BARGHAUSEN

4/21/2025

Technical Information Report

Fred Meyer Distribution Center Driveway

PREPARED BY

Barghausen Consulting Engineers, Inc.
18215 72nd Ave. South
Kent, WA 98032
Karen Harris, P.E.

PREPARED FOR	CLIENT ADDRESS
Kroger Logistics Maintenance & Engineering	2201 South Wilmington Avenue Compton, CA 90220 Attn: Doug Hardy

SITE ADDRESS	PROJECT NO.	DATE	JURISDICTION
2200 North Meridian Puyallup, WA 98371	18510	04/21/2025	City of Puyallup

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Tab 1.0

1.0 PROJECT OVERVIEW

The proposed project is located on the existing site of the Fred Meyer Distribution Center at 2200 North Meridian, Puyallup, WA 98371. The project is located on parcel 0420215004, which contains 56.53 acres. The project proposed revisions to an existing driveway on the west side of the site that provides access to the site from 7th Street NW. The proposed revisions include the replacement of approximately 14,500 square feet of pavement and the construction of a new guard house (approximately 380 square feet). The total project results in 2035 sf of additional pavement. The current zoning of the project site is Limited Manufacturing (ML). Please see the enclosed Figure 1 - Vicinity Map for additional location information.

The project area is located within a small portion of the existing Fred Meyer Distribution Center site. The existing site contains two large warehouse buildings, paved parking and trailer storage spaces, and associated utilities. There are four driveways currently serving the site, one on Todd Road NW, one on North Meridian Avenue, one on Valley Avenue East, and one on 7th Street NW. The site is relatively flat and does not contain any steep slopes. The site is fully developed and contains an existing stormwater system that drains to existing onsite bioswales, which discharge into the public stormwater system Valley Avenue NW, ultimately discharging to the Puyallup River. See Figure 2 for a map of existing site conditions. It will continue to serve the project area as it does in the existing condition. A Contech Stormfilter is proposed for basic water quality treatment of the new and replaced hard surfaces.

The site contains two flood zones within two of the onsite bioswales. These flood zones are outside of the project area. See Figure 4 for a FEMA flood map. According to Puyallup GIS mapping, the project does not contain any wetlands. Some potential landslide hazards are shown by GIS within the site where slopes are not flat. However, visual inspection of the areas in question shows that they are minor slopes and do not meet the definition of landslide hazards per 21.06.1210(3)(b) of the Puyallup Municipal Code.

Figure 1
Vicinity Map


TPN 0420215004
Fred Meyer Distribution Center
Approximate Boundary Line
Valley Ave E
Valley Ave NW
Valley Ave NW
Valley Ave NE
48th St E
82nd Ave E
Milwaukee Ave E
N Meridian Ave
4th St NW
2nd St
161
167
512
Proposed driveway revision
4000 ft
N

Figure 2
Existing
Conditions
Map

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

EXISTING CONDITIONS PLAN

LEGEND

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (AS NOTED)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- BENCHMARK
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- TRAFFIC SIGNAL LIGHTS
- POWER METER
- POWER POLE
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- CLEANOUT (AS NOTED)
- GAS METER
- GAS VALVE
- WATER VALVE (WV)
- FAUCET
- FIRE HYDRANT(FH) / CONNECTION(FDC)
- WATER MANHOLE
- WATER METER
- BLOW-OFF / AIRVAC
- MONITOR WELL
- SIGN
- IRRIGATION SPRINKLER
- DIRECTIONAL ARROW
- ADA SYMBOL
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- SILT FENCE
- METAL/IRON FENCE
- GUARD RAIL/CABLE FENCE
- BARBED WIRE FENCE
- W WATER LINE
- G GAS LINE
- T(XX) TELEPHONE LINE (OH) OR (UG)
- P(XX) POWER LINE (OH) OR (UG)
- SD STORM LINE
- SS SEWER LINE
- ROCKERY
- KEYSTONE WALL
- DECIDUOUS TREE
- CONIFEROUS TREE
- CONCRETE
- GRAVEL/SAND (AS NOTED)
- ASPHALT
- BUILDING LINE

