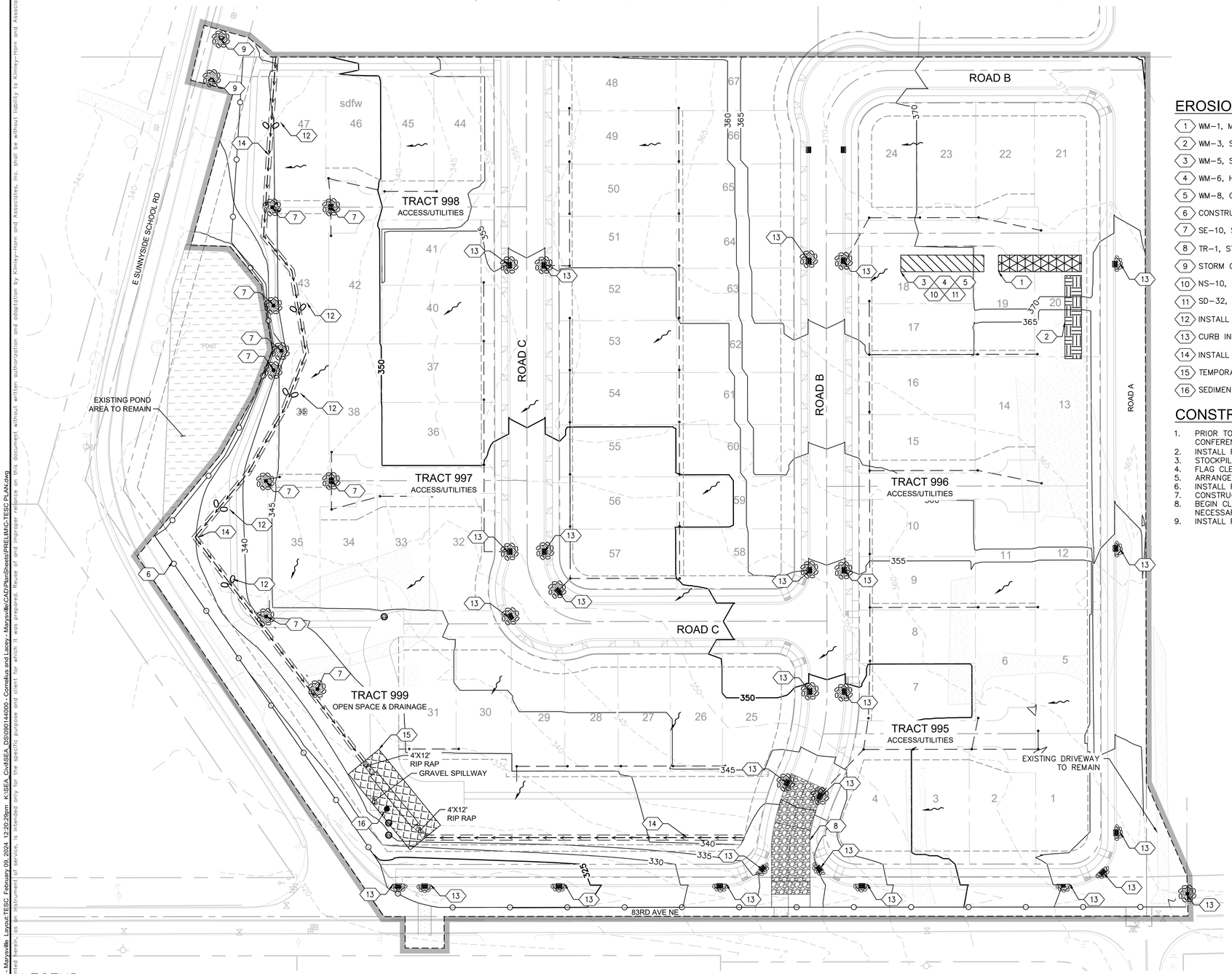
HORIZONTAL CONTROL PLAN

WASHINGTON
MARYSVILLE

CORNELIUS AND LACEY PROPERTY
PREPARED FOR
KM CAPITAL, LLC
10515 20TH STREET SE, SUITE 202
LAKE STEVENS, WA 98258
(425) 231-2718

SHEET
4 OF 14

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON



GRAPHIC SCALE IN FEET
0 20 40 80

NORTH

EROSION CONTROL NOTES

1. WM–1, MATERIAL DELIVERY AND STORAGE.
2. WM–3, STOCKPILE MANAGEMENT, CONTRACTOR TO SET UP STOCKPILE AREA.
3. WM–5, SANITARY AREA.
4. WM–6, HAZARDOUS WASTE MANAGEMENT.
5. WM–8, CONCRETE WASTE MANAGEMENT.
6. CONSTRUCTION FENCE. CONTRACTOR TO MAINTAIN DURING ALL GRADING & MOBILIZATION ACTIVITIES.
7. SE–10, STORM DRAIN INLET PROTECTION. REFER TO DETAIL 4, PER SHEET 6.
8. TR–1, STABILIZED CONSTRUCTION ENTRANCE/EXIT; REFER TO DETAIL 5, PER SHEET 6.
9. STORM CULVERT PROTECTION
10. NS–10, VEHICLE AND EQUIPMENT MAINTENANCE.
11. SD–32, TRASH STORAGE AREA.
12. INSTALL CHECK DAM EVERY 100' OR 2' OF ELEVATION CHANGE. REFER TO DETAIL 6, PER SHEET 6.
13. CURB INLET PROTECTION. REFER TO DETAIL 3, PER SHEET 6.
14. INSTALL 4' WIDE CONVEYANCE SWALE.
15. TEMPORARY SEDIMENT POND. SEE TEMP SEDIMENT POND TABLE THIS SHEET.
16. SEDIMENT POND RISER. REFER TO DETAIL 7 SHEET 6

CONSTRUCTION SEQUENCE

1. PRIOR TO ANY CONSTRUCTION ACTIVITY, THE CONTRACTOR SHALL SCHEDULE AND ATTEND A PRE–CONSTRUCTION CONFERENCE WITH THE CITY STAFF. CESCL SHALL ATTEND THE CONFERENCE.
2. INSTALL ROCK CONSTRUCTION ENTRANCE(S).
3. STOCKPILE ALL EROSION MATERIALS ON SITE.
4. FLAG CLEARING LIMITS.
5. ARRANGE FOR CITY INSPECTOR TO INSPECT AND APPROVE CLEARING LIMITS FLAGGING PRIOR TO CLEARING.
6. INSTALL FILTER FABRIC FENCE AND CONSTRUCTION FENCE AS SHOWN.
7. CONSTRUCT TEMPORARY SEDIMENT PONDS AND OUTFALLS.
8. BEGIN CLEARING AND GRADING, CONSTRUCT INTERCEPTOR DITCHES AND TEMPORARY CULVERTS AND RELOCATE AS NECESSARY DURING CONSTRUCTION.
9. INSTALL FINAL PAVING, CURBING AND SIDEWALK.

