INSIGHT ENGINEERING CO.

STORMWATER SITE PLAN
For
Kendall Auto Group

Prepared for
City of Marysville
80 Columbia Ave.
Marysville, WA-98270

Project Site Location:
XXXXX Smokey Point Blvd
Marysville, WA-98271

Applicant:
Kendall Auto Group
8854 W. Emerald St, STE 260
Boise, ID 83704

Contact:
IECO
P.O. Box 1478
Everett, WA 98206
425-303-9363

Tax Id: 31052800301200, 31052800300600
IECO Project: 20-1092

Certified Erosion and Sedimentation Control Lead:
To be named by contractor

Stormwater Site Plan Prepared By:

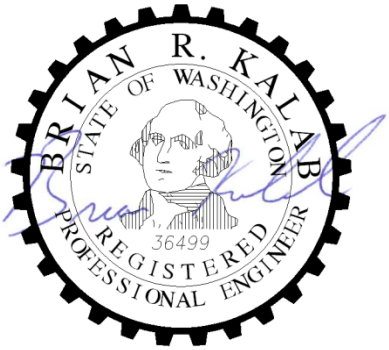
Shilpa Xavier

Stormwater Site Plan Preparation Date:

June 23, 2022

Approximate Construction Date:

May 1st, 2023



08/05/2022

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Acronyms and Abbreviations

BMP	Best Management Practices
DOE	Department of Ecology
ESC	Erosion and Sediment Control
IECO	Insight Engineering Company
MR	Minimum Requirement
SWPPP	Stormwater Pollution Prevention Plan
SWMMWW	Stormwater Management Manual for Western Washington
TESC	Temporary Erosion and Sediment Control
WWHM	Western Washington Hydrology Model

1.0 Executive Summary

The proposed project ***Kendall Auto Group*** is located at XXXXX Smokey Point BLVD in City of Marysville, Washington. More generally, the site is located within the SW ¼ of Section 28, Township 31 North, and Range 5 East of the Willamette Meridian. Please refer to the Vicinity Map attached later in the section. This report follows City of Marysville Drainage and Erosion Control Design Standards (April 1999, revised June 2016) and the 2019 SWMMWW.

The site contains 11.62 acres after BLA. The existing site is undeveloped. Based on the topography the site is flat and contains one drainage basin that drains to the south. Per NRCS survey of Snohomish County, the project site contains Custer and Norma soils that have a hydrologic classification of Type "D". Please refer to the soils map and descriptions attached later in this report for more details. Refer to section 4 of this report for the existing basin summary.

The project proposal is to develop the site by constructing a car dealership building and parking with associated utilities. The total clearing area for the project is 12.48 acres. The new impervious area onsite is 460,644 SF.

Per conversation with the City minimum requirements #1-5 shall apply for this project. Minimum Requirements #6-9 are taken care of through the existing storm system on site that flows to a regional detention pond that will provide the site flow control and water quality. See Section 1.2 for Minimum Requirements Summary included later in this report.

Onsite stormwater management was evaluated using List #1 per section 2.5.5 of the SWMMWW. Full dispersion was considered infeasible due to a lack of native vegetation, Permeable pavement, rain gardens, and bioretention have been deemed infeasible due to high groundwater levels. Seasonal groundwater levels have been observed as shallow as 2-feet below grade. Please refer to the geotechnical report in section 5B for more details. Sheet flow dispersion is also infeasible as the required vegetated flow paths could not be met due to the large impervious footprint of the project. BMP T5.13 will be used for all pervious areas. Pervious areas will infiltrate

into the underlaying soils. Impervious areas will be conveyed to the existing stormwater system which will provide flow control and water quality. The downstream public channel should not experience any future flooding problems as the system has been designed to handle the impervious development area.

VICINITY MAP

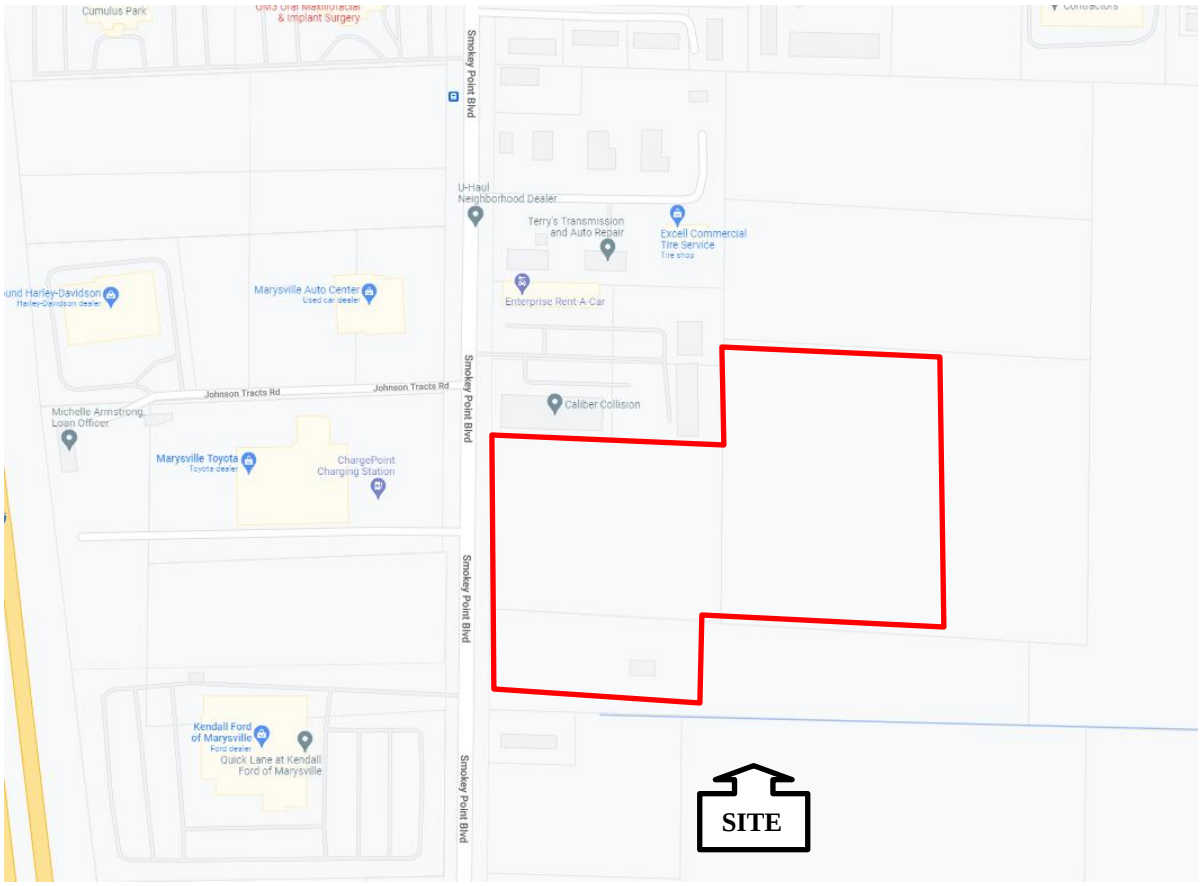

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Figure 1 -Vicinity Map
Kendall Auto Group
Marysville, Washington

SCALE: NTS	**DATE:** 8/5/22	**JOB #:** 20-1092
BY: SX	**FILE NAME:** 20-1092/doc/drainage report	

1.2 Minimum Requirements Summary

MR : Minimum Requirement

SWPPP : Stormwater Pollution Prevention Plan

MR #1 Stormwater Site Plan Narrative: This report follows City of Marysville Drainage and Erosion Control Design Standards (April 1999, revised June 2016) and the 2019 SWMMWW.

MR #2 SWPPP Narrative: A SWPPP has been included in section 5 of this report.

MR #3 Water Pollution Source Control for New Development: No source control pollutants pertain to the proposed project, therefore no BMP's are required for the proposed project.

MR #4 Preservation of Natural Drainage Systems and Outfalls: The runoff from the storage lot will be connected to the existing drainage system on-site to continue following the natural drainage flow path.

MR #5 Onsite Stormwater Management: Onsite stormwater management was evaluated using List #1 per section 2.5.5 of the SWMMWW. Full dispersion was considered infeasible due to a lack of native vegetation, Permeable pavement, rain gardens, and bioretention have been deemed infeasible due to high groundwater levels. Seasonal groundwater levels have been observed as shallow as 2-feet below grade. Please refer to the geotechnical report in section 5B for more details. Sheet flow dispersion is also infeasible as the required vegetated flow paths could not be met due to the large impervious footprint of the project. BMP T5.13 will be used for all pervious areas. Pervious areas will infiltrate into the underlaying soils.

2.0 Existing Conditions

The proposed project ***Kendall Auto Group*** is located at XXXXX Smokey Point BLVD in City of Marysville, Washington. More generally, the site is located within the SW ¼ of Section 28, Township 31 North, and Range 5 East of the Willamette Meridian. Please refer to the Vicinity Map attached later in the section.

The existing site is undeveloped. Based on the topography the site is flat and contains one drainage basin that drains to the south. Per NRCS survey of Snohomish County, the project site contains Custer and Norma soils that have a hydrologic classification of Type "D". Please refer to the soils map and descriptions attached later in this report for more details. Refer to section 4 of this report for the existing basin summary.

SOIL MAP

SOILS LEGEND

13- Custer fine sandy loam

39-Norma loam

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Figure 2 - Soil Map
Kendall Auto Group
Marysville, Washington

SCALE: NONE	**DATE:** 8/5/22	**JOB #:** 20-1092
BY: SX	**FILE NAME:** 20-1092\docs\drainage report	

Snohomish County Area, Washington

13—Custer fine sandy loam

Map Unit Setting

- *National map unit symbol:* 2hy0
- *Elevation:* 0 to 150 feet
- *Mean annual precipitation:* 32 to 50 inches
- *Mean annual air temperature:* 48 to 50 degrees F
- *Frost-free period:* 150 to 200 days
- *Farmland classification:* Prime farmland if irrigated and drained

Map Unit Composition

- *Custer, undrained, and similar soils:* 85 percent
- *Minor components:* 15 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Custer, Undrained

Setting

- *Landform:* Outwash plains
- *Parent material:* Glacial outwash

Typical profile

- *H1 - 0 to 9 inches:* fine sandy loam
- *H2 - 9 to 35 inches:* sand
- *H3 - 35 to 60 inches:* sand

Properties and qualities

- *Slope:* 0 to 2 percent
- *Depth to restrictive feature:* 20 to 40 inches to strongly contrasting textural stratification
- *Natural drainage class:* Poorly drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
- *Depth to water table:* About 0 to 12 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- *Available water storage in profile:* Low (about 3.1 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 5w
- *Hydrologic Soil Group:* C/D
- *Forage suitability group:* Wet Soils (G002XN102WA)
- *Hydric soil rating:* Yes

Minor Components

Norma, undrained

- *Percent of map unit:* 5 percent
- *Landform:* Depressions

- *Hydric soil rating:* Yes

Custer, drained

- *Percent of map unit:* 5 percent
- *Landform:* Depressions
- *Hydric soil rating:* Yes

Indianola

- *Percent of map unit:* 5 percent
- *Hydric soil rating:* No

Snohomish County Area, Washington

39—Norma loam

Map Unit Setting

- *National map unit symbol:* 2hyx
- *Elevation:* 0 to 1,000 feet
- *Mean annual precipitation:* 35 to 60 inches
- *Mean annual air temperature:* 48 to 52 degrees F
- *Frost-free period:* 150 to 200 days
- *Farmland classification:* Prime farmland if drained

Map Unit Composition

- *Norma, undrained, and similar soils:* 85 percent
- *Minor components:* 15 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Norma, Undrained

Setting

- *Landform:* Drainageways, depressions
- *Parent material:* Alluvium

Typical profile

- *H1 - 0 to 10 inches:* ashy loam
- *H2 - 10 to 28 inches:* sandy loam
- *H3 - 28 to 60 inches:* sandy loam

Properties and qualities

- *Slope:* 0 to 3 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Poorly drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
- *Depth to water table:* About 0 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* Frequent
- *Available water supply, 0 to 60 inches:* Moderate (about 9.0 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 5w
- *Hydrologic Soil Group:* B/D
- *Ecological site:* F002XA007WA - Puget Lowlands Wet Forest
- *Forage suitability group:* Wet Soils (G002XN102WA)
- *Other vegetative classification:* Wet Soils (G002XN102WA)
- *Hydric soil rating:* Yes

Minor Components

Terric medisaprists, undrained

- *Percent of map unit:* 5 percent
- *Landform:* Depressions
- *Other vegetative classification:* Wet Soils (G002XN102WA)
- *Hydric soil rating:* Yes

Bellingham, undrained

- *Percent of map unit:* 5 percent
- *Landform:* Depressions
- *Other vegetative classification:* Wet Soils (G002XN102WA)
- *Hydric soil rating:* Yes

Norma, drained

- *Percent of map unit:* 5 percent
- *Landform:* Depressions
- *Other vegetative classification:* Seasonally Wet Soils (G002XN202WA)
- *Hydric soil rating:* Yes

3.0 Offsite Analysis

The site contains 11.62 acres after BLA. No visible on-site drainage problems were observed at the time of field investigations.

3.1 Upstream Analysis

Based on the site reconnaissance and the topographic survey of the site, the upstream flows appear to be minimal.

3.2 Downstream Analysis

The entire site is generally flat and contains one drainage basin that drains to the south property line. The flow travels approximately 150-feet to the south of the southeast corner of the site to enter the existing storm system at 39th Ave SE. The flow then follows 39th Ave for about 2,700-feet via 42-inch corrugated polyethylene pipe. The flow then turns east along 152nd St NE for about 625-feet before crossing and continuing south through an undeveloped parcel for approximately 1,350-feet to the regional detention pond. This is where the downstream analysis was completed. There did not appear to be any restrictions or erosion problems within this distance.

DOWNSTREAM ANALYSIS MAP

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Figure 3 – Downstream Analysis
Kendall Auto Group
Marysville, Washington

SCALE: NONE	**DATE:** 8/5/22	**JOB #:** 20-1092
BY: SX	**FILE NAME:** 20-1092\docs\drainage report	

4.0 Permanent Stormwater Control Plan

The proposed project ***Kendall Auto Group*** is located at XXXXX Smokey Point BLVD in City of Marysville, Washington. More generally, the site is located within the SW ¼ of Section 28, Township 31 North, and Range 5 East of the Willamette Meridian. Please refer to the Vicinity Map attached later in the section. Based on the topography the site is flat and contains one drainage basin that drains to the south. Per NRCS survey of Snohomish County, the project site contains Custer and Norma soils that have a hydrologic classification of Type "D".

The project proposal is to develop the site by constructing a car dealership building and associated parking. The total clearing area is 12.10 acres. The new impervious area onsite is 473,384 SF.

Per conversation with the City minimum requirements #1-5 shall apply for this project. Minimum Requirements #6-9 are taken care of through the existing storm system on site that flows to a regional detention pond that will provide the site flow control and water quality. See Section 1.2 for Minimum Requirements Summary included later in this report.

Onsite stormwater management was evaluated using List #1 per section 2.5.5 of the SWMMWW. Full dispersion was considered infeasible due to a lack of native vegetation, Permeable pavement, rain gardens, and bioretention have been deemed infeasible due to high groundwater levels. Seasonal groundwater levels have been observed as shallow as 2-feet below grade. Please refer to the geotechnical report in section 5B for more details. Sheet flow dispersion is also infeasible as the required vegetated flow paths could not be met due to the large impervious footprint of the project. BMP T5.13 will be used for all pervious areas. Pervious areas will infiltrate into the underlaying soils. Impervious areas will be conveyed to the existing stormwater system which will provide flow control and water quality. The downstream public channel should not experience any future flooding problems as the system has been designed to handle the impervious development area.