ABBREVIATIONS

(R#)	REFERENCE SURVEYS
(OH)	OVERHEAD
(UG)	UNDERGROUND
(TYP)	TYPICAL
(C)	CALCULATED
(M)	MEASURED

N

0 10' 20' 40'

SCALE: 1"=20'

10' WIDE PSP&L EASEMENT 9409200339

50'X90' PSP&L EASEMENT 9409120399

7TH AVE SW (PUBLIC RIGHT-OF-WAY)

30' PSP&L EASEMENT 9409120399

TEMPORARY BENCHMARK: SET MAG NAIL W/ WASHER ELEV = 44.03 FT.

Δ=52°13'10" R=40.00' L=36.46'

S01°14'43"W 426.47'

S52°05'27"E 189.70'

N35°57'14"E 211.71'

CHAIN LINK FENCE

TOP OF SLOPE

TOE OF SLOPE

CONCRETE

LOT 1, CITY OF PUYALLUP SHORT PLAT NO. 94-81-005, RECORDED UNDER RECORDING NO. 9405100543, IN PIERCE COUNTY, WASHINGTON.

EASEMENT NOTE
EASEMENT FOR COMMUNICATIONS FACILITIES AND INCIDENTAL PURPOSES, EASEMENT REC. NO. 201310140202. AFFECTS THE SITE AND IS BLANKET IN NATURE FOR TELECOMMUNICATIONS CABLE SYSTEMS

Know what's below. Call before you dig.

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision

Title: EXISTING CONDITIONS PLAN

FRED MEYER - DISTRIBUTION CENTER

FRED MEYER

For:

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER — XXXX

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number 18510

Sheet C3 of 6

P:\18000s\18510\engineering\2024 CIVIL SET\18510-EXCON.dwg 2/23/2024 10:10 AM VSCHLONGA