TEMP SEDIMENT POND	
BOTTOM ELEVATION	336.00
BOTTOM AREA (SF)	306.00
TOP OF RISER ELEVATION	341.00
TOP AREA (SF)	3250.00
SIDE SLOPES	3H:1V
SPILLWAY ELEVATION	342.00
OUTLET INVERT ELEVATION	337.50
ORIFICE INVERT ELEV.	341
ORIFICE SIZE	0'–2 1/8"

LEGEND

- PROPERTY LINE
- LOT LINE
- CENTER LINE
- EASEMENT OR SETBACK LINE
- SILT FENCE
- CONVEYANCE SWALE
- CHECK DAM
- INLET PROTECTION
- CONSTRUCTION ENTRANCE
- TEMPORARY SEDIMENT POND (75'X30')
- STOCKPILE AREA
- SANITARY AREA, TRASH STORAGE, HAZARDOUS MATERIAL, CONCRETE MANAGEMENT, VEHICLE MAINTENANCE AND EQUIPMENT STORAGE AREA
- MATERIAL STORAGE AND DELIVERY
- EXISTING DIRECTION OF FLOW
- CLEARING AREA / PROTECTED AREA
- CLEARING LIMITS

CONTRACTOR RESPONSIBLE FOR TRAFFIC CONTROL AND PEDESTRIAN CONTROL WHILE PERFORMING WORK IN THE PUBLIC RIGHT–OF–WAY.

SITE PREPARATION SHOULD BE IN ACCORDANCE WITH GEOTECHNICAL INVESTIGATION

CONTRACTOR TO USE BEST MANAGEMENT PRACTICES TO ENSURE COMPLIANCE WITH NPDES AND WATER MANAGEMENT DISTRICT REGULATIONS FOR STORMWATER DISCHARGE FROM CONSTRUCTION ACTIVITIES AND DEWATERING OPERATIONS.

UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

Call before you DIG
Avoid cutting underground utility lines, it's costly.
CALL 811 OR 1-800-424-5555
WASHINGTON UTILITY LOCATES

No.	REVISIONS	DATE	BY

Kimley»Horn

1201 THIRD AVENUE, SUITE 2800
SEATTLE, WA 98101

LICENSED PROFESSIONAL ENGINEER — PATRICK A. MAYERS — STATE OF WASHINGTON — 22400 — REGISTERED PROFESSIONAL ENGINEER
DATE: 2/9/2024

KHA PROJECT 090014000	DESIGNED BY HEK
DATE 2/9/2024	DRAWN BY DAM
SCALE AS SHOWN	CHECKED BY KPM

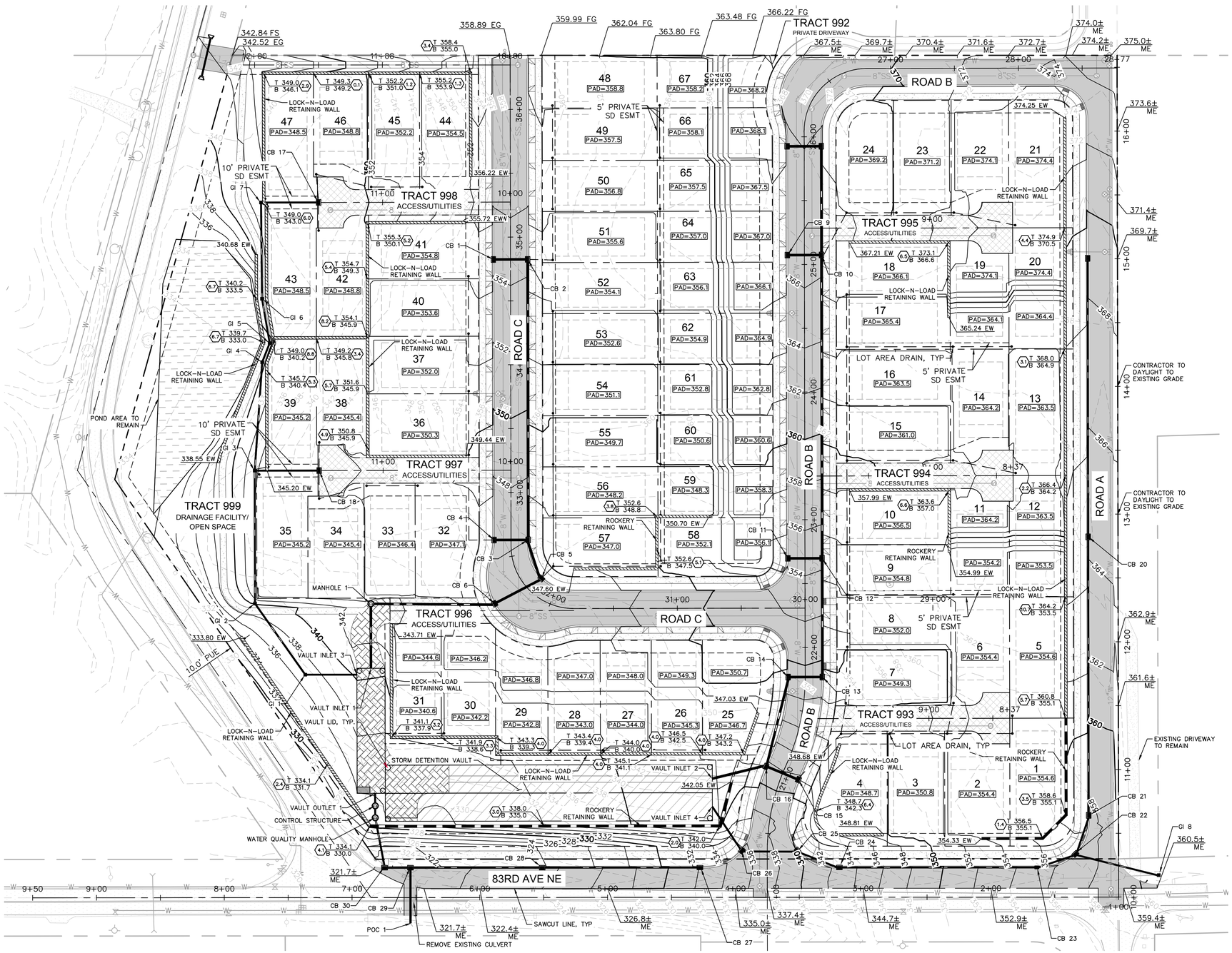
TESC PLAN

MARYSVILLE WASHINGTON

CORNELIUS AND LACEY PROPERTY
PREPARED FOR
KM CAPITAL, LLC
10515 20TH STREET SE, SUITE 202
LAKE STEVENS, WA 98258
(425) 231-2718