4.1 Existing Basin Summary

Site Area (after BLA)	= 11.62 Acres
Clearing Area	= 12.48 Acres
Existing Basin	= 12.48 Acres

4.2 Developed Basin Summary

Clearing Area	= 12.48 Acres
Developed Basin	= 12.48 Acres

Site Impervious:

Frontage Road	= 24,015 SF (0.55 Acres)
Frontage SW	= 4,133 SF (0.09 Acres)
Onsite SW	= 7,941 SF (0.18 Acres)
Roof	= 75,577 SF (1.74 Acres)
Parking	= 348,978 SF (8.01 acres)
Total Impervious	= 460,644 SF (10.57 Acres)

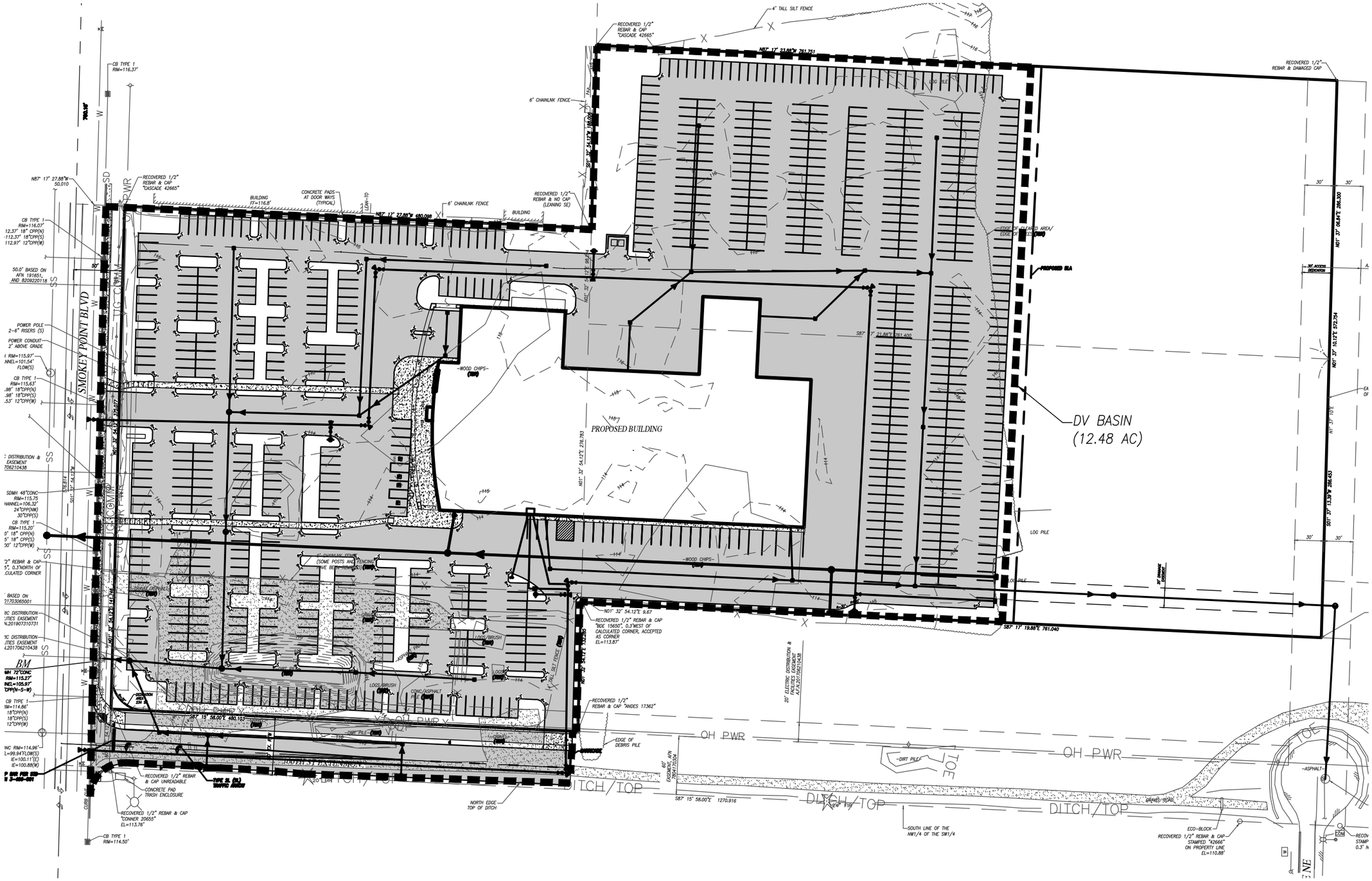
Permeable Area (Lawn)**:** = 12.48 Acres-10.57 Acres = 1.91 Acres

EX. BASIN
(12.48 AC)

SCALE: 1" = 100'

0 50 100

EXISTING BASIN MAP



SCALE: 1" = 100'

0 50 100

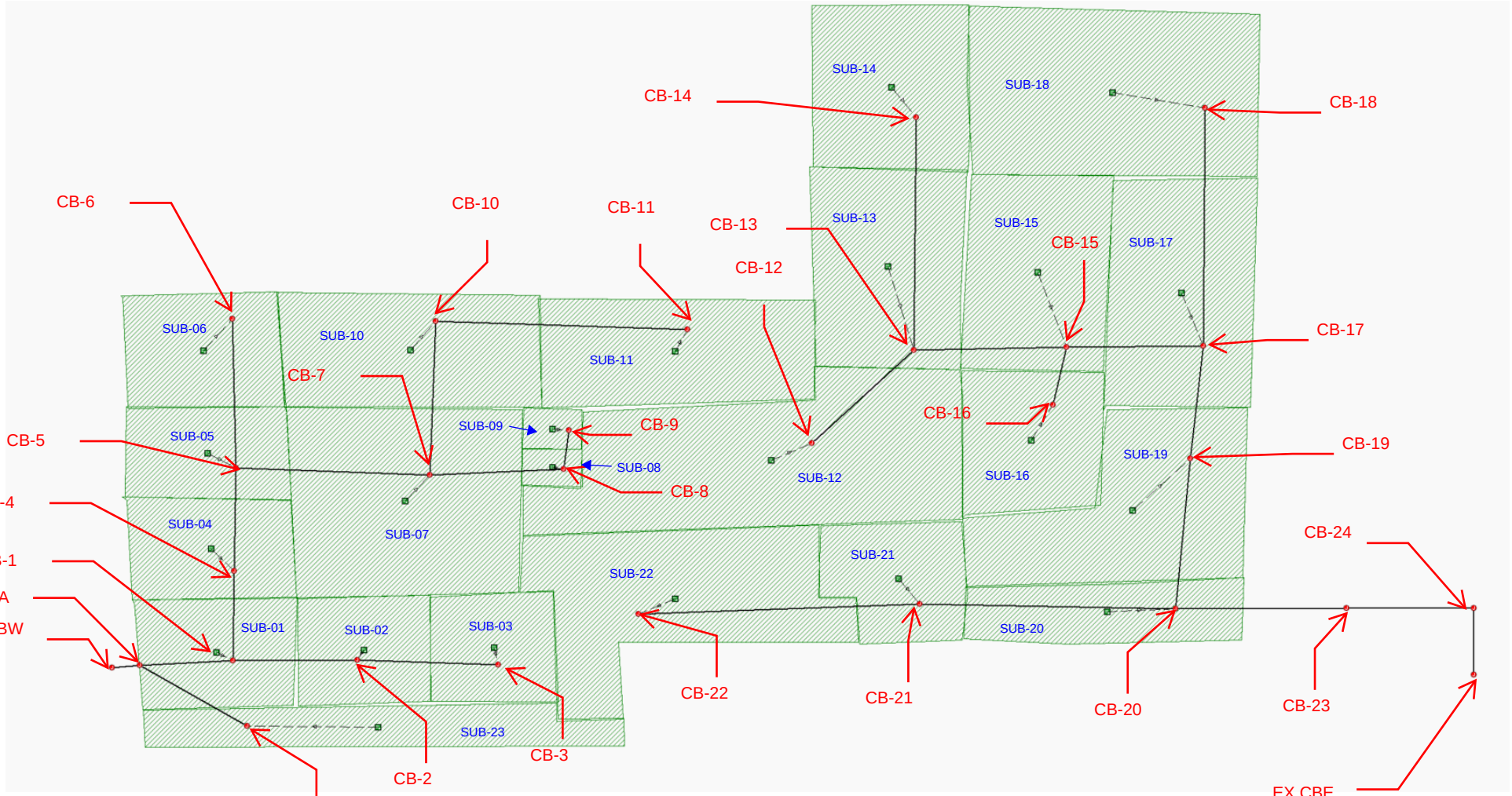
DEVELOPED BASIN MAP

4.3 Conveyance Analysis and Design

An onsite conveyance analysis was performed using “Storm and Sanitary Analysis” software using the “SBUH” method for the onsite conveyance system. A conveyance analysis for 25-yrand backwater analysis for 100-yr storm was also analyzed.

Refer to the following pages for a detailed analysis.

Conveyance Layout


SUB-14
SUB-18
CB-14
CB-18
CB-6
CB-10
CB-11
CB-13
SUB-13
SUB-15
CB-15
SUB-17
CB-12
CB-17
SUB-06
SUB-10
SUB-11
CB-7
CB-16
CB-5
SUB-05
SUB-09
CB-9
SUB-08
CB-19
SUB-19
SUB-12
SUB-16
CB-8
CB-4
SUB-04
SUB-07
CB-24
CB-1
SUB-21
SUB-22
CB-1A
EX CBW
SUB-01
SUB-02
SUB-03
SUB-20
CB-22
CB-21
CB-20
CB-23
SUB-23
CB-3
CB-2
EX CBE
CB-F

25-Conveyance Report

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.3.214 (Build 0)

****
Project Description
****
File Name ..... Kendall Auto.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. Santa Barbara UH
Time of Concentration..... User-Defined
Link Routing Method ..... Kinematic Wave
Storage Node Exfiltration.. None
Starting Date JUL-27-2022 00:00:00
Ending Date JUL-28-2022 00:00:00
Report Time Step 00:00:10

****
Element Count
****
Number of rain gages 2
Number of subbasins 23
Number of nodes 28
Number of links 26

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	TS-01	INTENSITY	6.00
Rain Gage-02	TS-02	INTENSITY	6.00

****
Subbasin Summary
****

Subbasin	Total Area	Imperv. Area	Raingage

ID	acres	%	
Sub-01	0.73	87.00	Rain Gage-01
Sub-02	0.56	77.00	Rain Gage-01
Sub-03	0.51	90.00	Rain Gage-01
Sub-04	0.37	81.00	Rain Gage-01
Sub-05	0.23	87.00	Rain Gage-01
Sub-06	0.58	84.00	Rain Gage-01
Sub-07	0.67	91.00	Rain Gage-01
Sub-08	0.03	100.00	Rain Gage-01
Sub-09	0.04	50.00	Rain Gage-01
Sub-10	0.13	100.00	Rain Gage-01
Sub-11	0.25	80.00	Rain Gage-01
Sub-12	0.89	100.00	Rain Gage-01
Sub-13	0.40	100.00	Rain Gage-01
Sub-14	0.43	100.00	Rain Gage-01
Sub-15	0.19	100.00	Rain Gage-01
Sub-16	0.46	100.00	Rain Gage-01
Sub-17	0.46	100.00	Rain Gage-01
Sub-18	0.62	100.00	Rain Gage-01
Sub-19	0.71	100.00	Rain Gage-01
Sub-20	0.55	100.00	Rain Gage-01
Sub-21	0.54	100.00	Rain Gage-01
Sub-22	1.10	99.00	Rain Gage-01
Sub-23	0.61	92.00	Rain Gage-01

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
CB-01	JUNCTION	109.06	113.50	0.00	
CB-01A	JUNCTION	108.00	114.60	0.00	
CB-02	JUNCTION	110.39	113.50	0.00	
CB-03	JUNCTION	111.00	113.50	0.00	
CB-04	JUNCTION	109.77	115.00	0.00	
CB-05	JUNCTION	110.39	116.20	0.00	
CB-06	JUNCTION	112.75	115.25	0.00	
CB-07	JUNCTION	111.06	114.20	0.00	
CB-08	JUNCTION	112.78	115.50	0.00	
CB-09	JUNCTION	113.00	115.50	0.00	
CB-10	JUNCTION	111.87	115.80	0.00	
CB-11	JUNCTION	112.80	115.30	0.00	
CB-12	JUNCTION	112.53	115.00	0.00	
CB-13	JUNCTION	112.11	114.75	0.00	
CB-14	JUNCTION	112.88	115.40	0.00	
CB-15	JUNCTION	111.20	115.00	0.00	

CB-16	JUNCTION	112.50	115.00	0.00	
CB-17	JUNCTION	110.85	114.25	0.00	
CB-18	JUNCTION	112.20	114.70	0.00	
CB-19	JUNCTION	109.54	114.00	0.00	
CB-20	JUNCTION	108.71	113.50	0.00	
CB-21	JUNCTION	109.85	114.00	0.00	
CB-22	JUNCTION	111.12	113.50	0.00	
CB-23E	JUNCTION	107.67	113.30	0.00	
CB-24	JUNCTION	106.51	113.53	0.00	
CB-F	JUNCTION	108.50	113.50	0.00	
EXCB-SE	JUNCTION	105.38	111.71	0.00	
EXCBW	JUNCTION	105.97	115.27	0.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-18	CB-16	CB-15	CONDUIT	71.0	1.8732	0.0120
P-01	CB-01	CB-01A	CONDUIT	95.2	1.1137	0.0120
P-01A	CB-01A	EXCBW	CONDUIT	29.0	7.0000	0.0120
P-02	CB-02	CB-01	CONDUIT	137.0	0.5036	0.0120
P-03	CB-03	CB-02	CONDUIT	122.0	0.5000	0.0120
P-04	CB-04	CB-01	CONDUIT	141.0	0.5035	0.0120
P-05	CB-05	CB-04	CONDUIT	123.0	0.5041	0.0120
P-06	CB-06	CB-05	CONDUIT	169.0	0.5030	0.0120
P-07	CB-07	CB-05	CONDUIT	134.0	0.5000	0.0120
P-08	CB-08	CB-07	CONDUIT	108.0	0.5000	0.0120
P-09	CB-09	CB-08	CONDUIT	44.0	0.5000	0.0120
P-10	CB-10	CB-07	CONDUIT	161.0	0.5031	0.0120
P-11	CB-11	CB-10	CONDUIT	185.0	0.5027	0.0120

P-12	CB-12	CB-13	CONDUIT	82.0	0.5122
0.0120					
P-13	CB-13	CB-15	CONDUIT	178.0	0.5112
0.0120					
P-14	CB-14	CB-13	CONDUIT	151.0	0.5099
0.0120					
P-15	CB-15	CB-17	CONDUIT	68.0	0.5147
0.0120					
P-17	CB-17	CB-19	CONDUIT	158.0	0.5127
0.0120					
P-18	CB-18	CB-17	CONDUIT	139.0	0.5036
0.0120					
P-19	CB-19	CB-20	CONDUIT	164.0	0.5061
0.0120					
P-20	CB-20	CB-23E	CONDUIT	204.0	0.5098
0.0120					
P-21	CB-21	CB-20	CONDUIT	126.0	0.5079
0.0120					
P-22	CB-22	CB-21	CONDUIT	249.0	0.5100
0.0120					
P-23	CB-23E	CB-24	CONDUIT	228.0	0.5088
0.0120					
P-24	CB-24	EXCB-SE	CONDUIT	203.0	0.5567
0.0120					
P-F	CB-F	CB-01A	CONDUIT	81.0	0.6173
0.0120					

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter	Width	No. of Barrels	Cross Sectional Area	Full Flow Hydraulic Radius	Design Flow Capacity
		ft	ft		ft²	ft	cfs
Link-18	CIRCULAR	1.00	1.00	1	0.79	0.25	5.28
P-01	CIRCULAR	1.00	1.00	1	0.79	0.25	4.07
P-01A	CIRCULAR	1.00	1.00	1	0.79	0.25	10.21
P-02	CIRCULAR	1.00	1.00	1	0.79	0.25	2.74

P-03	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-04	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-05	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-06	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-07	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-08	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-09	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-10	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-11	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-12	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-13	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-14	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-15	CIRCULAR	1.00	1.00	1	0.79
0.25	2.77				
P-17	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-18	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-19	CIRCULAR	1.50	1.50	1	1.77
0.38	8.10				
P-20	CIRCULAR	1.50	1.50	1	1.77
0.38	8.13				
P-21	CIRCULAR	1.00	1.00	1	0.79
0.25	2.75				
P-22	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-23	CIRCULAR	1.50	1.50	1	1.77
0.38	8.12				
P-24	CIRCULAR	1.50	1.50	1	1.77
0.38	8.49				
P-F	CIRCULAR	1.00	1.00	1	0.79
0.25	3.03				