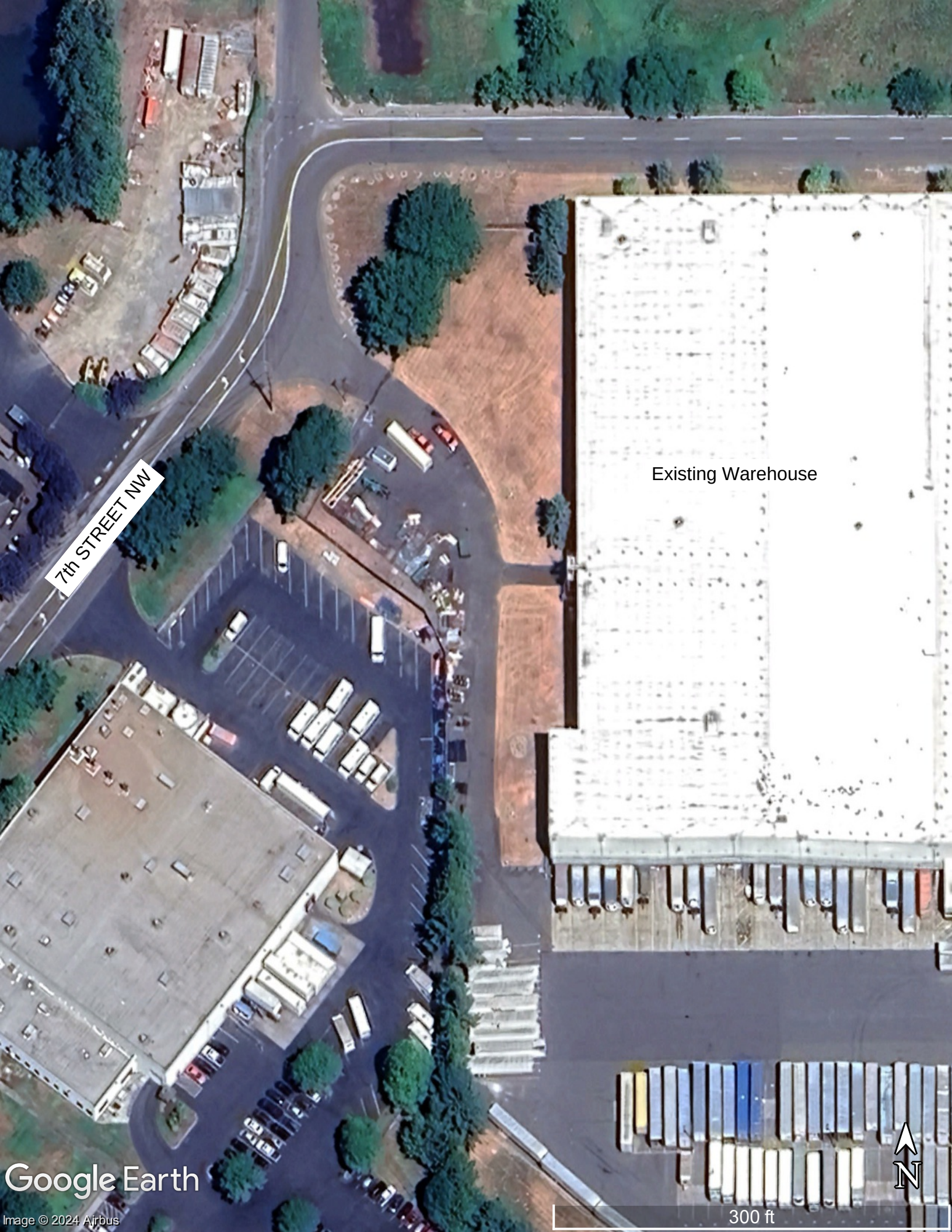
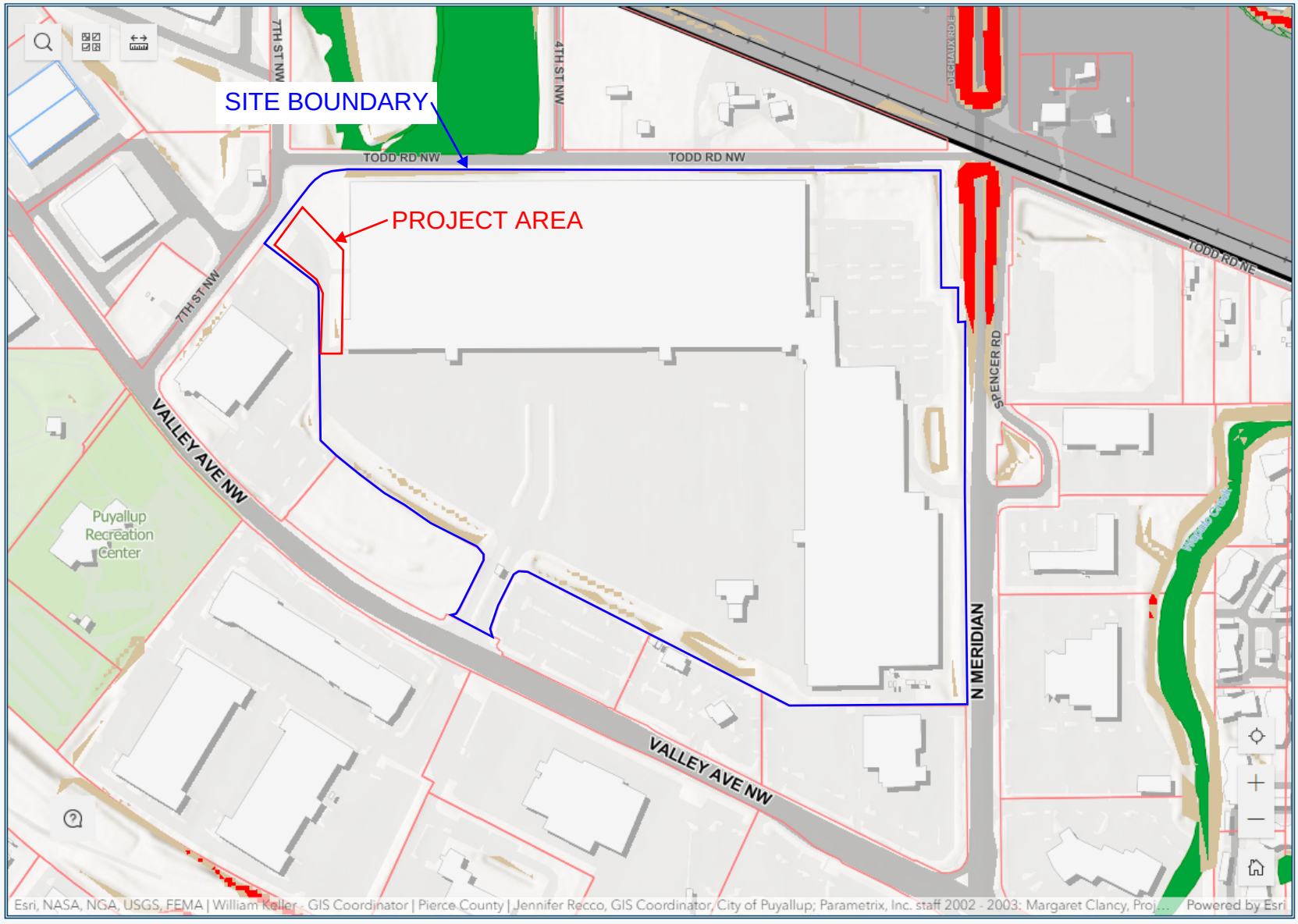