SHEET
5 OF 14

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON



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No.	REVISIONS	DATE	BY

Kimley»Horn

1201 THIRD AVENUE, SUITE 2800
SEATTLE, WA 98101

LICENSED PROFESSIONAL ENGINEER
PATRICK M. MAYFIELD
STATE OF WASHINGTON
PROFESSIONAL ENGINEER

KHA PROJECT	090014000
DATE	2/9/2024
SCALE	AS SHOWN
DESIGNED BY	HEK
DRAWN BY	DAM
CHECKED BY	KPM
QA/QC BY	KPM
DATE	2/9/2024

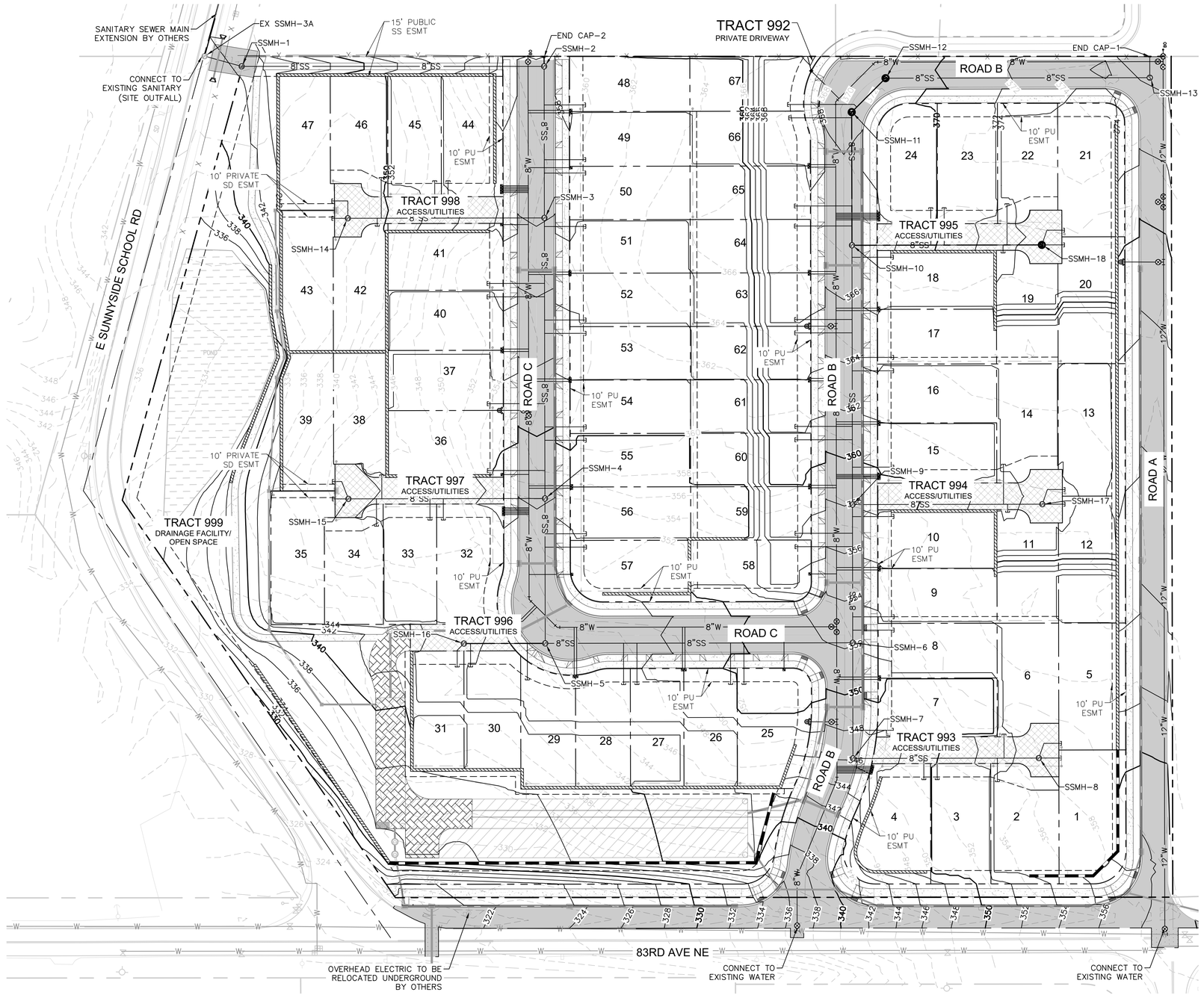
PRELIMINARY DRAINAGE & GRADING PLAN

WASHINGTON
MARYSVILLE

CORNELIUS AND LACEY PROPERTY
PREPARED FOR
KM CAPITAL, LLC
10515 20TH STREET SE, SUITE 202
LAKE STEVENS, WA 98258
(425) 231-2718

SHEET
7 OF 14

A PORTION OF SW ¼ OF SW ¼ SEC 36, TWN 30 N, RGE 5 E, W.M. CITY OF MARYSVILLE, SNOHOMISH COUNTY, WASHINGTON



GRAPHIC SCALE IN FEET
0 20 40 80

NORTH

NOTES:

- LOTS 1,5,12,13,20,21,35,39,43,47 TO BE FULLY SPRINKLERED.

UTILITY NOTE

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WASHINGTON UTILITY LOCATES

No.	REVISIONS	DATE	BY

Kimley»Horn

1201 THIRD AVENUE, SUITE 2800
SEATTLE, WA 98101

LICENSED PROFESSIONAL ENGINEER
PATRICK A. MAYERS
STATE OF WASHINGTON
EXPIRES: 10/10/2024
PROFESSIONAL ENGINEER
DATE: 2/9/2024

KHA PROJECT	090014000
DATE	2/9/2024
SCALE	AS SHOWN
DESIGNED BY	HEK
DRAWN BY	DAM
CHECKED BY	KPM

PRELIMINARY UTILITY PLAN

MARYSVILLE WASHINGTON

CORNELIUS AND LACEY PROPERTY

PREPARED FOR
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SHEET
8 OF 14

APPENDIX B: DOWNSTREAM DRAINAGE PHOTOS

Photo 1 – Looking southwest from East Sunnyside School Road at the east side of the project site. The manmade pond is pictured in the right.

Photo 2 – Looking west along the south side of East Sunnyside School Road. The upstream culvert that discharges onto the site is pictured in the bottom and the manmade pond is pictured in the left.

Photo 3 – Looking north along the south side of East Sunnyside School Road, picture in the bottom is the existing 15-inch CMP culvert that flows to the north underneath the roadway.

Photo 4 – Looking south from East Sunny School Road at the west portion of the project site. The manmade pond is pictured on the left.

Photo 5 – Looking southwest along the north side of East Sunnyside School Road at the existing ditch that continues to the west to 83rd Avenue NE

Photo 6 – Looking south along the east side of 83rd Avenue NE near the 18-inch culvert crossing

Photo 7 – Looking northeast from the west side of 83rd Avenue NE. The outlet of the 18-inch culvert is pictured in the bottom left.

Photo 8 – Looking northeast at the project at the intersection of 44th Street NE and 83rd Avenue NE

Photo 9 – Looking north along the east side of 83rd Avenue NE at the existing ditch and culvert system that flows north.