**************************	Volume	Depth
Runoff Quantity Continuity	acre-ft	inches
**************************	---------	-------
Total Precipitation	2.389	2.592

```
  Surface Runoff ...........         2.090         2.268
  Continuity Error (%) .....         0.000


  **************************        Volume        Volume
  Flow Routing Continuity          acre-ft      Mgallons
  **************************     ---------     ---------
  External Inflow ..........         0.000         0.000
  External Outflow .........         2.082         0.679
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.005         0.002
  Continuity Error (%) .....         0.001


  ****************************************
  Composite Curve Number Computations Report
  ****************************************

  ------------------
  Subbasin Sub-01
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                          0.73
95.14

  ------------------
  Subbasin Sub-02
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                          0.56
92.94

  ------------------
  Subbasin Sub-03
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
```

```
----
  Composite Area & Weighted CN                              0.51
95.80

  ------------------
  Subbasin Sub-04
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.37
93.82

  ------------------
  Subbasin Sub-05
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.23
95.14

  ------------------
  Subbasin Sub-06
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.58
94.48

  ------------------
  Subbasin Sub-07
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.67
```

96.02

Subbasin Sub-08

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.03		98.00

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.04		87.00

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.13		98.00

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.25		93.60

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.89		98.00

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.40		98.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.43		98.00

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.19		98.00

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.46		98.00

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.46		98.00

Subbasin Sub-18

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.62		98.00

Subbasin Sub-19

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.71		98.00

Subbasin Sub-20

Soil/Surface Description	Area	Soil

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.55		98.00

Subbasin Sub-21

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.54		98.00

Subbasin Sub-22

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	1.10		97.78

Subbasin Sub-23

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.61		96.24

****
Runoff Coefficient Computations Report
****

Subbasin Sub-01

```
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.73           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.73
  0.72

  ------------------
  Subbasin Sub-02
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.56           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.56
  0.72

  ------------------
  Subbasin Sub-03
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.51           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.51
  0.72

  ------------------
  Subbasin Sub-04
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.
```

```
-------------------------------------------------------------------------------
-----
  -                                                    0.37            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.37
  0.72

  ------------------
  Subbasin Sub-05
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.23            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.23
  0.72

  ------------------
  Subbasin Sub-06
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.58            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.58
  0.72

  ------------------
  Subbasin Sub-07
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.67            -
  0.72
```

Composite Area & Weighted Runoff Coeff. 0.67
0.72

Subbasin Sub-08

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.03	-	0.72
Composite Area & Weighted Runoff Coeff.	0.03		0.72

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.04	-	0.72
Composite Area & Weighted Runoff Coeff.	0.04		0.72

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.13	-	0.72
Composite Area & Weighted Runoff Coeff.	0.13		0.72

Subbasin Sub-11

```
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.25           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.25
  0.72

  ------------------
  Subbasin Sub-12
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.89           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.89
  0.72

  ------------------
  Subbasin Sub-13
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.40           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.40
  0.72

  ------------------
  Subbasin Sub-14
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.
```

```
-------------------------------------------------------------------------------
-----
  -                                                    0.43            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.43
  0.72

  ------------------
  Subbasin Sub-15
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.19            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.19
  0.72

  ------------------
  Subbasin Sub-16
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.46            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.46
  0.72

  ------------------
  Subbasin Sub-17
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.46            -
  0.72
```

Composite Area & Weighted Runoff Coeff. 0.46
0.72

Subbasin Sub-18

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.72
Composite Area & Weighted Runoff Coeff.	0.62		0.72

Subbasin Sub-19

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.71	-	0.72
Composite Area & Weighted Runoff Coeff.	0.71		0.72

Subbasin Sub-20

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.55	-	0.72
Composite Area & Weighted Runoff Coeff.	0.55		0.72

Subbasin Sub-21

```
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               0.54           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         0.54
  0.72

  ------------------
  Subbasin Sub-22
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               1.10           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         1.10
  0.72

  ------------------
  Subbasin Sub-23
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               0.61           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         0.61
  0.72

  **********************
  Subbasin Runoff Summary
  **********************

  ------------------------------------------------------------------------
  Subbasin             Total     Total      Peak  Weighted           Time of
  ID                  Precip    Runoff    Runoff     Curve     Concentration
```

	in	in	cfs	Number	days	hh:mm:ss
Sub-01	2.59	2.15	0.39	95.140	0	00:06:00
Sub-02	2.59	1.99	0.27	92.940	0	00:06:00
Sub-03	2.59	2.20	0.28	95.800	0	00:06:00
Sub-04	2.59	2.06	0.19	93.820	0	00:06:00
Sub-05	2.59	2.15	0.12	95.140	0	00:06:00
Sub-06	2.59	2.11	0.30	94.480	0	00:06:00
Sub-07	2.59	2.22	0.37	96.020	0	00:06:00
Sub-08	2.59	2.36	0.02	98.000	0	00:06:00
Sub-09	2.59	1.56	0.01	87.000	0	00:06:00
Sub-10	2.59	2.36	0.08	98.000	0	00:06:00
Sub-11	2.59	2.04	0.12	93.600	0	00:06:00
Sub-12	2.59	2.36	0.53	98.000	0	00:06:00
Sub-13	2.59	2.36	0.24	98.000	0	00:06:00
Sub-14	2.59	2.36	0.26	98.000	0	00:06:00
Sub-15	2.59	2.36	0.11	98.000	0	00:06:00
Sub-16	2.59	2.36	0.27	98.000	0	00:06:00
Sub-17	2.59	2.36	0.27	98.000	0	00:06:00
Sub-18	2.59	2.36	0.37	98.000	0	00:06:00
Sub-19	2.59	2.36	0.42	98.000	0	00:06:00
Sub-20	2.59	2.36	0.33	98.000	0	00:06:00
Sub-21	2.59	2.36	0.32	98.000	0	00:06:00
Sub-22	2.59	2.35	0.65	97.780	0	00:06:00
Sub-23	2.59	2.23	0.34	96.240	0	00:06:00

****
Node Depth Summary
****

Node ID	Average Depth Attained	Maximum Depth Attained	Maximum HGL Attained	Time of Max Occurrence		Total Flooded Volume	Total Flooded Time	Retention Time
	ft	ft	ft	days	hh:mm	acre-in	minutes	hh:mm:ss
CB-01	0.76	0.94	110.00	0	07:55	0	0	0:00:00
CB-01A	0.19	0.52	108.52	0	07:56	0	0	0:00:00

CB-02	0.12	0.30	110.69	0	07:54	0	0
0:00:00							
CB-03	0.09	0.22	111.22	0	07:54	0	0
0:00:00							
CB-04	0.17	0.47	110.24	0	07:56	0	0
0:00:00							
CB-05	1.60	1.73	112.12	0	07:55	0	0
0:00:00							
CB-06	0.09	0.22	112.97	0	07:54	0	0
0:00:00							
CB-07	1.21	1.26	112.32	0	07:56	0	0
0:00:00							
CB-08	0.03	0.08	112.86	0	07:54	0	0
0:00:00							
CB-09	0.02	0.05	113.05	0	08:00	0	0
0:00:00							
CB-10	0.07	0.18	112.05	0	07:55	0	0
0:00:00							
CB-11	0.06	0.14	112.94	0	07:54	0	0
0:00:00							
CB-12	0.12	0.30	112.83	0	07:54	0	0
0:00:00							
CB-13	0.16	0.42	112.53	0	07:54	0	0
0:00:00							
CB-14	0.08	0.21	113.09	0	07:54	0	0
0:00:00							
CB-15	0.18	0.50	111.70	0	07:55	0	0
0:00:00							
CB-16	0.09	0.18	112.68	0	07:54	0	0
0:00:00							
CB-17	0.75	0.90	111.75	0	07:55	0	0
0:00:00							
CB-18	0.10	0.25	112.45	0	07:54	0	0
0:00:00							
CB-19	0.72	1.14	110.68	0	07:55	0	0
0:00:00							
CB-20	0.65	0.91	109.62	0	07:55	0	0
0:00:00							
CB-21	0.15	0.41	110.26	0	07:55	0	0
0:00:00							
CB-22	0.13	0.33	111.45	0	07:54	0	0
0:00:00							
CB-23E	0.26	0.72	108.39	0	07:56	0	0
0:00:00							
CB-24	0.26	0.72	107.23	0	07:57	0	0
0:00:00							
CB-F	0.09	0.23	108.73	0	07:54	0	0
0:00:00							
EXCB-SE	6.02	6.33	111.71	0	01:11	0	0
0:00:00							

```
  EXCBW              8.95      9.30    115.27      0  00:54         0         0
0:00:00


  *****************
  Node Flow Summary
  *****************


-------------------------------------------------------------------------------
  Node                 Element     Maximum     Peak      Time of   Maximum Time of
Peak
  ID                      Type     Lateral   Inflow  Peak Inflow  Flooding
Flooding
                                    Inflow            Occurrence  Overflow
Occurrence
                                       cfs      cfs  days  hh:mm       cfs  days
hh:mm

-------------------------------------------------------------------------------
  CB-01                JUNCTION      0.39     2.14     0  07:56      0.00
  CB-01A               JUNCTION      0.00     2.48     0  07:56      0.00
  CB-02                JUNCTION      0.27     0.55     0  07:54      0.00
  CB-03                JUNCTION      0.28     0.28     0  07:54      0.00
  CB-04                JUNCTION      0.19     1.21     0  07:56      0.00
  CB-05                JUNCTION      0.12     1.02     0  07:55      0.00
  CB-06                JUNCTION      0.30     0.30     0  07:54      0.00
  CB-07                JUNCTION      0.37     0.60     0  07:55      0.00
  CB-08                JUNCTION      0.02     0.03     0  07:54      0.00
  CB-09                JUNCTION      0.01     0.01     0  08:00      0.00
  CB-10                JUNCTION      0.08     0.20     0  07:55      0.00
  CB-11                JUNCTION      0.12     0.12     0  07:54      0.00
  CB-12                JUNCTION      0.53     0.53     0  07:54      0.00
  CB-13                JUNCTION      0.24     1.02     0  07:54      0.00
  CB-14                JUNCTION      0.26     0.26     0  07:54      0.00
  CB-15                JUNCTION      0.11     1.41     0  07:55      0.00
  CB-16                JUNCTION      0.27     0.27     0  07:54      0.00
  CB-17                JUNCTION      0.27     2.05     0  07:55      0.00
  CB-18                JUNCTION      0.37     0.37     0  07:54      0.00
  CB-19                JUNCTION      0.42     2.47     0  07:55      0.00
  CB-20                JUNCTION      0.33     3.76     0  07:56      0.00
  CB-21                JUNCTION      0.32     0.97     0  07:55      0.00
  CB-22                JUNCTION      0.65     0.65     0  07:54      0.00
  CB-23E               JUNCTION      0.00     3.76     0  07:56      0.00
  CB-24                JUNCTION      0.00     3.76     0  07:57      0.00
  CB-F                 JUNCTION      0.34     0.34     0  07:54      0.00
  EXCB-SE              JUNCTION      0.00     3.76     0  07:57      0.00
  EXCBW                JUNCTION      0.00     2.48     0  07:56      0.00
```

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow	Maximum Velocity	Length Factor	Peak Flow during Analysis	Design Flow	Ratio of Maximum Flow /Design Flow	Ratio of Maximum Capacity	Total Reported Time Surcharged	Condition
		days hh:mm	ft/sec		cfs	cfs			minutes	
Link-18	CONDUIT	0 07:54	3.54	1.00	0.27	5.28	0.05	0.15	0	Calculated
P-01	CONDUIT	0 07:56	5.25	1.00	2.14	4.07	0.53	0.52	0	Calculated
P-01A	CONDUIT	0 07:56	10.72	1.00	2.48	10.21	0.24	0.34	0	Calculated
P-02	CONDUIT	0 07:55	2.73	1.00	0.55	2.74	0.20	0.30	0	Calculated
P-03	CONDUIT	0 07:55	2.24	1.00	0.28	2.73	0.10	0.22	0	Calculated
P-04	CONDUIT	0 07:56	3.38	1.00	1.21	2.74	0.44	0.46	0	Calculated
P-05	CONDUIT	0 07:56	3.23	1.00	1.02	2.74	0.37	0.42	0	Calculated
P-06	CONDUIT	0 07:55	2.30	1.00	0.30	2.74	0.11	0.22	0	Calculated
P-07	CONDUIT	0 07:56	2.79	1.00	0.60	2.73	0.22	0.32	0	Calculated
P-08	CONDUIT	0 07:56	1.17	1.00	0.03	2.73	0.01	0.08	0	Calculated
P-09	CONDUIT	0 08:00	0.91	1.00	0.01	2.73	0.01	0.05	0	Calculated
P-10	CONDUIT	0 07:56	2.04	1.00	0.20	2.74	0.07	0.18	0	Calculated
P-11	CONDUIT	0 07:56	1.78	1.00	0.12	2.74	0.05	0.14	0	Calculated
P-12	CONDUIT	0 07:54	2.71	1.00	0.53	2.76	0.19	0.30	0	Calculated
P-13	CONDUIT	0 07:55	3.25	1.00	1.02	2.76	0.37	0.42	0	Calculated
P-14	CONDUIT	0 07:55	2.20	1.00	0.26	2.76	0.09	0.21	0	Calculated

```
  P-15                 CONDUIT      0  07:55      3.54    1.00        1.41
2.77      0.51      0.50           0  Calculated
  P-17                 CONDUIT      0  07:55      3.85    1.00        2.05
2.76      0.74      0.64           0  Calculated
  P-18                 CONDUIT      0  07:55      2.43    1.00        0.37
2.74      0.13      0.25           0  Calculated
  P-19                 CONDUIT      0  07:56      4.02    1.00        2.47
8.10      0.30      0.38           0  Calculated
  P-20                 CONDUIT      0  07:56      4.51    1.00        3.76
8.13      0.46      0.48           0  Calculated
  P-21                 CONDUIT      0  07:55      3.19    1.00        0.97
2.75      0.35      0.41           0  Calculated
  P-22                 CONDUIT      0  07:55      2.88    1.00        0.65
2.76      0.23      0.33           0  Calculated
  P-23                 CONDUIT      0  07:57      4.51    1.00        3.76
8.12      0.46      0.48           0  Calculated
  P-24                 CONDUIT      0  07:57      4.66    1.00        3.76
8.49      0.44      0.47           0  Calculated
  P-F                  CONDUIT      0  07:54      2.55    1.00        0.34
3.03      0.11      0.23           0  Calculated


  ********************************
  Highest Flow Instability Indexes
  ********************************
  All links are stable.

  WARNING 107 : Initial water surface elevation defined for Junction CB-01 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-01 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-01A is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-01A is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-02 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-02 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-03 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-03 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-04 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
```

WARNING 108 : Surcharge elevation defined for Junction CB-04 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-05 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-05 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-06 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-06 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-07 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-07 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-08 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-08 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-09 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-09 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-10 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-10 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-11 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-11 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-12 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-12 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-13 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-13 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-14 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.

WARNING 108 : Surcharge elevation defined for Junction CB-14 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-15 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-15 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-16 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-16 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-17 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-17 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-18 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-18 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-19 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-19 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-20 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-20 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-21 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-21 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-22 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-22 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-23E is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-23E is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-24 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.

WARNING 108 : Surcharge elevation defined for Junction CB-24 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-F is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-F is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction EXCB-SE is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction EXCB-SE is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction EXCBW is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction EXCBW is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.