Photo 10 – Looking northwest at the western portion of the site. 83rd Avenue NE is pictured on the left.

Photo 11 – Looking north at the intersection of 83rd Avenue NE and East Sunnyside School Road. The 16-inch culvert is pictured in the bottom.

Photo 12 – Looking north along the west side of 83rd Avenue NE at the discharge of the existing 16-inch culvert.

Photo 13 – Looking northwest at the intersection of 44th Street NE and 79th Avenue NE. The inlet to the 24-inch culvert is located near the white paint mark in the center of the picture.

Photo 14 - Looking south along the south side of 44th Street NE at the discharge of the 24-inch culvert. This is at the quarter mile downstream drainage point from the project site.

APPENDIX C: STORMWATER CALCULATIONS

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: Cornelius-PRELIM DET VAULT
Site Name:
Site Address:
City:

Report Date:	10/19/2023
Gage:	Everett
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.200
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Existing Onsite Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	10.61
Pervious Total	10.61
Impervious Land Use	acre
Impervious Total	0
Basin Total	10.61

South Upstream Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	4.65
C, Pasture, Mod	3.17
Pervious Total	7.82
Impervious Land Use	acre
ROOF TOPS FLAT	1.46
Impervious Total	1.46
Basin Total	9.28

Mitigated Land Use

South Upstream Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Mod	4.65
C, Pasture, Mod	3.17
Pervious Total	7.82
Impervious Land Use	acre
ROOF TOPS FLAT	1.46
Impervious Total	1.46
Basin Total	9.28

Onsite Detained Area

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	2.06
Pervious Total	2.06
Impervious Land Use	acre
ROOF TOPS FLAT	6.71
Impervious Total	6.71
Basin Total	8.77

Bypass 83rd Ave

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	0.07
Pervious Total	0.07
Impervious Land Use	acre
ROADS MOD	0.24
Impervious Total	0.24
Basin Total	0.31

North Bypass

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
C, Pasture, Mod	1.3
Pervious Total	1.3
Impervious Land Use	acre
SIDEWALKS FLAT	0.23
Impervious Total	0.23
Basin Total	1.53

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 55.28 ft.
Length: 221.11 ft.
Depth: 13 ft.
Discharge Structure
Riser Height: 12 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.119 ft.
Notch Height: 2.066 ft.
Orifice 1 Diameter: 3.227 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

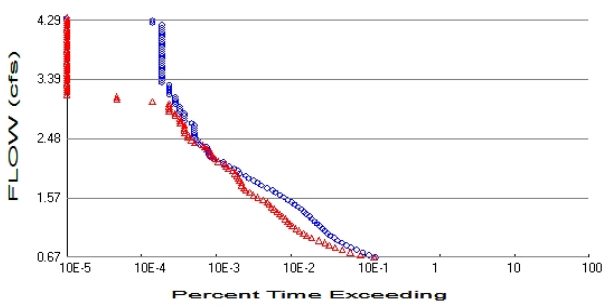
Vault Hydraulic Table

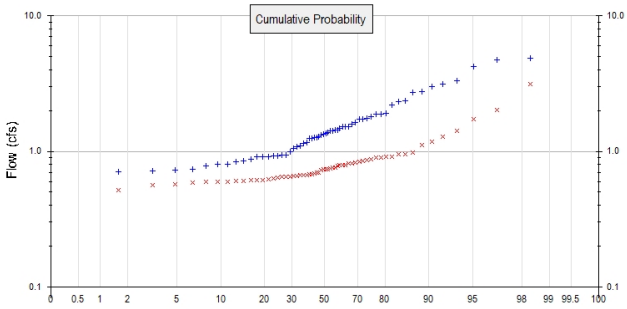
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.280	0.000	0.000	0.000
0.1444	0.280	0.040	0.107	0.000
0.2889	0.280	0.081	0.151	0.000
0.4333	0.280	0.121	0.186	0.000
0.5778	0.280	0.162	0.214	0.000
0.7222	0.280	0.202	0.240	0.000
0.8667	0.280	0.243	0.263	0.000
1.0111	0.280	0.283	0.284	0.000
1.1556	0.280	0.324	0.303	0.000
1.3000	0.280	0.364	0.322	0.000
1.4444	0.280	0.405	0.339	0.000
1.5889	0.280	0.445	0.356	0.000
1.7333	0.280	0.486	0.372	0.000
1.8778	0.280	0.526	0.387	0.000
2.0222	0.280	0.567	0.402	0.000
2.1667	0.280	0.608	0.416	0.000
2.3111	0.280	0.648	0.429	0.000
2.4556	0.280	0.689	0.442	0.000
2.6000	0.280	0.729	0.455	0.000
2.7444	0.280	0.770	0.468	0.000
2.8889	0.280	0.810	0.480	0.000
3.0333	0.280	0.851	0.492	0.000
3.1778	0.280	0.891	0.503	0.000
3.3222	0.280	0.932	0.515	0.000
3.4667	0.280	0.972	0.526	0.000
3.6111	0.280	1.013	0.537	0.000
3.7556	0.280	1.053	0.547	0.000
3.9000	0.280	1.094	0.558	0.000
4.0444	0.280	1.134	0.568	0.000
4.1889	0.280	1.175	0.578	0.000
4.3333	0.280	1.215	0.588	0.000
4.4778	0.280	1.256	0.598	0.000
4.6222	0.280	1.297	0.607	0.000
4.7667	0.280	1.337	0.617	0.000
4.9111	0.280	1.378	0.626	0.000
5.0556	0.280	1.418	0.635	0.000
5.2000	0.280	1.459	0.644	0.000

5.3444	0.280	1.499	0.653	0.000
5.4889	0.280	1.540	0.662	0.000
5.6333	0.280	1.580	0.670	0.000
5.7778	0.280	1.621	0.679	0.000
5.9222	0.280	1.661	0.687	0.000
6.0667	0.280	1.702	0.696	0.000
6.2111	0.280	1.742	0.704	0.000
6.3556	0.280	1.783	0.712	0.000
6.5000	0.280	1.823	0.720	0.000
6.6444	0.280	1.864	0.728	0.000
6.7889	0.280	1.905	0.736	0.000
6.9333	0.280	1.945	0.744	0.000
7.0778	0.280	1.986	0.752	0.000
7.2222	0.280	2.026	0.759	0.000
7.3667	0.280	2.067	0.767	0.000
7.5111	0.280	2.107	0.774	0.000
7.6556	0.280	2.148	0.782	0.000
7.8000	0.280	2.188	0.789	0.000
7.9444	0.280	2.229	0.796	0.000
8.0889	0.280	2.269	0.803	0.000
8.2333	0.280	2.310	0.811	0.000
8.3778	0.280	2.350	0.818	0.000
8.5222	0.280	2.391	0.825	0.000
8.6667	0.280	2.431	0.832	0.000
8.8111	0.280	2.472	0.839	0.000
8.9556	0.280	2.512	0.845	0.000
9.1000	0.280	2.553	0.852	0.000
9.2444	0.280	2.594	0.859	0.000
9.3889	0.280	2.634	0.866	0.000
9.5333	0.280	2.675	0.872	0.000
9.6778	0.280	2.715	0.879	0.000
9.8222	0.280	2.756	0.885	0.000
9.9667	0.280	2.796	0.894	0.000
10.111	0.280	2.837	0.927	0.000
10.256	0.280	2.877	0.973	0.000
10.400	0.280	2.918	1.026	0.000
10.544	0.280	2.958	1.084	0.000
10.689	0.280	2.999	1.145	0.000
10.833	0.280	3.039	1.208	0.000
10.978	0.280	3.080	1.275	0.000
11.122	0.280	3.120	1.354	0.000
11.267	0.280	3.161	1.438	0.000
11.411	0.280	3.202	1.708	0.000
11.556	0.280	3.242	1.828	0.000
11.700	0.280	3.283	1.952	0.000
11.844	0.280	3.323	2.081	0.000
11.989	0.280	3.364	2.215	0.000
12.133	0.280	3.404	3.003	0.000
12.278	0.280	3.445	4.486	0.000
12.422	0.280	3.485	6.115	0.000
12.567	0.280	3.526	7.427	0.000
12.711	0.280	3.566	8.189	0.000
12.856	0.280	3.607	8.815	0.000
13.000	0.280	3.647	9.352	0.000
13.144	0.280	3.688	9.853	0.000
13.289	0.000	0.000	10.32	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 18.43
Total Impervious Area: 1.46

Mitigated Landuse Totals for POC #1
Total Pervious Area: 11.25
Total Impervious Area: 8.64

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.331064
5 year	2.058331
10 year	2.647645
25 year	3.528317
50 year	4.292004
100 year	5.155674

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.747863
5 year	1.003247
10 year	1.20027
25 year	1.483084
50 year	1.719929
100 year	1.980613

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	1.749	0.617
1950	1.801	0.776
1951	1.154	0.649
1952	1.259	0.623
1953	1.435	0.651
1954	4.239	1.113
1955	1.720	0.812
1956	1.076	0.791
1957	1.734	0.911
1958	3.124	1.179

1959	1.151	0.737
1960	1.488	0.749
1961	4.884	1.736
1962	1.320	0.758
1963	2.311	0.896
1964	1.382	0.635
1965	0.720	0.651
1966	0.707	0.518
1967	1.514	0.900
1968	1.419	0.829
1969	4.727	1.292
1970	0.936	0.570
1971	1.585	0.687
1972	1.524	0.843
1973	1.277	0.665
1974	2.365	0.792
1975	1.513	0.672
1976	0.839	0.695
1977	0.807	0.608
1978	0.925	0.587
1979	2.742	0.976
1980	1.338	0.610
1981	0.918	0.600
1982	0.994	0.846
1983	1.874	0.758
1984	1.044	0.732
1985	1.412	0.792
1986	2.987	1.410
1987	1.270	0.872
1988	1.095	0.656
1989	1.361	0.606
1990	0.942	0.674
1991	0.907	0.733
1992	1.242	0.615
1993	0.930	0.567
1994	0.734	0.654
1995	0.868	0.730
1996	1.879	0.948
1997	3.308	3.133
1998	1.251	0.696
1999	0.851	0.631
2000	1.637	0.815
2001	0.557	0.518
2002	0.786	0.668
2003	0.724	0.594
2004	1.435	0.955
2005	0.805	0.677
2006	2.707	0.910
2007	2.206	0.864
2008	1.921	2.006
2009	0.909	0.598

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	4.8837	3.1326
2	4.7275	2.0065
3	4.2394	1.7360

4	3.3078	1.4097
5	3.1237	1.2920
6	2.9870	1.1786
7	2.7423	1.1131
8	2.7070	0.9763
9	2.3648	0.9553
10	2.3110	0.9484
11	2.2059	0.9114
12	1.9210	0.9104
13	1.8791	0.8999
14	1.8739	0.8963
15	1.8005	0.8725
16	1.7487	0.8635
17	1.7336	0.8457
18	1.7200	0.8434
19	1.6373	0.8292
20	1.5850	0.8153
21	1.5242	0.8116
22	1.5141	0.7923
23	1.5127	0.7916
24	1.4884	0.7914
25	1.4354	0.7764
26	1.4354	0.7582
27	1.4193	0.7577
28	1.4119	0.7492
29	1.3821	0.7368
30	1.3607	0.7330
31	1.3380	0.7322
32	1.3202	0.7297
33	1.2765	0.6959
34	1.2700	0.6948
35	1.2590	0.6865
36	1.2514	0.6770
37	1.2424	0.6744
38	1.1544	0.6722
39	1.1512	0.6679
40	1.0953	0.6652
41	1.0763	0.6562
42	1.0445	0.6539
43	0.9944	0.6508
44	0.9424	0.6507
45	0.9357	0.6493
46	0.9300	0.6355
47	0.9250	0.6306
48	0.9185	0.6234
49	0.9094	0.6167
50	0.9066	0.6155
51	0.8683	0.6103
52	0.8509	0.6081
53	0.8394	0.6057
54	0.8068	0.5999
55	0.8050	0.5979
56	0.7857	0.5940
57	0.7338	0.5872
58	0.7238	0.5699
59	0.7196	0.5670
60	0.7066	0.5180
61	0.5572	0.5178

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.6655	2930	2776	94	Pass
0.7022	2391	1842	77	Pass
0.7388	1977	1342	67	Pass
0.7754	1643	1042	63	Pass
0.8121	1378	839	60	Pass
0.8487	1189	702	59	Pass
0.8853	1042	615	59	Pass
0.9219	916	515	56	Pass
0.9586	816	409	50	Pass
0.9952	726	348	47	Pass
1.0318	666	316	47	Pass
1.0685	611	278	45	Pass
1.1051	566	250	44	Pass
1.1417	522	224	42	Pass
1.1784	479	206	43	Pass
1.2150	446	192	43	Pass
1.2516	414	180	43	Pass
1.2883	382	165	43	Pass
1.3249	346	151	43	Pass
1.3615	321	140	43	Pass
1.3982	298	129	43	Pass
1.4348	268	117	43	Pass
1.4714	240	110	45	Pass
1.5080	220	104	47	Pass
1.5447	195	91	46	Pass
1.5813	172	78	45	Pass
1.6179	154	68	44	Pass
1.6546	134	60	44	Pass
1.6912	121	53	43	Pass
1.7278	102	50	49	Pass
1.7645	87	47	54	Pass
1.8011	77	47	61	Pass
1.8377	68	44	64	Pass
1.8744	58	42	72	Pass
1.9110	53	41	77	Pass
1.9476	44	38	86	Pass
1.9842	42	36	85	Pass
2.0209	37	31	83	Pass
2.0575	32	29	90	Pass
2.0941	27	28	103	Pass
2.1308	27	23	85	Pass
2.1674	20	21	104	Pass
2.2040	18	19	105	Pass
2.2407	17	18	105	Pass
2.2773	17	18	105	Pass
2.3139	16	16	100	Pass
2.3506	16	15	93	Pass
2.3872	13	14	107	Pass
2.4238	12	11	91	Pass
2.4605	12	10	83	Pass
2.4971	11	9	81	Pass
2.5337	11	9	81	Pass
2.5703	11	8	72	Pass