Analysis began on: Tue Aug 2 14:42:30 2022
Analysis ended on: Tue Aug 2 14:42:32 2022
Total elapsed time: 00:00:02

100-Yr Conveyance Report

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.3.214 (Build 0)

****
Project Description
****
File Name ..... Kendall Auto.SPF

****
Analysis Options
****
Flow Units ..... cfs
Subbasin Hydrograph Method. Santa Barbara UH
Time of Concentration..... User-Defined
Link Routing Method ..... Kinematic Wave
Storage Node Exfiltration.. None
Starting Date JUL-27-2022 00:00:00
Ending Date JUL-28-2022 00:00:00
Report Time Step 00:00:10

****
Element Count
****
Number of rain gages 2
Number of subbasins 23
Number of nodes 28
Number of links 26

****
Raingage Summary
****

Gage ID	Data Source	Data Type	Recording Interval min
Rain Gage-01	TS-01	INTENSITY	6.00
Rain Gage-02	TS-02	INTENSITY	6.00

****
Subbasin Summary
****

Subbasin	Total Area	Imperv. Area	Raingage

ID	acres	%	
Sub-01	0.73	87.00	Rain Gage-02
Sub-02	0.56	77.00	Rain Gage-02
Sub-03	0.51	90.00	Rain Gage-02
Sub-04	0.37	81.00	Rain Gage-02
Sub-05	0.23	87.00	Rain Gage-02
Sub-06	0.58	84.00	Rain Gage-02
Sub-07	0.67	91.00	Rain Gage-02
Sub-08	0.03	100.00	Rain Gage-02
Sub-09	0.04	50.00	Rain Gage-02
Sub-10	0.13	100.00	Rain Gage-02
Sub-11	0.25	80.00	Rain Gage-02
Sub-12	0.89	100.00	Rain Gage-02
Sub-13	0.40	100.00	Rain Gage-02
Sub-14	0.43	100.00	Rain Gage-02
Sub-15	0.19	100.00	Rain Gage-02
Sub-16	0.46	100.00	Rain Gage-02
Sub-17	0.46	100.00	Rain Gage-02
Sub-18	0.62	100.00	Rain Gage-02
Sub-19	0.71	100.00	Rain Gage-02
Sub-20	0.55	100.00	Rain Gage-02
Sub-21	0.54	100.00	Rain Gage-02
Sub-22	1.10	99.00	Rain Gage-02
Sub-23	0.61	92.00	Rain Gage-02

****
Node Summary
****

Node ID	Element Type	Invert Elevation ft	Maximum Elev. ft	Ponded Area ft²	External Inflow
CB-01	JUNCTION	109.06	113.50	0.00	
CB-01A	JUNCTION	108.00	114.60	0.00	
CB-02	JUNCTION	110.39	113.50	0.00	
CB-03	JUNCTION	111.00	113.50	0.00	
CB-04	JUNCTION	109.77	115.00	0.00	
CB-05	JUNCTION	110.39	116.20	0.00	
CB-06	JUNCTION	112.75	115.25	0.00	
CB-07	JUNCTION	111.06	114.20	0.00	
CB-08	JUNCTION	112.78	115.50	0.00	
CB-09	JUNCTION	113.00	115.50	0.00	
CB-10	JUNCTION	111.87	115.80	0.00	
CB-11	JUNCTION	112.80	115.30	0.00	
CB-12	JUNCTION	112.53	115.00	0.00	
CB-13	JUNCTION	112.11	114.75	0.00	
CB-14	JUNCTION	112.88	115.40	0.00	
CB-15	JUNCTION	111.20	115.00	0.00	

CB-16	JUNCTION	112.50	115.00	0.00	
CB-17	JUNCTION	110.85	114.25	0.00	
CB-18	JUNCTION	112.20	114.70	0.00	
CB-19	JUNCTION	109.54	114.00	0.00	
CB-20	JUNCTION	108.71	113.50	0.00	
CB-21	JUNCTION	109.85	114.00	0.00	
CB-22	JUNCTION	111.12	113.50	0.00	
CB-23E	JUNCTION	107.67	113.30	0.00	
CB-24	JUNCTION	106.51	113.53	0.00	
CB-F	JUNCTION	108.50	113.50	0.00	
EXCB-SE	JUNCTION	105.38	111.71	0.00	
EXCBW	JUNCTION	105.97	115.27	0.00	

****
Link Summary
****

Link ID	From Node	To Node	Element Type	Length ft	Slope %	Manning's Roughness
Link-18	CB-16	CB-15	CONDUIT	71.0	1.8732	0.0120
P-01	CB-01	CB-01A	CONDUIT	95.2	1.1137	0.0120
P-01A	CB-01A	EXCBW	CONDUIT	29.0	7.0000	0.0120
P-02	CB-02	CB-01	CONDUIT	137.0	0.5036	0.0120
P-03	CB-03	CB-02	CONDUIT	122.0	0.5000	0.0120
P-04	CB-04	CB-01	CONDUIT	141.0	0.5035	0.0120
P-05	CB-05	CB-04	CONDUIT	123.0	0.5041	0.0120
P-06	CB-06	CB-05	CONDUIT	169.0	0.5030	0.0120
P-07	CB-07	CB-05	CONDUIT	134.0	0.5000	0.0120
P-08	CB-08	CB-07	CONDUIT	108.0	0.5000	0.0120
P-09	CB-09	CB-08	CONDUIT	44.0	0.5000	0.0120
P-10	CB-10	CB-07	CONDUIT	161.0	0.5031	0.0120
P-11	CB-11	CB-10	CONDUIT	185.0	0.5027	0.0120

P-12	CB-12	CB-13	CONDUIT	82.0	0.5122
0.0120					
P-13	CB-13	CB-15	CONDUIT	178.0	0.5112
0.0120					
P-14	CB-14	CB-13	CONDUIT	151.0	0.5099
0.0120					
P-15	CB-15	CB-17	CONDUIT	68.0	0.5147
0.0120					
P-17	CB-17	CB-19	CONDUIT	158.0	0.5127
0.0120					
P-18	CB-18	CB-17	CONDUIT	139.0	0.5036
0.0120					
P-19	CB-19	CB-20	CONDUIT	164.0	0.5061
0.0120					
P-20	CB-20	CB-23E	CONDUIT	204.0	0.5098
0.0120					
P-21	CB-21	CB-20	CONDUIT	126.0	0.5079
0.0120					
P-22	CB-22	CB-21	CONDUIT	249.0	0.5100
0.0120					
P-23	CB-23E	CB-24	CONDUIT	228.0	0.5088
0.0120					
P-24	CB-24	EXCB-SE	CONDUIT	203.0	0.5567
0.0120					
P-F	CB-F	CB-01A	CONDUIT	81.0	0.6173
0.0120					

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter	Width	No. of Barrels	Cross Sectional Area	Full Flow Hydraulic Radius	Design Flow Capacity
		ft	ft		ft²	ft	cfs
Link-18	CIRCULAR	1.00	1.00	1	0.79	0.25	5.28
P-01	CIRCULAR	1.00	1.00	1	0.79	0.25	4.07
P-01A	CIRCULAR	1.00	1.00	1	0.79	0.25	10.21
P-02	CIRCULAR	1.00	1.00	1	0.79	0.25	2.74

P-03	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-04	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-05	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-06	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-07	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-08	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-09	CIRCULAR	1.00	1.00	1	0.79
0.25	2.73				
P-10	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-11	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-12	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-13	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-14	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-15	CIRCULAR	1.00	1.00	1	0.79
0.25	2.77				
P-17	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-18	CIRCULAR	1.00	1.00	1	0.79
0.25	2.74				
P-19	CIRCULAR	1.50	1.50	1	1.77
0.38	8.10				
P-20	CIRCULAR	1.50	1.50	1	1.77
0.38	8.13				
P-21	CIRCULAR	1.00	1.00	1	0.79
0.25	2.75				
P-22	CIRCULAR	1.00	1.00	1	0.79
0.25	2.76				
P-23	CIRCULAR	1.50	1.50	1	1.77
0.38	8.12				
P-24	CIRCULAR	1.50	1.50	1	1.77
0.38	8.49				
P-F	CIRCULAR	1.00	1.00	1	0.79
0.25	3.03				

**************************	Volume	Depth
Runoff Quantity Continuity	acre-ft	inches
**************************	---------	-------
Total Precipitation	2.940	3.190

```
  Surface Runoff ...........         2.628         2.851
  Continuity Error (%) .....         0.000


  **************************        Volume        Volume
  Flow Routing Continuity          acre-ft      Mgallons
  **************************     ---------     ---------
  External Inflow ..........         0.000         0.000
  External Outflow .........         2.619         0.853
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.006         0.002
  Continuity Error (%) .....         0.001


  ****************************************
  Composite Curve Number Computations Report
  ****************************************

  ------------------
  Subbasin Sub-01
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                          0.73
95.14

  ------------------
  Subbasin Sub-02
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                          0.56
92.94

  ------------------
  Subbasin Sub-03
  ------------------
                                                      Area           Soil
  Soil/Surface Description                           (acres)         Group
   CN

-------------------------------------------------------------------------------
```

```
----
  Composite Area & Weighted CN                              0.51
95.80

  ------------------
  Subbasin Sub-04
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.37
93.82

  ------------------
  Subbasin Sub-05
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.23
95.14

  ------------------
  Subbasin Sub-06
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.58
94.48

  ------------------
  Subbasin Sub-07
  ------------------
                                                             Area           Soil
  Soil/Surface Description                                 (acres)         Group
   CN

-------------------------------------------------------------------------------
----
  Composite Area & Weighted CN                              0.67
```

96.02

Subbasin Sub-08

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.03		98.00

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.04		87.00

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.13		98.00

Subbasin Sub-11

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.25		93.60

Subbasin Sub-12

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.89		98.00

Subbasin Sub-13

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.40		98.00

Subbasin Sub-14

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.43		98.00

Subbasin Sub-15

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.19		98.00

Subbasin Sub-16

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.46		98.00

Subbasin Sub-17

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.46		98.00

Subbasin Sub-18

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.62		98.00

Subbasin Sub-19

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.71		98.00

Subbasin Sub-20

Soil/Surface Description	Area	Soil

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.55		98.00

Subbasin Sub-21

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.54		98.00

Subbasin Sub-22

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	1.10		97.78

Subbasin Sub-23

Soil/Surface Description	Area (acres)	Soil Group	CN
Composite Area & Weighted CN	0.61		96.24

****
Runoff Coefficient Computations Report
****

Subbasin Sub-01

```
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.73           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.73
  0.72

  ------------------
  Subbasin Sub-02
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.56           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.56
  0.72

  ------------------
  Subbasin Sub-03
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.51           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.51
  0.72

  ------------------
  Subbasin Sub-04
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.
```

```
-------------------------------------------------------------------------------
-----
  -                                                    0.37            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.37
  0.72

  ------------------
  Subbasin Sub-05
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.23            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.23
  0.72

  ------------------
  Subbasin Sub-06
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.58            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.58
  0.72

  ------------------
  Subbasin Sub-07
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.67            -
  0.72
```

Composite Area & Weighted Runoff Coeff. 0.67
0.72

Subbasin Sub-08

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.03	-	0.72
Composite Area & Weighted Runoff Coeff.	0.03		0.72

Subbasin Sub-09

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.04	-	0.72
Composite Area & Weighted Runoff Coeff.	0.04		0.72

Subbasin Sub-10

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.13	-	0.72
Composite Area & Weighted Runoff Coeff.	0.13		0.72

Subbasin Sub-11

```
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.25           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.25
  0.72

  ------------------
  Subbasin Sub-12
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.89           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.89
  0.72

  ------------------
  Subbasin Sub-13
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                      0.40           -
  0.72
  Composite Area & Weighted Runoff Coeff.                0.40
  0.72

  ------------------
  Subbasin Sub-14
  ------------------
                                                        Area          Soil
Runoff
  Soil/Surface Description                            (acres)       Group
Coeff.
```

```
-------------------------------------------------------------------------------
-----
  -                                                    0.43            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.43
  0.72

  ------------------
  Subbasin Sub-15
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.19            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.19
  0.72

  ------------------
  Subbasin Sub-16
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.46            -
  0.72
  Composite Area & Weighted Runoff Coeff.              0.46
  0.72

  ------------------
  Subbasin Sub-17
  ------------------
                                                      Area          Soil
Runoff
  Soil/Surface Description                           (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                    0.46            -
  0.72
```

Composite Area & Weighted Runoff Coeff. 0.46
0.72

Subbasin Sub-18

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.62	-	0.72
Composite Area & Weighted Runoff Coeff.	0.62		0.72

Subbasin Sub-19

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.71	-	0.72
Composite Area & Weighted Runoff Coeff.	0.71		0.72

Subbasin Sub-20

Soil/Surface Description	Area (acres)	Soil Group	Runoff Coeff.
-	0.55	-	0.72
Composite Area & Weighted Runoff Coeff.	0.55		0.72

Subbasin Sub-21

```
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               0.54           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         0.54
  0.72

  ------------------
  Subbasin Sub-22
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               1.10           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         1.10
  0.72

  ------------------
  Subbasin Sub-23
  ------------------
                                                                  Area          Soil
Runoff
  Soil/Surface Description                                      (acres)        Group
Coeff.

-------------------------------------------------------------------------------
-----
  -                                                               0.61           -
  0.72
  Composite Area & Weighted Runoff Coeff.                         0.61
  0.72

  **********************
  Subbasin Runoff Summary
  **********************

  ------------------------------------------------------------------------
  Subbasin             Total     Total      Peak  Weighted           Time of
  ID                  Precip    Runoff    Runoff     Curve     Concentration
```

	in	in	cfs	Number	days	hh:mm:ss
Sub-01	3.19	2.72	0.49	95.140	0	00:06:00
Sub-02	3.19	2.54	0.35	92.940	0	00:06:00
Sub-03	3.19	2.78	0.35	95.800	0	00:06:00
Sub-04	3.19	2.61	0.24	93.820	0	00:06:00
Sub-05	3.19	2.72	0.15	95.140	0	00:06:00
Sub-06	3.19	2.67	0.38	94.480	0	00:06:00
Sub-07	3.19	2.80	0.46	96.020	0	00:06:00
Sub-08	3.19	2.96	0.02	98.000	0	00:06:00
Sub-09	3.19	2.05	0.02	87.000	0	00:06:00
Sub-10	3.19	2.96	0.10	98.000	0	00:06:00
Sub-11	3.19	2.60	0.16	93.600	0	00:06:00
Sub-12	3.19	2.96	0.66	98.000	0	00:06:00
Sub-13	3.19	2.96	0.30	98.000	0	00:06:00
Sub-14	3.19	2.96	0.32	98.000	0	00:06:00
Sub-15	3.19	2.96	0.14	98.000	0	00:06:00
Sub-16	3.19	2.96	0.34	98.000	0	00:06:00
Sub-17	3.19	2.96	0.34	98.000	0	00:06:00
Sub-18	3.19	2.96	0.46	98.000	0	00:06:00
Sub-19	3.19	2.96	0.52	98.000	0	00:06:00
Sub-20	3.19	2.96	0.41	98.000	0	00:06:00
Sub-21	3.19	2.96	0.40	98.000	0	00:06:00
Sub-22	3.19	2.94	0.81	97.780	0	00:06:00
Sub-23	3.19	2.81	0.43	96.240	0	00:06:00

****
Node Depth Summary
****

Node ID	Average Depth Attained	Maximum Depth Attained	Maximum HGL Attained	Time of Max Occurrence		Total Flooded Volume	Total Flooded Time	Retention Time
	ft	ft	ft	days	hh:mm	acre-in	minutes	hh:mm:ss
CB-01	0.77	0.98	110.04	0	07:55	0	0	0:00:00
CB-01A	0.21	0.60	108.60	0	07:56	0	0	0:00:00