2.6070	11	8	72	Pass
2.6436	11	8	72	Pass
2.6802	11	8	72	Pass
2.7169	10	7	70	Pass
2.7535	8	7	87	Pass
2.7901	8	7	87	Pass
2.8268	8	6	75	Pass
2.8634	8	6	75	Pass
2.9000	7	5	71	Pass
2.9367	7	5	71	Pass
2.9733	7	5	71	Pass
3.0099	6	5	83	Pass
3.0465	6	3	50	Pass
3.0832	6	1	16	Pass
3.1198	6	1	16	Pass
3.1564	5	0	0	Pass
3.1931	5	0	0	Pass
3.2297	5	0	0	Pass
3.2663	5	0	0	Pass
3.3030	5	0	0	Pass
3.3396	4	0	0	Pass
3.3762	4	0	0	Pass
3.4129	4	0	0	Pass
3.4495	4	0	0	Pass
3.4861	4	0	0	Pass
3.5228	4	0	0	Pass
3.5594	4	0	0	Pass
3.5960	4	0	0	Pass
3.6326	4	0	0	Pass
3.6693	4	0	0	Pass
3.7059	4	0	0	Pass
3.7425	4	0	0	Pass
3.7792	4	0	0	Pass
3.8158	4	0	0	Pass
3.8524	4	0	0	Pass
3.8891	4	0	0	Pass
3.9257	4	0	0	Pass
3.9623	4	0	0	Pass
3.9990	4	0	0	Pass
4.0356	4	0	0	Pass
4.0722	4	0	0	Pass
4.1088	4	0	0	Pass
4.1455	4	0	0	Pass
4.1821	4	0	0	Pass
4.2187	4	0	0	Pass
4.2554	3	0	0	Pass
4.2920	3	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	2053.77			☐	0.00			
Total Volume Infiltrated		2053.77	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

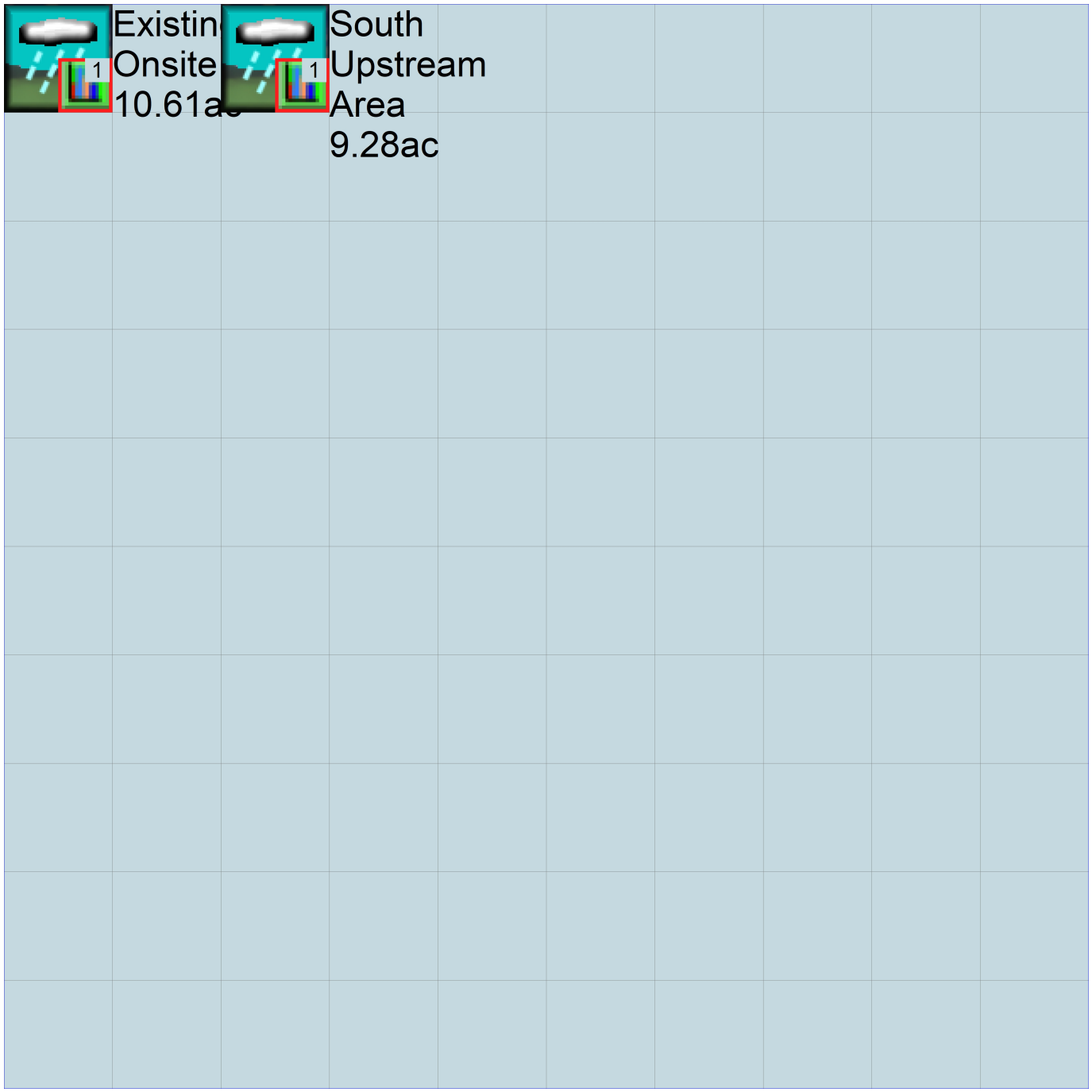
No PERLND changes have been made.

IMPLND Changes

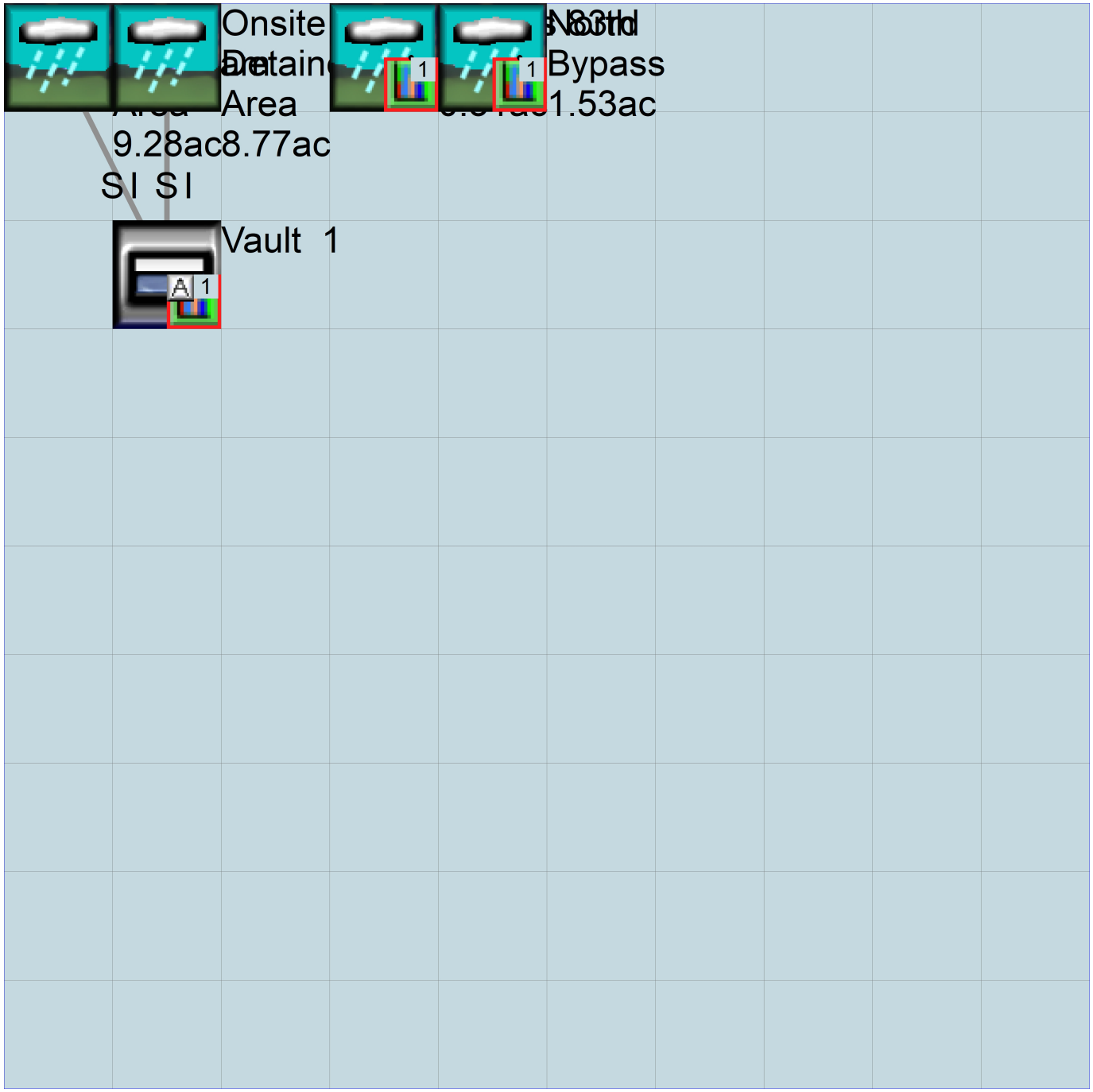
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Cornelius-PRELIM DET VAULT.wdm
MESSU      25   PreCornelius-PRELIM DET VAULT.MES
           27   PreCornelius-PRELIM DET VAULT.L61
           28   PreCornelius-PRELIM DET VAULT.L62
           30   POCCornelius-PRELIM DET VAULT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      PERLND      14
      IMPLND       4
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Existing Onsite Area        MAX                   1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   11     C, Forest, Mod          1    1    1    1   27    0
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   11         0    0    1    0    0    0    0    0    0    0    0    0
   14         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
   14         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0         0         0
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            0.2       0.5      0.35         6       0.5       0.7
   14           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   11              0         0         0         0       2.5         1         0
   14              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    4         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
```

```
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Existing Onsite Area***
PERLND  11                       10.61     COPY   501     12
PERLND  11                       10.61     COPY   501     13
South Upstream Area***
PERLND  11                        4.65     COPY   501     12
PERLND  11                        4.65     COPY   501     13
PERLND  14                        3.17     COPY   501     12
PERLND  14                        3.17     COPY   501     13
IMPLND   4                        1.46     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1
```

```
  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Cornelius-PRELIM DET VAULT.wdm
MESSU       25   MitCornelius-PRELIM DET VAULT.MES
            27   MitCornelius-PRELIM DET VAULT.L61
            28   MitCornelius-PRELIM DET VAULT.L62
            30   POCCornelius-PRELIM DET VAULT1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      11
      PERLND      14
      IMPLND       4
      IMPLND       2
      IMPLND       8
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   11     C, Forest, Mod          1    1    1    1   27    0
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
   11         0    0    1    0    0    0    0    0    0    0    0    0
   14         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   11         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   11         0    0    0    0    0    0    0    0    0    0    0
   14         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   11              0       4.5      0.08       400       0.1       0.5     0.996
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   11              0         0         2         2         0         0         0
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   11            0.2       0.5      0.35         6       0.5       0.7
   14           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
   11              0         0         0         0       2.5          1         0
   14              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    4      ROOF TOPS/FLAT         1    1    1   27    0
    2      ROADS/MOD              1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    4         0    0    1    0    0    0
    2         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
```

```
    4         0    0    4    0    0    4    1    9
    2         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    4         0    0    0    0    0
    2         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    4           400      0.01       0.1       0.1
    2           400      0.05       0.1      0.08
    8           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    4             0         0
    2             0         0
    8             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    4             0         0
    2             0         0
    8             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
South Upstream Area***
PERLND  11                      4.65     RCHRES   1      2
PERLND  11                      4.65     RCHRES   1      3
PERLND  14                      3.17     RCHRES   1      2
PERLND  14                      3.17     RCHRES   1      3
IMPLND   4                      1.46     RCHRES   1      5
Onsite Detained Area***
PERLND  14                      2.06     RCHRES   1      2
PERLND  14                      2.06     RCHRES   1      3
IMPLND   4                      6.71     RCHRES   1      5
Bypass 83rd Ave***
PERLND  14                      0.07     COPY   501     12
PERLND  14                      0.07     COPY   601     12
PERLND  14                      0.07     COPY   501     13
PERLND  14                      0.07     COPY   601     13
IMPLND   2                      0.24     COPY   501     15
IMPLND   2                      0.24     COPY   601     15
North Bypass***
PERLND  14                       1.3     COPY   501     12
PERLND  14                       1.3     COPY   601     12
PERLND  14                       1.3     COPY   501     13
PERLND  14                       1.3     COPY   601     13
IMPLND   8                      0.23     COPY   501     15
IMPLND   8                      0.23     COPY   601     15

******Routing******
PERLND  11                      4.65     COPY     1     12
PERLND  14                      3.17     COPY     1     12
```