CB-02	0.13	0.34	110.73	0	07:54	0	0	0:00:00
CB-03	0.10	0.24	111.24	0	07:54	0	0	0:00:00
CB-04	0.20	0.53	110.30	0	07:56	0	0	0:00:00
CB-05	1.61	1.76	112.15	0	07:55	0	0	0:00:00
CB-06	0.10	0.25	113.00	0	07:54	0	0	0:00:00
CB-07	1.22	1.27	112.33	0	07:59	0	0	0:00:00
CB-08	0.04	0.09	112.87	0	07:54	0	0	0:00:00
CB-09	0.03	0.06	113.06	0	08:00	0	0	0:00:00
CB-10	0.08	0.21	112.08	0	07:55	0	0	0:00:00
CB-11	0.07	0.16	112.96	0	07:54	0	0	0:00:00
CB-12	0.13	0.33	112.86	0	07:54	0	0	0:00:00
CB-13	0.18	0.48	112.59	0	07:54	0	0	0:00:00
CB-14	0.09	0.23	113.11	0	07:54	0	0	0:00:00
CB-15	0.21	0.58	111.78	0	07:55	0	0	0:00:00
CB-16	0.10	0.20	112.70	0	07:54	0	0	0:00:00
CB-17	0.76	0.93	111.78	0	07:54	0	0	0:00:00
CB-18	0.11	0.28	112.48	0	07:54	0	0	0:00:00
CB-19	0.75	1.26	110.80	0	07:55	0	0	0:00:00
CB-20	0.67	0.96	109.67	0	07:55	0	0	0:00:00
CB-21	0.17	0.46	110.31	0	07:55	0	0	0:00:00
CB-22	0.14	0.37	111.49	0	07:54	0	0	0:00:00
CB-23E	0.30	0.82	108.49	0	07:56	0	0	0:00:00
CB-24	0.30	0.82	107.33	0	07:57	0	0	0:00:00
CB-F	0.10	0.25	108.75	0	07:54	0	0	0:00:00
EXCB-SE	6.06	6.33	111.71	0	01:01	0	0	0:00:00

```
  EXCBW              9.01      9.30    115.27      0  00:45         0         0
0:00:00


  *****************
  Node Flow Summary
  *****************


-------------------------------------------------------------------------------
  Node                 Element     Maximum     Peak      Time of   Maximum Time of
Peak
  ID                      Type     Lateral   Inflow  Peak Inflow  Flooding
Flooding
                                    Inflow            Occurrence  Overflow
Occurrence
                                       cfs      cfs  days  hh:mm       cfs  days
hh:mm

-------------------------------------------------------------------------------
  CB-01                JUNCTION      0.49     2.71     0  07:56      0.00
  CB-01A               JUNCTION      0.00     3.13     0  07:56      0.00
  CB-02                JUNCTION      0.35     0.70     0  07:54      0.00
  CB-03                JUNCTION      0.35     0.35     0  07:54      0.00
  CB-04                JUNCTION      0.24     1.52     0  07:56      0.00
  CB-05                JUNCTION      0.15     1.29     0  07:55      0.00
  CB-06                JUNCTION      0.38     0.38     0  07:54      0.00
  CB-07                JUNCTION      0.46     0.76     0  07:55      0.00
  CB-08                JUNCTION      0.02     0.04     0  07:54      0.00
  CB-09                JUNCTION      0.02     0.02     0  08:00      0.00
  CB-10                JUNCTION      0.10     0.25     0  07:55      0.00
  CB-11                JUNCTION      0.16     0.16     0  07:54      0.00
  CB-12                JUNCTION      0.66     0.66     0  07:54      0.00
  CB-13                JUNCTION      0.30     1.27     0  07:54      0.00
  CB-14                JUNCTION      0.32     0.32     0  07:54      0.00
  CB-15                JUNCTION      0.14     1.75     0  07:55      0.00
  CB-16                JUNCTION      0.34     0.34     0  07:54      0.00
  CB-17                JUNCTION      0.34     2.55     0  07:55      0.00
  CB-18                JUNCTION      0.46     0.46     0  07:54      0.00
  CB-19                JUNCTION      0.52     3.07     0  07:55      0.00
  CB-20                JUNCTION      0.41     4.67     0  07:56      0.00
  CB-21                JUNCTION      0.40     1.20     0  07:55      0.00
  CB-22                JUNCTION      0.81     0.81     0  07:54      0.00
  CB-23E               JUNCTION      0.00     4.67     0  07:56      0.00
  CB-24                JUNCTION      0.00     4.67     0  07:57      0.00
  CB-F                 JUNCTION      0.43     0.43     0  07:54      0.00
  EXCB-SE              JUNCTION      0.00     4.67     0  07:57      0.00
  EXCBW                JUNCTION      0.00     3.13     0  07:56      0.00
```

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow	Maximum Velocity	Length Factor	Peak Flow during Analysis	Design Flow Capacity	Ratio of Maximum /Design Flow	Ratio of Total Reported Maximum Flow	Time Surcharged	Condition
		days hh:mm	ft/sec		cfs	cfs			minutes	
Link-18	CONDUIT	0 07:54	3.76	1.00	0.34	5.28	0.06	0.17	0	Calculated
P-01	CONDUIT	0 07:56	5.54	1.00	2.71	4.07	0.66	0.60	0	Calculated
P-01A	CONDUIT	0 07:56	11.43	1.00	3.13	10.21	0.31	0.38	0	Calculated
P-02	CONDUIT	0 07:55	2.91	1.00	0.69	2.74	0.25	0.34	0	Calculated
P-03	CONDUIT	0 07:54	2.39	1.00	0.35	2.73	0.13	0.24	0	Calculated
P-04	CONDUIT	0 07:56	3.58	1.00	1.52	2.74	0.56	0.53	0	Calculated
P-05	CONDUIT	0 07:56	3.44	1.00	1.29	2.74	0.47	0.48	0	Calculated
P-06	CONDUIT	0 07:55	2.46	1.00	0.38	2.74	0.14	0.25	0	Calculated
P-07	CONDUIT	0 07:56	2.97	1.00	0.76	2.73	0.28	0.36	0	Calculated
P-08	CONDUIT	0 07:59	1.27	1.00	0.04	2.73	0.02	0.09	0	Calculated
P-09	CONDUIT	0 08:00	1.00	1.00	0.02	2.73	0.01	0.06	0	Calculated
P-10	CONDUIT	0 07:56	2.18	1.00	0.25	2.74	0.09	0.21	0	Calculated
P-11	CONDUIT	0 07:55	1.91	1.00	0.16	2.74	0.06	0.16	0	Calculated
P-12	CONDUIT	0 07:54	2.88	1.00	0.66	2.76	0.24	0.33	0	Calculated
P-13	CONDUIT	0 07:55	3.44	1.00	1.27	2.76	0.46	0.48	0	Calculated
P-14	CONDUIT	0 07:55	2.34	1.00	0.32	2.76	0.12	0.23	0	Calculated

```
  P-15                 CONDUIT      0  07:55      3.73    1.00        1.75
2.77      0.63      0.58           0  Calculated
  P-17                 CONDUIT      0  07:55      4.00    1.00        2.54
2.76      0.92      0.76           0  Calculated
  P-18                 CONDUIT      0  07:54      2.59    1.00        0.46
2.74      0.17      0.28           0  Calculated
  P-19                 CONDUIT      0  07:56      4.26    1.00        3.07
8.10      0.38      0.43           0  Calculated
  P-20                 CONDUIT      0  07:56      4.76    1.00        4.67
8.13      0.58      0.54           0  Calculated
  P-21                 CONDUIT      0  07:55      3.39    1.00        1.20
2.75      0.44      0.46           0  Calculated
  P-22                 CONDUIT      0  07:55      3.05    1.00        0.81
2.76      0.29      0.37           0  Calculated
  P-23                 CONDUIT      0  07:57      4.75    1.00        4.67
8.12      0.58      0.54           0  Calculated
  P-24                 CONDUIT      0  07:57      4.92    1.00        4.67
8.49      0.55      0.53           0  Calculated
  P-F                  CONDUIT      0  07:54      2.72    1.00        0.42
3.03      0.14      0.25           0  Calculated


  ********************************
  Highest Flow Instability Indexes
  ********************************
  All links are stable.

  WARNING 107 : Initial water surface elevation defined for Junction CB-01 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-01 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-01A is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-01A is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-02 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-02 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-03 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
  WARNING 108 : Surcharge elevation defined for Junction CB-03 is below junction
maximum elevation. Assumed surcharge elevation equal to maximum elevation.
  WARNING 107 : Initial water surface elevation defined for Junction CB-04 is below
junction invert elevation.
                Assumed initial water surface elevation equal to invert elevation.
```

WARNING 108 : Surcharge elevation defined for Junction CB-04 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-05 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-05 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-06 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-06 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-07 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-07 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-08 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-08 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-09 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-09 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-10 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-10 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-11 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-11 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-12 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-12 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-13 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-13 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-14 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.

WARNING 108 : Surcharge elevation defined for Junction CB-14 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-15 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-15 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-16 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-16 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-17 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-17 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-18 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-18 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-19 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-19 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-20 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-20 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-21 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-21 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-22 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-22 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-23E is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-23E is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-24 is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.

WARNING 108 : Surcharge elevation defined for Junction CB-24 is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction CB-F is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction CB-F is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction EXCB-SE is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction EXCB-SE is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.
WARNING 107 : Initial water surface elevation defined for Junction EXCBW is below junction invert elevation.
Assumed initial water surface elevation equal to invert elevation.
WARNING 108 : Surcharge elevation defined for Junction EXCBW is below junction maximum elevation. Assumed surcharge elevation equal to maximum elevation.

Analysis began on: Tue Aug 2 14:38:47 2022
Analysis ended on: Tue Aug 2 14:38:50 2022
Total elapsed time: 00:00:03

5.0 Special Reports and Studies

A. SWPPP
B. Geotechnical Report

A. SWPPP

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Kendall Auto Group

Prepared for:

The Washington State Department of Ecology
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Permittee / Owner	Developer	Operator / Contractor
Kendall Development Group, LLC	Kendall Development Group, LLC	To be determined
3449 E Copper Point Drive	3449 E Copper Point Drive	
Meridian, ID 83642	Meridian, ID 83642	

Project Site Location

Marysville, WA 98271
Parcel# 31052800301200, 31052800300300, 31052800300600

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
Brian R. Kalab, P. E.	Insight Engineering	425-303-9363

SWPPP Prepared By

Name	Organization	Contact Phone Number
Shilpa Xavier	Insight Engineering	425-303-9363

SWPPP Preparation Date

June 24, 2022

Project Construction Dates

Activity / Phase	Start Date	End Date
Construction Duration	May 1, 2023	March 1, 2024

Table of Contents

List of Tables

List of Appendices

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Kendall Auto Group
Street/Location: XXXX
City: Marysville State: WA Zip code: 98271
Subdivision:
Receiving waterbody:
Hayho Creek

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage:	11.62 acres
Disturbed acreage:	11.62 acres
Existing structures:	0 acres
Landscape topography:	11.62 acres
Drainage patterns:	Sheet Flow
Existing Vegetation:	Typical scrub forest with undergrowth with a mixed stand of trees.
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):	Buffer area provided from wetland N/A

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody:

N/A

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
The project proposal is to develop the site by constructing a car dealership building and parking with associated utilities.

Description of construction activities (example: site preparation, demolition, excavation):
Prepare the site for construction by the installation of the indicated BMP's. Excavate the site for the new car dealership

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Per conversation with the City minimum requirements #1-5 shall apply for this project. Minimum Requirements #6-9 are taken care of through the existing storm system on site that flows to a regional detention pond that will provide the site flow control and water quality.

Description of final stabilization (example: extent of revegetation, paving, landscaping):

The access to the site will be from Smokey Point Blvd and Future 160th St Extension. Typical commercial landscaping will be around the building and the parking to provide final stabilization.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
Minimum Requirements #6-9 are taken care of through the existing storm system on site that flows to a regional detention pond that will provide the site flow control and water quality.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL or local agency has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible.

List and describe BMPs: • High Visibility Plastic or Metal Fence (BMP C103)
Install orange barrier fencing along the clearing limits, according to the approved construction plans, prior to any construction activities. Maintain until all construction activities are completed.

Installation Schedules: The limits of construction will be clearly marked before land-disturbing activities begin.
Inspection and Maintenance plan: Site inspections will be conducted at least once a week and within 24 hours following any rainfall event which causes a discharge of stormwater from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

Responsible Staff: Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

2.1.2 Element 2: Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters.

List and describe BMPs: Stabilized Construction Entrance (BMP C105)

Installation Schedules: Install the temporary construction entrance, according to the approved construction plans, prior to any clearing or grading activities

Inspection and Maintenance plan: Maintain until the access road is paved.

Responsible Staff: Contractor.

2.1.3 Element 3: Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

Will you construct stormwater retention and/or detention facilities?

☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

☐ Yes ☒ No

List and describe BMPs: Temporary Sediment Pond (BMP C241),

Installation Schedules: Install temporary sediment pond, according to the approved construction plans, prior to any construction activities.

Inspection and Maintenance plan: Maintain until all construction activities are completed.

Responsible Staff: Contractor

2.1.4 Element 4: Install Sediment Controls

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas .

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or bio-filtration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be re-stabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

The following BMP will be implemented as end-of-pipe sediment controls as required to meet permitted turbidity limits in the site discharge(s). Prior to the implementation of these technologies, sediment sources and erosion control and soil stabilization BMP efforts will be maximized to reduce the need for end-of-pipe sedimentation controls. In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash-off of sediments from adjacent streets in runoff.

List and describe BMPs:

- Silt Fence (BMP C233)

Installation Schedules: Install silt fencing, according to the approved plans, prior to any clearing or grading activities.

Inspection and Maintenance plan: Maintain Silt Fence until all construction activities are completed.

Responsible Staff: Contractor.

2.1.5 Element 5: Stabilize Soils

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: May 1, 2022 End date: March 1, 2024

Will you construct during the wet season?
☐ Yes ☒ No

List and describe BMPs:
Exposed and un-worked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Temporary and Permanent Seeding (BMP C120)

Installation Schedules:
Apply temporary hydro-seed to exposed and un-worked soils, according to the approved construction plans, as needed to prevent erosion during site grading.
Inspection and Maintenance plan:
Apply permanent hydro-seed to areas at final grade as site grading is completed.

- Mulching (BMP C121)

Installation Schedules:
Apply mulching to exposed and un-worked soils, according to the approved construction plans, as needed to prevent erosion during site grading.
Inspection and Maintenance plan:
Maintain until site grading is completed and permanent hydro-seed is applied.

- Plastic Covering (BMP C123)

Installation Schedules:
Cover stockpiles with plastic sheeting, according to the approved construction plans, as needed to prevent erosion during site grading.

Inspection and Maintenance plan:
Maintain until stockpiles are removed from site.

- Dust Control (BMP C140)

Installation Schedules and Inspection and Maintenance plan:

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Entrance (BMP C105).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126) added to water at a rate of 0.5 lbs. per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may actually reduce the quantity of water needed for dust control. Use of PAM could be a cost-effective dust control method.

Techniques that can be used for unpaved roads and lots include:

- Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
- Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
- Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
- Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- Encourage the use of alternate, paved routes, if available.
- Restrict use of paved roadways by tracked vehicles and heavy trucks to prevent damage to road surface and base.
- Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.

- Pave unpaved permanent roads and other trafficked areas.
- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Limit dust-causing work on windy days.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

• Early application of gravel base on areas to be paved

Place gravel base on roadways, according to the approved construction plans, after roadways are graded to sub-grade. Maintain until roads are paved.

Responsible Staff: Contractor.

2.1.6 Element 6: Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

Will steep slopes be present at the site during construction?
☐ Yes ☒ No

List and describe BMPs: Temporary and Permanent Seeding (BMP C120)

Installation Schedules: Apply temporary hydro-seed to cut and fill slopes, according to the approved construction plans, as needed to minimize erosion during site grading.
Inspection and Maintenance plan: Apply permanent hydro-seed to cut and fill slopes at final grade as site grading is completed.
Responsible Staff: Contractor

2.1.7 Element 7: Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site.

List and describe BMPs: Storm Drian Inlet Protection

Installation Schedules: Install storm drain inlet protection according to the approved construction plans

Inspection and Maintenance plan: Maintain until all construction activities are completed.

Responsible Staff: Contractor

2.1.8 Element 8: Stabilize Channels and Outlets

No site runoff is to be conveyed into channels, or discharged to a stream or some other natural drainage point.— The onsite flowrates will be minimal therefore no BMP's are proposed Stabilize Channels and Outlets.

If any BMP's are provideded, the project site is located west of the Cascade Mountain Crest. As such, all temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
Petroleum products
Solid waste

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

☒ All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.

☐ On-site permanent fueling tanks and petroleum product storage containers shall include secondary containment.

☐ Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.

☐ In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

☐ Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

☐ Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2005

Excavation and tunneling spoils dewatering waste:

☐ Dewatering BMPs and BMPs specific to the excavation and tunneling (including handling of contaminated soils) are discussed under Element 10.

Demolition:

☐ Dust released from demolished sidewalks, buildings, or structures will be controlled using Dust Control measures (BMP C140).

☐ Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using Storm Drain Inlet Protection (BMP C220 as described above for Element 7).

 Process water and slurry resulting from saw-cutting and surfacing operations will be prevented from entering the waters of the State by implementing Saw-cutting and Surfacing Pollution Prevention measures (BMP C152).

Sanitary wastewater:

 Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.

Solid Waste:

 Solid waste will be stored in secure, clearly marked containers.

Other:

 Other BMPs will be administered as necessary to address any additional pollutant sources on site.

A SPCC plan is required for this site.

As per the Federal regulations of the Clean Water Act (CWA) and according to Final Rule 40 CFR Part 112, as stated in the National Register, a Spill Prevention, Control, and Countermeasure (SPCC) Plan is required for construction activities. A SPCC Plan has been prepared to address an approach to prevent, respond to, and report spills or releases to the environment that could result from construction activities. This Plan must:

 Be well thought out in accordance with good engineering;

List and describe BMPs: BMP C151, BMP C152, BMP C153, BMP C140 and BMP C220.

Installation Schedules:

Inspection and Maintenance plan: All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris.

Achieve three objectives - prevent spills, contain a spill that occurs, and clean up the spill;

 Identify the name, location, owner, and type of facility;
 Include the date of initial operation and oil spill history;
 Name the designated person responsible;
 Show evidence of approval and certification by the person in authority; and
 Contain a facility analysis.

Responsible Staff: Contractor.

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

☐ Yes☒ No

Will wheel wash or tire bath system BMPs be used during construction?

☐ Yes☒ No

Will pH-modifying sources be present on-site?

☐ Yes☒ No

Table 3 – pH-Modifying Sources

☒	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

Stormwater runoff will be monitored for pH starting on the first day of any activity that includes more than 40 yards of poured or recycled concrete, or after the application of "Engineered Soils" such as, Portland cement treated base, cement kiln dust, or fly ash. This does not include fertilizers. For concrete work, pH monitoring will start the first day concrete is poured and continue until 3 weeks after the last pour. For engineered soils, the pH monitoring period begins when engineered soils are first exposed to precipitation and continue until the area is fully stabilized.

Stormwater samples will be collected daily from all points of discharge from the site and measured for pH using a calibrated pH meter, pH test kit, or wide range pH indicator paper. If the measured pH is 8.5 or greater, the following steps will be conducted:

1. Prevent the high pH water from entering storm drains or surface water.

2. Adjust or neutralize the high pH water if necessary using appropriate technology such as CO_2 sparging (liquid or dry ice).

3. Contact Ecology if chemical treatment other than CO_2 sparging is planned.

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed. Excess concrete must be returned to the plant for recycling if there are no concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?

☐ Yes ☒ No

2.1.10 Element 10: Control Dewatering

No dewatering is proposed for the development. If dewatering is needed, Transport. off-site in a vehicle (vacuum truck for legal disposal).

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☒	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☒	Schedule major earthwork during the dry season
☐	Other (please describe)

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
Mark Clearing Limits	High Visibility Plastic or Metal Fence (BMP C103)	05/01/2023	Dry
Mobilize equipment on site	Construction Road/Parking area stabilization (BMP C107)	05/01/2023	Dry
Mobilize and store all ESC and soil stabilization products	Silt Fence (BMP C233) Storm Drain Inlet Protection (BMP C220) Plastic Covering (BMP C123) Surface roughening (BMP C130)	05/01/2023	Dry
Install ESC measures	Silt Fence (BMP C233) Storm Drain Inlet Protection (BMP C220)	05/01/2023	Dry
Install stabilized construction entrance	Stabilized Construction Entrance (BMP C105)	05/01/2023	Dry
Begin clearing and grubbing	Dust Control (BMP C140)	05/15/2023	Dry
Site grading begins	Dust Control (BMP C140)	05/27/2023	Dry
Grade road and stabilize with gravel base	Dust Control (BMP C140)	05/27/2023	Dry
Begin excavation for new utilities and services		07/01/2023	Dry
Soil stabilization on excavated side slopes (in idle, no work areas)	Mulching (BMP C121) Dust Control (BMP C140) Plastic Covering (BMP C123) Nets and Blankets (BMP C122)	08/05/2023	Dry
Temporary erosion control measures (hydro-seeding)	Temporary Seeding (BMP C120)	09/01/2023	Dry
Site grading ends		09/15/2023	Dry
Begin pouring concrete curbs & sidewalks and implement	BMP C151 Concrete Handling (BMP C151) Sawcutting and Surfacing Pollution Prevention (BMP C152)	10/01/2023	Wet

Pave asphalt roads		11/05/2023	Wet
Implement Element #12 BMPs and manage site to minimize soil disturbance during the wet season	Scheduling (BMP C162) CESC Lead (BMP C160)	12/01/2023	Wet
Final landscaping and planting begins		02/1/2024	Wet
Permanent erosion control measures (hydro-seeding)	Permanent Seeding (BMP C120)	03/01/2024	Wet

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

On-site stormwater management BMPs used for runoff from roofs and other hard surfaces include: full dispersion, roof downspout full infiltration or dispersion systems, perforated stubout connections, rain gardens, bioretention systems, permeable pavement, sheetflow dispersion, and concentrated flow dispersion. The areas on the site to be used for these BMPs shall be protected from siltation and compaction during construction by sequencing the construction in a fashion to install these BMPs at the latter part of the construction grading operations, by excluding equipment from the BMPS and the associated areas, and by using the erosion and sedimentation control BMPs listed below. Additional requirements for protecting these BMPs during the construction process, testing functionality, and restoring functionality are needed at the final stage of the construction process.

Relevant BMPs

C103: High Visibility Fence BMP
C200: Interceptor Dike and Swale BMP
C201: Grass-lined Channels BMP
C207: Check Dams BMP
C208: Triangular Silt Dike BMP
C233: Silt Fence BMP

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Brian Kalab	425-303-9363
Resident Engineer	Brian Kalab / Insight Engineering	425-303-9363
Emergency Ecology Contact	Tracy Walters	425-649-7000
Emergency Permittee/ Owner Contact	Todd McFarlane	541-335-4585
Non-Emergency Owner Contact	Todd McFarlane	541-335-4585
Monitoring Personnel	TBD	425-345-9547
Ecology Regional Office	Northwest Regional Office	425-649-7000

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

The receiving waterbody, Swamp Creek, is impaired for: Bacteria, Bioassessment, DO. pH and Temp. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.
The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.
Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☐	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☒	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The limit for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.
If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Stop effluent discharge to receiving waterbody immediately. If discharge continues, this will be a direct violation of the SWPPP and CSWGP. Implement baker tanks to prevent discharge from entering reciving water body. Replace/repair BMP's if not functioning properly. Do not discharge runoff until the turbidity value is 25 nephelometric turbidity units (NTU) or less and a transparency less than 33 centimeters.

2. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the limit.
3. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the limit. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
4. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the limit. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for "Significant concrete work" (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

No pH monitering will be necessary as none of the proposed work includes pH modifying activities.

5 Reporting and Record Keeping

5.1 Record Keeping

5.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

5.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

5.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

5.2 Reporting

5.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given

monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.
DMRs will be reported online through Ecology's WQWebDMR System.

5.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

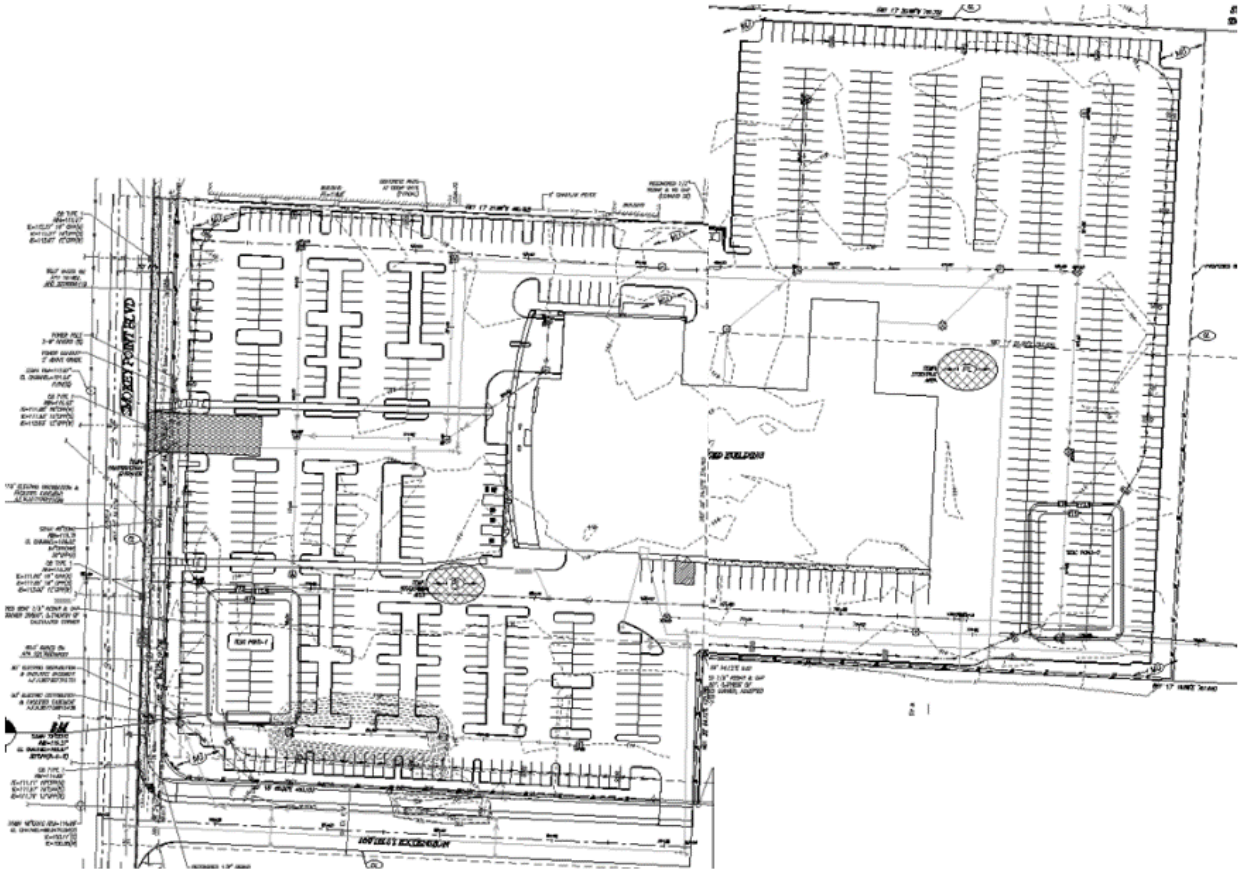
- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

A. Site Map



B. BMP Detail

Element #1 - Mark Clearing Limits

- High Visibility Plastic or Metal Fence (BMP C103)

Element #2 - Establish Construction Access

- Stabilized Construction Entrance (BMP C105)

Element #3 - Control Flow Rates

- Sediment Pond (BMP C241)

Element #4 - Install Sediment Controls

- Silt Fence (BMP C233)
- Interceptor Dike and Swale (BMP C200)

Element #5 - Stabilize Soils

- Mulching (BMP C121)
- Temporary and Permanent Seeding (BMP C120)

Element #6 - Protect Slopes

- Plastic Covering (BMP C123)

Element #8 - Stabilize Channels and Outlets

- Outlet Protection (BMP C209)
  Element #10 - Control Dewatering
- Additional Advanced BMPs to Control Dewatering:

Element #11 – Maintain BMP's

- Scheduling (BMP C162)

Element #12 – Manage the Project

- CESC Lead (BMP C160)

Element #13 – Protect On-site Stormwater Management BMPs for Runoff from Roofs and Other Hard Surfaces

- C103: High Visibility Fence BMP
- C200: Interceptor Dike and Swale BMP
- C201: Grass-lined Channels BMP
- C233: Silt Fence BMP

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

E. Construction Stormwater General Permit (CSWGP)

F. Contaminated Site Information

There is no contaminated soil onsite.

G. Engineering Calculations

TESC Pond sizing calculations

The total contributing area to the proposed sediment pond is approximately 11.62 acres. The sediment pond is sized for the developed 10-year / 24-hour design storm due to the proximity to the wetlands.

1. Discharge rate

Q 10yr/24hr = 9.50 cfs

Surface Area (SA)

SA = 2 X Q10yr/24hr / Vsed

SA = 2 X 0.55 / 0.00096

Where Vsed is the settling velocity.

= 19,792 Sqft

2. Sizing the De-watering Mechanism:

Principal Spillway (Riser pipe)

The diameter shall be the minimum necessary to pass the pre-developed 10-yr/24-hr design storm. Use Figure III.2.38 Riser inflow curves (DOE) to determine this diameter (h = 1 foot)

Q (10yr/24hr predev) = 0.76 cfs

Per figure III.2.38 of the DOE manual, the minimum riser diameter is 12 inches to convey this flow rate.

Emergency Overflow Spillway

The emergency overflow spillway shall convey the 100yr/24hr developed design storm.

Q 100yr/24hr = 15.15 cfs

H = 0.5 ft

$$\text{Length (L)} = \frac{Q_{100yr/24hr}}{3.21\,(H)^{3/2}} - 2.4\,(H)$$

$$= \frac{15.15}{3.21\,(0.5)^{3/2}} - 1.2$$

Length (L) = 12.15 feet. Use the minimum length of 6.0 feet.

De-Watering Orifice:

Size the de-watering orifice (1" minimum diameter) per the following equation:

$$Ao = \frac{As\ (2H)^{1/2}}{0.6 \times 3600\ Tg^{1/2}}$$

where Ao = Orifice area in square feet
As = Pond surface area in square feet
H = Head above the Orifice (height of riser in pipe=2.5-ft)
T = De-watering Time (T = 24 hours)
g = Acceleration due to gravity

$$Ao = \frac{19{,}792(2*2.5)^{1/2}}{0.6 \times 3600\ (24)\ (32.2)^{1/2}}$$

Ao = 0.15044 Sqft

Convert Ao to Diameter (D) in inches

D = 24 x (Ao / 3.14)^1/2

D = 5.25 inches. (Use 1" minimum) Per the DOE design standards; the perforated pipe shall be a minimum of two inches larger than the orifice sizes. Use 4-inch diameter for the perforated pipe.

Refer to the construction plans for more details.

* Sediment pond shall be a minimum of 3.5-ft deep, which includes 1-ft towards free board, 1-ft towards settling depth and 1.5-ft towards sediment storage. Refer to the construction plans for more details.

B. Geotechnical Report

NELSON GEOTECHNICAL
ASSOCIATES, INC.

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Woodinville, WA 98072
(425) 486-1669
www.nelsongeotech.com

July 27, 2022

2812 Architecture
ATTN: Adam Clark
VIA Email: adam@2812architecture.com

Geotechnical Engineering Evaluation – **REV2**
Kendall Subaru Development
16xxx Smokey Point Boulevard
Marysville, Washington
NGA File No. 1378422

INTRODUCTION

This letter presents the results of our geotechnical engineering investigation and evaluation of the planned Kendall Subaru Development project evaluation for the Kendall Subaru Dealership project located at **16xxx Smokey Point Boulevard in Marysville, Washington,** as shown on the Vicinity Map in Figure 1. The parcel numbers for the affected properties are 31052800300600, -1200, and -0300. We have been requested to revise this document so it does not include the seismic site coefficient F_a, which we understand the project structural engineer will determine without our input.

The purpose of this study is to explore and characterize the site's surface and subsurface conditions and to provide geotechnical recommendations for the planned site development.

The properties consist of three rectangular parcels that are offset to form an irregularly shaped site that covers approximately 15.72 acres. It is currently vacant and undeveloped. Topographically, the site is relatively level. We understand the plans for development include the construction of an auto dealership structure and associated parking lot. We have been informed that the structure will be supported only with isolated foundations, and it will not include any continuous foundations. We have been informed that site stormwater will be directed off-site. We have been requested to prepare this letter to address the City of Marysville code.

For our use in preparing this letter, we were provided with a site plan titled "Kendall Subaru," dated May 26, 2022, and prepared by 2812 Architecture. We also were provided with a geotechnical report titled "Geotechnical Investigation - CamNel Properties," dated December 26, 2016, and prepared by Liu and Associates, Inc.

SCOPE

The purpose of this study is to explore and characterize the site surface and subsurface conditions and provide general recommendations for site development.

Specifically, our scope of services included the following:

1. Review available soil and geologic maps of the area, including previous geotechnical documentation.
2. Visit the site to reconnoiter surficial information and evaluate subsurface soil and groundwater conditions within the site with test pits using a mini excavator.
3. Perform laboratory grain-size sieve analysis on soil samples, as necessary.
4. Determine the presence of Geologically Hazardous Areas in accordance with the City of Marysville Municipal Code, as warranted.
5. Provide recommendations for earthwork and foundation support.
6. Provide recommendations for retaining walls.
7. Provide recommendations for temporary and permanent slopes.
8. Provide recommendations for subsurface utilities and pavement subgrade preparation.
9. Provide general recommendations for site drainage and erosion control.
10. Document the results of our findings, conclusions, and recommendations in an updated written geotechnical letter.