```
IMPLND   4                        1.46     COPY     1     15
PERLND  11                        4.65     COPY     1     13
PERLND  14                        3.17     COPY     1     13
PERLND  14                        2.06     COPY     1     12
IMPLND   4                        6.71     COPY     1     15
PERLND  14                        2.06     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                               ***
    1     Vault  1               1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                   ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------><--------> ***
    1             1      0.04       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                      ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
```

0.000000	0.280601	0.000000	0.000000
0.144444	0.280601	0.040531	0.107427
0.288889	0.280601	0.081062	0.151925
0.433333	0.280601	0.121594	0.186070
0.577778	0.280601	0.162125	0.214855
0.722222	0.280601	0.202656	0.240215
0.866667	0.280601	0.243187	0.263142
1.011111	0.280601	0.283718	0.284226
1.155556	0.280601	0.324250	0.303850
1.300000	0.280601	0.364781	0.322282
1.444444	0.280601	0.405312	0.339715
1.588889	0.280601	0.445843	0.356296
1.733333	0.280601	0.486374	0.372139
1.877778	0.280601	0.526906	0.387335
2.022222	0.280601	0.567437	0.401956
2.166667	0.280601	0.607968	0.416064
2.311111	0.280601	0.648499	0.429709
2.455556	0.280601	0.689030	0.442934
2.600000	0.280601	0.729561	0.455776
2.744444	0.280601	0.770093	0.468265
2.888889	0.280601	0.810624	0.480430
3.033333	0.280601	0.851155	0.492294
3.177778	0.280601	0.891686	0.503879
3.322222	0.280601	0.932217	0.515203
3.466667	0.280601	0.972749	0.526284
3.611111	0.280601	1.013280	0.537137
3.755556	0.280601	1.053811	0.547774
3.900000	0.280601	1.094342	0.558209
4.044444	0.280601	1.134873	0.568452
4.188889	0.280601	1.175405	0.578514
4.333333	0.280601	1.215936	0.588404
4.477778	0.280601	1.256467	0.598130
4.622222	0.280601	1.296998	0.607701
4.766667	0.280601	1.337529	0.617123
4.911111	0.280601	1.378061	0.626404
5.055556	0.280601	1.418592	0.635549
5.200000	0.280601	1.459123	0.644564
5.344444	0.280601	1.499654	0.653455
5.488889	0.280601	1.540185	0.662226
5.633333	0.280601	1.580717	0.670883
5.777778	0.280601	1.621248	0.679430
5.922222	0.280601	1.661779	0.687870
6.066667	0.280601	1.702310	0.696209
6.211111	0.280601	1.742841	0.704448
6.355556	0.280601	1.783373	0.712592
6.500000	0.280601	1.823904	0.720644
6.644444	0.280601	1.864435	0.728608
6.788889	0.280601	1.904966	0.736485
6.933333	0.280601	1.945497	0.744278
7.077778	0.280601	1.986028	0.751991
7.222222	0.280601	2.026560	0.759626
7.366667	0.280601	2.067091	0.767185
7.511111	0.280601	2.107622	0.774669
7.655556	0.280601	2.148153	0.782083
7.800000	0.280601	2.188684	0.789426
7.944444	0.280601	2.229216	0.796702
8.088889	0.280601	2.269747	0.803912
8.233333	0.280601	2.310278	0.811058
8.377778	0.280601	2.350809	0.818142
8.522222	0.280601	2.391340	0.825165
8.666667	0.280601	2.431872	0.832128
8.811111	0.280601	2.472403	0.839034
8.955556	0.280601	2.512934	0.845884
9.100000	0.280601	2.553465	0.852678
9.244444	0.280601	2.593996	0.859419
9.388889	0.280601	2.634528	0.866107
9.533333	0.280601	2.675059	0.872744
9.677778	0.280601	2.715590	0.879330
9.822222	0.280601	2.756121	0.885868
9.966667	0.280601	2.796652	0.894690

```
  10.11111  0.280601  2.837184  0.927388
  10.25556  0.280601  2.877715  0.973035
  10.40000  0.280601  2.918246  1.026245
  10.54444  0.280601  2.958777  1.084342
  10.68889  0.280601  2.999308  1.145532
  10.83333  0.280601  3.039840  1.208456
  10.97778  0.280601  3.080371  1.275726
  11.12222  0.280601  3.120902  1.354659
  11.26667  0.280601  3.161433  1.438124
  11.41111  0.280601  3.201964  1.708726
  11.55556  0.280601  3.242495  1.827994
  11.70000  0.280601  3.283027  1.952388
  11.84444  0.280601  3.323558  2.081691
  11.98889  0.280601  3.364089  2.215715
  12.13333  0.280601  3.404620  3.003104
  12.27778  0.280601  3.445151  4.486319
  12.42222  0.280601  3.485683  6.115148
  12.56667  0.280601  3.526214  7.427727
  12.71111  0.280601  3.566745  8.189214
  12.85556  0.280601  3.607276  8.815421
  13.00000  0.280601  3.647807  9.352864
  13.14444  0.280601  3.688339  9.853069
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76          PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76          IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
```

```
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012
PROJECT REPORT

Project Name: Cornelius-COMPARE
Site Name: Cornelius & Lacey
Site Address: 83rd Ave
City : Marysville
Report Date: 10/19/2023
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2023/01/27
Version : 4.2.19

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : South Upstream Area
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	4.65
C, Pasture, Mod	3.17
Pervious Total	7.82

Impervious Land Use	acre
ROOF TOPS FLAT	1.46
Impervious Total	1.46

Basin Total 9.28

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Onsite Detained Area
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Mod	2.06
Pervious Total	2.06

Impervious Land Use	acre
ROOF TOPS FLAT	6.71
Impervious Total	6.71
Basin Total	8.77

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:7.82
Total Impervious Area:1.46

Mitigated Landuse Totals for POC #1
Total Pervious Area:2.06
Total Impervious Area:6.71

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.022037
5 year	1.519407
10 year	1.918721
25 year	2.511624
50 year	3.023283
100 year	3.600029

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	3.655617
5 year	4.980074
10 year	5.953741
25 year	7.298617
50 year	8.386748
100 year	9.551442

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated

<TABLE REMOVED TO CONSERVE PAPER>

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated

<TABLE REMOVED TO CONSERVE PAPER>

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs) Predev Mit Percentage Pass/Fail
<TABLE REMOVED TO CONSERVE PAPER>

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.3238 **acre-feet**
On-line facility target flow: 0.1649 **cfs.**
Adjusted for 15 min: 0.1649 **cfs.**
Off-line facility target flow: 0.1051 **cfs.**
Adjusted for 15 min: 0.1051 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality Treated	Quality Percent	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes
No changes have been made.

APPENDIX D: CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

(TO BE PROVIDED AT A LATER SUBMITTAL)

APPENDIX E: SPECIAL REPORTS AND STUDIES

GEOTECHNICAL REPORT

APPENDIX F: OPERATIONS & MAINTENANCE MANUAL

(TO BE PROVIDED AT A LATER SUBMITTAL)