SITE CONDITIONS

Surface Conditions

The site consists of three rectangular parcels that are offset to form an irregularly shaped site that covers 15.72 acres. The site is bordered to the west by Smokey Point Boulevard, to the north by undeveloped, wooded land and by an automotive repair business, and to the south and east by undeveloped, wooded land. The site is currently undeveloped and is generally fairly level. A mound of soil up to about 12 feet tall has been placed in a stockpile near the southwest corner of the site. That stockpile has side slopes with inclination close to 3H:1V, and approximate dimensions of 120 feet by 50 feet. The western two-thirds of the site is sparsely vegetated with brush, with areas of exposed soil. The eastern third of the

property is wooded. We did not observe surface water within the site during our site visit on May 20, 2022.

Subsurface Conditions

Geology: The geologic units for this area are shown on the Geologic Map of the Arlington West 7.5 Minute Quadrangle, Snohomish County, Washington, by James P. Minard, et al. (USGS, 1985). The site is mapped as Marysville Sand (Qvrm). The Marysville Sand is described as well-drained, stratified to massive outwash sand with some fine gravel. Our explorations encountered topsoil or disturbed ground underlain by fine to medium sand with varying amounts of silt consistent with the description of Marysville Sand.

Explorations: The subsurface conditions within the site were explored on June 22, 2022 by excavating four test pits to depths of 6.5 feet below the existing ground surface using a mini excavator. The approximate locations of our explorations are shown on the Site Plan in Figure 2. A geologist from NGA was present during the explorations, examined the soils and geologic conditions encountered, obtained samples of the different soil types, and maintained logs of the test pits. The soils were visually classified in general accordance with the Unified Soil Classification System, presented in Figure 3. The logs of our test pits are attached to this report and are presented as Figure 4. We present a brief summary of the subsurface conditions in the following paragraph. For a detailed description of the subsurface conditions, the logs of the test pits should be reviewed. The test pits encountered 0.5 to 1 foot of topsoil or fill/disturbed ground at the ground surface. These surficial soils were generally underlain by medium dense sand with silt and varying amounts of roots, which extended to 1.5 to 2.5 feet below the surface. That sand with silt was underlain by medium dense sand, which extended to the maximum explored depths of 6.5 feet. We interpret the sand to be Marysville Sand. Heavy test pit caving was observed below depths of 2 to 3.5 feet in all of the test pits. The conditions observed in our test pits are generally consistent with the subsurface soil conditions described in the provided 2016 geotechnical report for the site.

Hydrogeologic Conditions

We observed groundwater within the test pits at depths of 3 to 4 feet, which we interpret to be associated with the regional groundwater table. We would expect the groundwater elevation to be slightly lower during drier times of the year and slightly higher during wetter periods. The provided 2016 geotechnical report for the site describes 6 test pit explorations that were completed on August 25, 2016. Groundwater was encountered in those test pits at depths of 6 to 7.5 feet. Those explorations were excavated late in the summer, and groundwater was lower than in our recent test pits, excavated early in the summer.

SENSITIVE AREA EVALUATION

General

We reviewed the 2012 City of Marysville Critical Areas map and found that the subject site is not mapped as having critical areas.

Seismic Hazard

We reviewed the 2018 International Building Code (IBC) for seismic site classification for this project. Since competent glacial outwash soils are inferred to underlie the site at depth, the site conditions best fit the IBC description for Site Class D.

Table 1 below provides seismic design parameters for the site that are in conformance with the 2018 IBC, which specifies a design earthquake having a 2% probability of occurrence in 50 years (return interval of 2,475 years), and the 2008 USGS seismic hazard maps.

Table 1 – 2018 IBC Seismic Design Parameters

Site Class	Spectral Acceleration at 0.2 sec. (g) S_s	Spectral Acceleration at 1.0 sec. (g) S_1	Site Coefficients		Design Spectral Response Parameters	
				F_v	S_{DS}	S_{D1}
D	1.072	0.383		null	0.858	null

The spectral response accelerations were obtained from the OSHPD Seismic Design Maps website (ASCE 7-16 data) for the project latitude and longitude.

We reviewed the Liquefaction Susceptibility Map of Snohomish County, Washington by Stephen Palmer et al. (Washington State Department of Natural Resources, 2004). The site and surrounding vicinity are mapped as having low to moderate liquefaction susceptibility.

Hazards associated with seismic activity include liquefaction potential and amplification of ground motion. Liquefaction is caused by a rise in pore pressures in a loose, fine sand deposit beneath the groundwater table. It is our opinion that the medium dense native Marysville Sand deposits interpreted to underlie the site have a low to moderate potential for liquefaction or amplification of ground motion.

Erosion Hazard

The criteria used for determination of the erosion hazard for affected areas include soil type, slope gradient, vegetation cover, and groundwater conditions. The erosion sensitivity is related to vegetative cover and the specific surface soil types, which are related to the underlying geologic soil units. The Soil Survey of Snohomish County Area, Washington by the Natural Resources Conservation Service (NRCS), classifies the site as Custer fine sandy loam and Norma loam. These soils are listed as having slight erosion hazard. Based on our experience in the area and our observations in the field, it is our opinion that the site would have a low erosion hazard for areas where the soils are exposed. It is our opinion that the erosion hazard for site soils should be very low in areas where vegetation is not disturbed.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion from a geotechnical standpoint that the planned development is feasible. Our explorations indicated that the site was underlain by medium dense sand with silt or sand at depths of 0.5 to 1 foot below the ground surface. These native soils should provide adequate support for foundation, slab, and pavement loads. We recommend that the new structure be designed utilizing shallow foundations. Footings should extend through any loose soil and be founded on the underlying medium dense native soil, or structural fill extending to these soils. Footing excavations that extend below groundwater should be filled with compacted crushed rock above the water level. Deeper areas of unsuitable soils and/or undocumented fill could be encountered in the unexplored areas of the site. This condition, if encountered, would require deeper excavations in foundation, slab, and pavement areas to remove the unsuitable soils.

The surficial soils encountered on this site are considered moisture-sensitive and may disturb easily when wet. We recommend that construction take place during the drier summer months, if possible. If construction is to take place during wet weather, the soils may disturb and additional expenses and delays should be expected due to the wet conditions. Additional expenses could include the need for placing a blanket of rock spalls to protect exposed subgrades and construction traffic areas. Some of the native granular on-site soils may be suitable for use as structural fill depending on the moisture content of the soil during construction. NGA should be retained to determine if the on-site soils can be used as structural fill material during construction.

Erosion Control

The erosion hazard for the on-site soils is interpreted to be low for exposed soils, but actual erosion potential will be dependent on how the site is graded and how water is allowed to concentrate. Best Management Practices (BMPs) should be used to control erosion. Areas disturbed during construction should be protected from erosion. Erosion control measures may include diverting surface water away from the stripped or disturbed areas. Silt fences and/or straw bales should be erected to prevent muddy water from leaving the site. Disturbed areas should be planted as soon as practical, and the vegetation should be maintained until it is established. The erosion potential of areas not stripped of vegetation should be low.

Site Preparation and Grading

After erosion control measures are implemented, site preparation should consist of removing loose soils, topsoil, and any undocumented fill from foundations, slab, and pavement areas, to expose medium dense native bearing soils. The stripped soil should be removed from the site or stockpiled for later use as a landscaping fill. Based on our observations, we anticipate native, medium dense soil is present at depths of approximately 0.5 to 1 foot at the site. We recommend that if loose soils are encountered at the foundation subgrades, that the subgrade be compacted to a non-yielding condition using a vibratory roller or a heavy plate compactor. Deeper areas of unsuitable soils and/or undocumented fill could be encountered in the unexplored areas of the site. This condition, if encountered, would require deeper excavations in foundation, slab, and pavement areas to remove the unsuitable soils. After site preparation, if the exposed subgrade is deemed loose, it should be compacted to a non-yielding condition and then proof-rolled with a heavy rubber-tired piece of equipment. Areas observed to pump or weave during the proof-roll test should be reworked to structural fill specifications or over-excavated and replaced with properly compacted structural fill or rock spalls. If loose soils are encountered in foundation areas, the loose soils should be removed and replaced with rock spalls. If significant surface water flow is encountered during construction, this flow should be diverted around areas to be developed, and the exposed subgrades should be maintained in a semi-dry condition. If wet conditions are encountered, alternative site grading techniques might be necessary. These techniques could include using large excavators equipped with wide tracks and a smooth bucket to complete site grading and covering exposed subgrade with a layer of crushed rock for protection. If wet conditions are encountered or construction is attempted in wet weather, the subgrade should not be compacted, as this could cause further subgrade disturbance. In wet conditions, it may be necessary to cover the exposed subgrade with a layer of crushed rock as soon as it is exposed to protect the moisture sensitive soils from disturbance by machine or foot

traffic during construction. The prepared subgrade should be protected from construction traffic and surface water should be diverted around areas of prepared subgrade.

Temporary and Permanent Slopes

Temporary cut slope stability is a function of many factors, including the type and consistency of soils, depth of the cut, surcharge loads adjacent to the excavation, length of time a cut remains open, and the presence of surface or groundwater. It is exceedingly difficult under these variable conditions to estimate a stable, temporary, cut slope angle. Therefore, it should be the responsibility of the contractor to maintain safe slope configurations at all times as indicated in OSHA guidelines for cut slopes.

The following information is provided solely for the benefit of the owner and other design consultants and should not be construed to imply that Nelson Geotechnical Associates, Inc. assumes responsibility for job site safety. Job site safety is the sole responsibility of the project contractor.

For planning purposes, we recommend that temporary cuts in the on-site soils be no steeper than 1.5 Horizontal to 1 Vertical (1.5H:1V). If significant groundwater seepage or surface water flow were encountered, flatter inclinations would be necessary. We recommend that cut slopes be protected from erosion. The slope protection measures may include covering cut slopes with plastic sheeting and diverting surface runoff away from the top of cut slopes. We do not recommend vertical slopes for cuts deeper than four feet, if worker access is necessary. We recommend that cut slope heights and inclinations conform to appropriate OSHA/WISHA regulations. Permanent cut and fill slopes should be no steeper than 3H:1V. However, flatter inclinations may be required in areas where loose soils are encountered. Permanent slopes should be vegetated, and the vegetative cover maintained until established.

Foundations

Conventional shallow spread foundations should be placed on medium dense native bearing soils or be supported on structural fill or rock spalls extending to those soils. Medium dense soils should be encountered approximately 0.5 to one foot below ground surface based on our explorations. Where undocumented fill or loose soils are encountered at footing bearing elevation, the subgrade should be over-excavated to expose suitable bearing soil. The over-excavation may be filled with structural fill, or the footing may be extended down to the competent native soils. If footings are supported on structural fill, the fill zone should extend outside the edges of the footing a distance equal to one half of the depth of the over-excavation below the bottom of the footing.

Footings should extend at least 18-inches below the lowest adjacent finished ground surface for frost protection and bearing capacity considerations. Foundations should be designed in accordance with the 2018 IBC. Footing widths should be based on the anticipated loads and allowable soil bearing pressure. Water should not be allowed to accumulate in footing trenches. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend an allowable bearing pressure of not more than 2,000 pounds per square foot (psf) be used for the design of isolated footings with a minimum dimension of at least 4 feet founded on the medium dense or denser native bearing soils or structural fill extending to the competent native bearing material. The foundation bearing soil should be evaluated by a representative of NGA. We should be consulted if higher bearing pressures are needed. Current IBC guidelines should be used when considering increased allowable bearing pressure for short-term transitory wind or seismic loads. Potential foundation settlement using the recommended allowable bearing pressure is estimated to be less than 1-inch total and ½-inch differential between adjacent footings or across a distance of about 20 feet, based on our experience with similar projects.

Lateral loads may be resisted by friction on the base of the footing and passive resistance against the subsurface portions of the foundation. A coefficient of friction of 0.35 may be used to calculate the base friction and should be applied to the vertical dead load only. Passive resistance may be calculated as a triangular equivalent fluid pressure distribution. An equivalent fluid density of 200 pounds per cubic foot (pcf) should be used for passive resistance design for a level ground surface adjacent to the footing. This level surface should extend a distance equal to at least three times the footing depth. These recommended values incorporate safety factors of 1.5 and 2.0 applied to the estimated ultimate values for frictional and passive resistance, respectively. To achieve this value of passive resistance, the foundations should be poured “neat” against the native medium dense soils or compacted fill should be used as backfill against the front of the footing. We recommend that the upper one foot of soil be neglected when calculating the passive resistance.

Retaining Walls

Should retaining walls be utilized, they should be designed and constructed as outlined hereon. The lateral pressure acting on subsurface retaining walls is dependent on the nature and density of the soil behind the wall, the amount of lateral wall movement which can occur as backfill is placed, wall drainage conditions, and the inclination of the backfill. For walls that are free to yield at the top at least one thousandth of the height of the wall (active condition), soil pressures will be less than if movement is limited by such factors as wall stiffness or bracing (at-rest condition). We recommend that walls supporting horizontal backfill and not subjected to hydrostatic forces, be designed using a triangular earth pressure distribution equivalent to that exerted by a fluid with a density of 35 pcf for yielding (active condition) walls, and 55 pcf for non-yielding (at-rest condition) walls. A seismic design loading of 8H should also be included in the wall design, where "H" represents the total height of the wall.

These recommended lateral earth pressures are for a drained granular backfill and assume of a horizontal ground surface behind the wall for a distance of at least the subsurface height of the wall, and do not account for surcharge loads. Additional lateral earth pressures should be considered for surcharge loads acting adjacent to subsurface walls and within a distance equal to the subsurface height of the wall. This would include the effects of surcharges such as traffic loads, floor slab loads, slopes, or other surface loads. We could consult with the structural engineer regarding additional loads on retaining walls during final design, if needed.

The lateral pressures on walls may be resisted by friction between the foundation and subgrade soil, and by passive resistance acting on the below-grade portion of the foundation. Recommendations for frictional and passive resistance to lateral loads are presented in the **Foundations** subsection of this report.

All wall backfill should be well compacted as outlined in the **Structural Fill** subsection of this report. Care should be taken to prevent the buildup of excess lateral soil pressures due to over-compaction of the wall backfill. This can be accomplished by placing wall backfill in 8-inch loose lifts and compacting the backfill with small, hand-operated compactors within a distance behind the wall equal to at least one-half the height of the wall. The thickness of the loose lifts should be reduced to accommodate the lower compactive energy of the hand-operated equipment. The recommended level of compaction should still be maintained. Permanent drainage systems should be installed for retaining walls. Recommendations for these systems are found in the **Subsurface Drainage** subsection of this report. We recommend that we be retained to evaluate the proposed wall drain backfill material and observe installation of the drainage systems.

Structural Fill

General: Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and standards, and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the **Site Preparation and Grading** subsection prior to beginning fill placement. Sloping areas to receive fill should be benched using a minimum 8-foot-wide horizontal benches into competent soils.

Materials: Structural fill should consist of a good quality, granular soil, free of organics and other deleterious material, and be well graded to a maximum size of about three inches. All-weather fill should contain no more than five-percent fines (soil finer than U.S. No. 200 sieve, based on that fraction passing the U.S. 3/4-inch sieve). Some of the more granular on-site soils may be suitable for use as structural fill depending on the moisture content of the soil during construction. We should be retained to evaluate all proposed structural fill material prior to placement.

Fill Placement: Following subgrade preparation, placement of structural fill may proceed. All filling should be accomplished in uniform lifts up to eight inches thick. Each lift should be spread evenly and be thoroughly compacted prior to placement of subsequent lifts. All structural fill underlying building areas and pavement subgrade should be compacted to a minimum of 95 percent of its maximum dry density. Maximum dry density, in this report, refers to that density as determined by the ASTM D-1557 Compaction Test procedure. The moisture content of the soils to be compacted should be within about two percent of optimum so that a readily compactable condition exists. It may be necessary to over-excavate and remove wet soils in cases where drying to a compactable condition is not feasible. All compaction should be accomplished by equipment of a type and size sufficient to attain the desired degree of compaction and should be tested.

Slab-on-Grade

Slabs-on-grade should be supported on subgrade soils prepared as described in the **Site Preparation and Grading** subsection of this report. We recommend that all floor slabs be underlain by at least six inches of free-draining gravel with less than three percent by weight of the material passing Sieve #200 for use as a capillary break. A suitable vapor barrier, such as heavy plastic sheeting (6-mil minimum), should be placed over the capillary break material. An additional 2-inch-thick moist sand layer may be used to cover

the vapor barrier. This sand layer is optional and is intended to be used to protect the vapor barrier membrane and to aid in curing the concrete.

Pavements

Pavement subgrade preparation and structural filling where required, should be completed as recommended in the **Site Preparation and Grading** and **Structural Fill** subsections of this report. The pavement subgrade should be proof-rolled with a heavy, rubber-tired piece of equipment, to identify soft or yielding areas that require repair. The pavement section should be underlain by a minimum of six inches of clean granular pit run or crushed rock. We should be retained to observe the proof-rolling and recommend subgrade repairs prior to placement of the asphalt or hard surfaces.

Utilities

We recommend that underground utilities be bedded with a minimum six inches of pea gravel prior to backfilling the trench with on-site or imported material. Trenches within settlement sensitive areas should be compacted to 95% of the modified proctor as described in the **Structural Fill** subsection of this report. Trenches located in non-structural areas should be compacted to a minimum 90% of the maximum dry density. Trench backfill compaction should be tested.

Site Drainage

Surface Drainage: The finished ground surface should be graded such that stormwater is directed to an appropriate stormwater collection system. Water should not be allowed to stand in any areas where footings, slabs, or pavements are to be constructed. Final site grades should allow for drainage away from the proposed structures. We suggest that the finished ground be sloped at a minimum downward gradient of three percent, for a distance of at least 10 feet away from the proposed structures. Surface water should be collected by permanent catch basins and drain lines and be discharged into an approved discharge system.

Subsurface Drainage: If groundwater is encountered during construction, we recommend that the contractor slope the bottom of the excavation and collect the water into ditches and small sump pits where the water can be pumped out and routed into a permanent storm drain. We recommend the use of footing drains around the structures. Footing drains should be installed at least one foot below planned finished floor elevation. The drains should consist of a minimum 4-inch-diameter, rigid, slotted or perforated, PVC pipe surrounded by free-draining material wrapped in a filter fabric. We recommend that the free-draining material consist of an 18-inch-wide zone of clean (less than three-percent fines), granular material placed along the back of walls. Pea gravel is an acceptable drain material. The free-

draining material should extend up the wall to one foot below the finished surface. The top foot of backfill should consist of impermeable soil placed over plastic sheeting or building paper to minimize surface water or fines migration into the footing drain. Footing drains should discharge into tightlines leading to an approved collection and discharge point with convenient cleanouts to prolong the useful life of the drains. Roof drains should not be connected to wall or footing drains.

CONSTRUCTION MONITORING

We should be retained to provide construction monitoring services during the earthwork phase of the project to evaluate subgrade conditions, temporary cut conditions, fill compaction, and drainage system installation.

USE OF THIS LETTER

NGA has prepared this letter for **Adam Clark with 2812 Architecture,** and associated agents, for use in the planning and design of the development on this site only. The scope of our work does not include services related to construction safety precautions and our recommendations are not intended to direct the contractors' methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. There are possible variations in subsurface conditions between the explorations and also with time. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. A contingency for unanticipated conditions should be included in the budget and schedule.

We recommend that NGA be retained to provide monitoring and consultation services during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed differ from those anticipated, and to evaluate whether or not earthwork and foundation installation activities comply with contract plans and specifications. We should be contacted a minimum of one week prior to construction activities and could attend pre-construction meetings if requested.

Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this report was prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

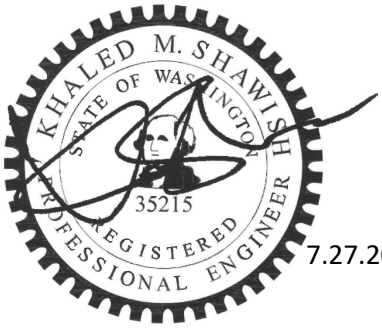
o-o-o

It has been a pleasure to provide service to you on this project. If you have any questions or require further information, please call.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Thor Christensen, PE
Project Engineer



7.27.2022

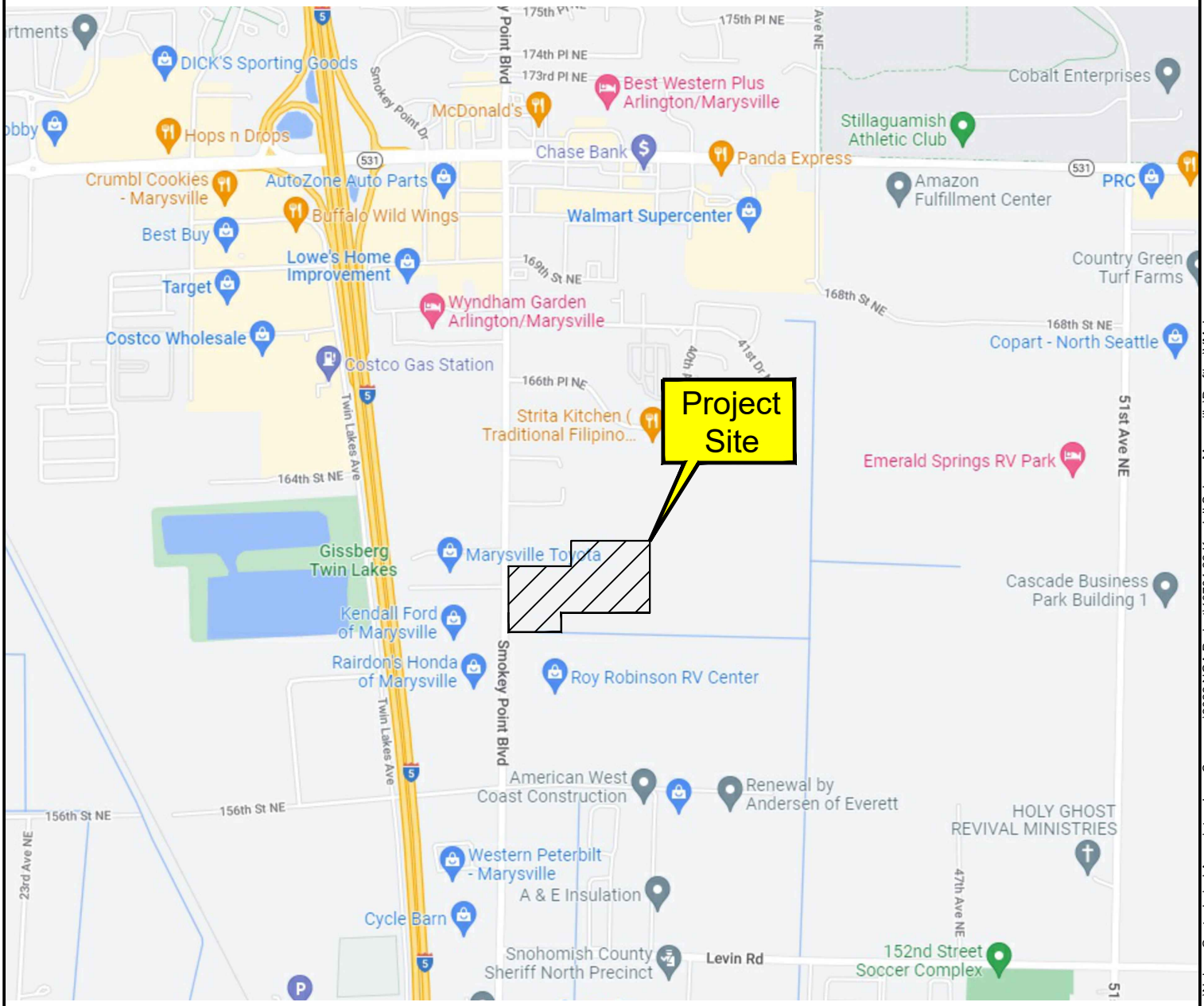
Khaled M. Shawish, PE
Principal Engineer

TRC:KMS:dy

Four Figures Attached

VICINITY MAP

Not to Scale



Marysville, WA

Project Number	Kendall Subaru Marysville Vicinity Map	NELSON GEOTECHNICAL ASSOCIATES, INC	No.	Date	Revision	By	CK
1378422			1	6/27/22	Original	DPN	DJO
Figure 1		

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Woodinville, WA 98072
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105 Palouse St.
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(509) 665-7696 / Fax: 665-7692

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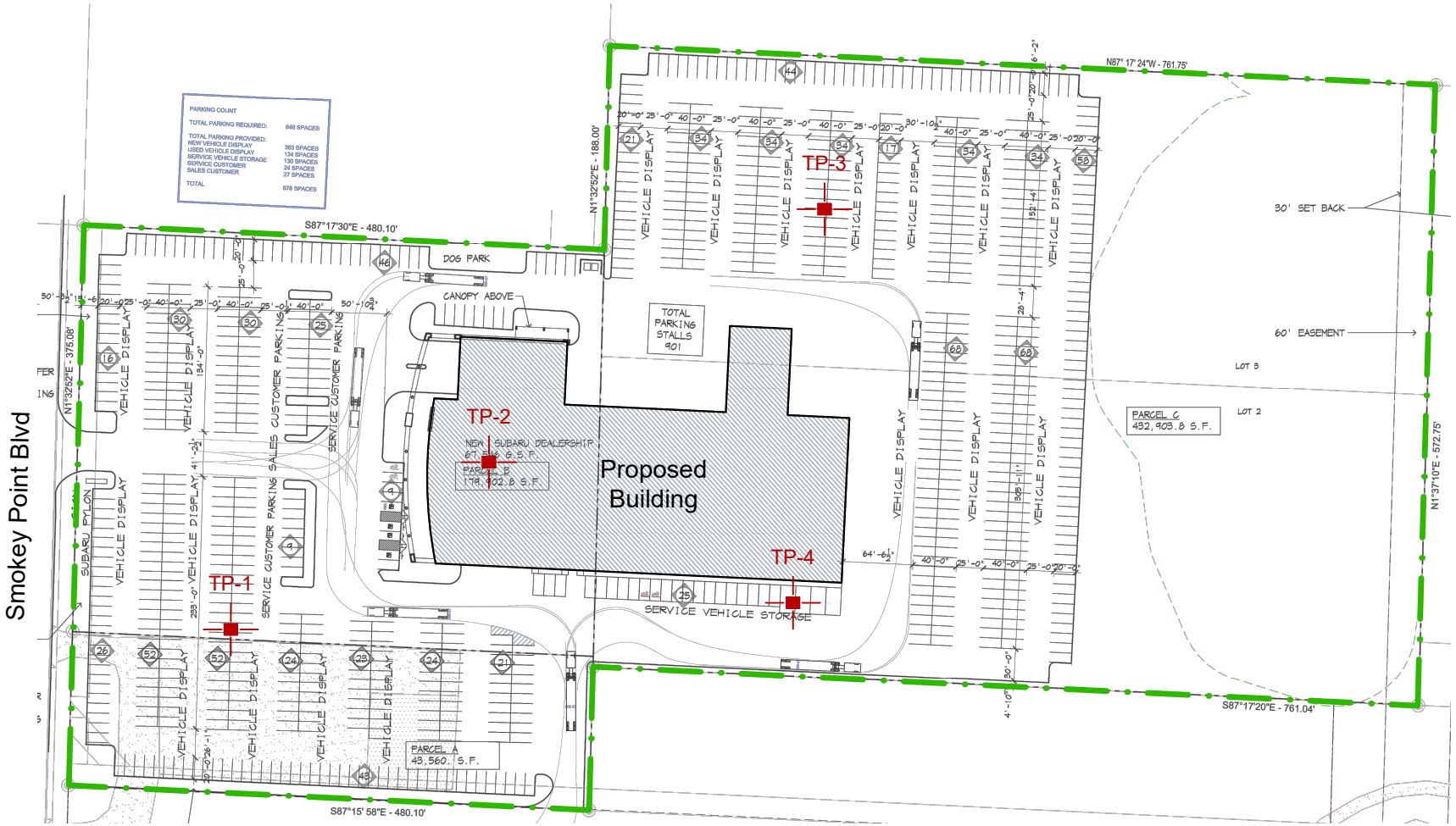
Site Plan



LEGEND

Property line

TP-1

Number and approximate location of test pit

0 150 300

Scale: 1 inch = 150 feet

Reference: Site plan based on a plan dated May 26, 2022 titled "New Auto Dealership for: Kendall Subaru," prepared by 2012 Architecture.

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Project Number 1378422

Figure 2

Kendall Subaru Marysville
Site Plan

NELSON GEOTECHNICAL ASSOCIATES, INC

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17311-135th Ave. NE, A-500
Woodinville, WA 98072
(425) 486-1669 / Fax: 481-2510

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No.	Date	Revision	By	CK
1	6/27/22	Original	DPN	DJO

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE - GRAINED SOILS MORE THAN 50 % RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50 % OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50 % OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE - GRAINED SOILS MORE THAN 50 % PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50 %	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 % OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1) Field classification is based on visual examination of soil in general accordance with ASTM D 2488-93.

2) Soil classification using laboratory tests is based on ASTM D 2488-93.

3) Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water.

Wet - Visible free water or saturated, usually soil is obtained from below water table

Project Number	Kendall Subaru Marysville Soil Classification Chart	NELSON GEOTECHNICAL ASSOCIATES, INC	No.	Date	Revision	By	CK
1378422			1	6/27/22	Original	DPN	DJO
Figure 3		

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LOG OF EXPLORATION

DEPTH (FEET)	USCS	SOIL DESCRIPTION
TEST PIT ONE		
0.0 – 0.5		**TOPSOIL**
0.5 – 1.5	SP	ORANGE-BROWN TO ORANGE-GRAY, FINE TO MEDIUM SAND WITH IRON-OXIDE WEATHERING AND TRACE ROOTS (MEDIUM DENSE, MOIST)
1.5 – 6.5	SP	GRAY, FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST TO WET)
		SAMPLES WERE NOT COLLECTED MINOR GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 3.0 FEET HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 3.75 FEET MODERATE TEST PIT CAVING WAS ENCOUNTERED FROM 2.0 TO 6.5 FEET TEST PIT WAS COMPLETED AT 6.5 FEET ON 06/22/2022
TEST PIT TWO		
0.0 – 0.5		**TOPSOIL** / WOOD CHIPS
0.5 – 1.5	SP-SM	ORANGE-BROWN TO ORANGE-GRAY, FINE TO MEDIUM SAND WITH SILT, IRON-OXIDE WEATHERING, AND TRACE ROOTS (MEDIUM DENSE, MOIST)
1.5 – 6.5	SP	GRAY, FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST TO WET)
		SAMPLES WERE NOT COLLECTED HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 3.5 FEET MODERATE TEST PIT CAVING WAS ENCOUNTERED FROM 3.0 TO 6.5 FEET TEST PIT WAS COMPLETED AT 6.5 FEET ON 06/22/2022
TEST PIT THREE		
0.0 – 0.75		ORANGE-BROWN, SILTY FINE TO MEDIUM SAND WITH ROOTS AND ORGANICS (LOOSE TO MEDIUM DENSE, MOIST) (**FILL/DISTURBED GROUND**)
0.75 – 2.0	SP-SM	ORANGE-BROWN TO ORANGE-GRAY, FINE TO MEDIUM SAND WITH SILT, IRON-OXIDE WEATHERING, AND TRACE ROOTS (MEDIUM DENSE, MOIST)
2.0 – 6.5	SW	GRAY, FINE TO COARSE SAND WITH TRACE GRAVEL (MEDIUM DENSE, MOIST TO WET)
		SAMPLES WERE NOT COLLECTED HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 4.0 FEET MODERATE TEST PIT CAVING WAS ENCOUNTERED FROM 3.5 TO 6.5 FEET TEST PIT WAS COMPLETED AT 6.5 FEET ON 06/22/2022
TEST PIT FOUR		
0.0 – 1.0		ORANGE-BROWN TO DARK BROWN, SILTY FINE TO MEDIUM SAND WITH ROOTS AND ORGANICS (LOOSE TO MEDIUM DENSE, MOIST) (**FILL/DISTURBED GROUND**)
1.0 – 2.5	SP-SM	ORANGE-BROWN TO ORANGE-GRAY, FINE TO MEDIUM SAND WITH SILT AND IRON-OXIDE WEATHERING (MEDIUM DENSE, MOIST)
2.5 – 6.5	SW	GRAY, FINE TO COARSE SAND WITH TRACE GRAVEL (MEDIUM DENSE, MOIST TO WET)
		SAMPLES WERE NOT COLLECTED HEAVY GROUNDWATER SEEPAGE WAS ENCOUNTERED AT 4.0 FEET MODERATE TEST PIT CAVING WAS ENCOUNTERED FROM 3.5 TO 6.5 FEET TEST PIT WAS COMPLETED AT 6.5 FEET ON 06/22/2022

6.0 Other Permits

A right-of-way permit will be required for the city of Marysville.