7th STREET NW
Existing Warehouse
Google Earth
Image © 2024 Airbus
N
300 ft

Figure 3
Critical Areas
Map

City of Puyallup Public Data Viewer



Legend

Environment

Potential Landslide Hazard

- High
- Moderate

Wetlands

- Field-verified Delineated
- Field-verified
- Unverified
- Unverified
- Unverified
- Buffer
- Mitigation Site

Parcels

Tax Parcels

- Base Parcel
- Condominium
- Condominium
- Other
- Other
- Other
- Other

Figure 4
FEMA Flood
Map

National Flood Hazard Layer FIRMette

FEMA

122°18'12"W 47°12'50"N

122°17'35"W 47°12'26"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/23/2024 at 7:22 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Tab 2.0

2.0 MINIMUM REQUIREMENTS SUMMARY

Per Figure 1-3.1 and 1-3.2 of the 2019 Department of Ecology Stormwater Management Manual for Western Washington (the Manual), minimum requirements #1 through #9 apply to this project. Minimum requirements (MRs) as listed in the Manual are listed in this section.

MR1 - Preparation of Stormwater Site Plans.

This report and the prepared construction drawings satisfy this requirement.

MR2 - Construction Stormwater Pollution Prevention Plan (SWPPP)

A SWPPP has been prepared and is included as Appendix A.

MR3 - Source Control of Pollution

Source Control BMPs will continue to be implemented on the site as they are in the existing conditions. The project does not propose any change to the use of the site.

MR4 - Preservation of Natural Drainage Systems and Outfalls

The existing site stormwater system will remain intact and unmodified. It will continue to discharge to the existing City stormwater conveyance system in Valley Avenue NW, ultimately discharging to the Puyallup River.

MR5 - On-Site Stormwater Management

The project discharges to a flow control exempt waterbody (Puyallup River), therefore List #3 is applied to this minimum requirement.

BMP T5.13: Post-Construction Soil Quality and Depth – This BMP will be applied to all disturbed lawn and landscape areas.

BMP T5.10A: Downspout Full Infiltration – Onsite soils are not suitable for infiltration. Per the Geotechnical Response Letter, the area near the new truck entrance has fill soils that were placed without geotechnical supervision since test pits encountered concrete and metal debris. Fill material cannot be used for infiltration if the fill was not placed and compacted with geotechnical supervision.

BMP T5.10B: Downspout Dispersion Systems – The proposed guard shack is adjacent to pavement. Providing adequate space for dispersion is not feasible.

BMPT 5.10C: Perforated Stub-Out Connections – Onsite soils are not suitable for infiltration.

BMP T5.12: Sheet Flow Dispersion and BMP T5.11: Concentrated Flow Dispersion – The paved area contains existing catch basins that receive all runoff. It is not feasible to provide any space for dispersion before runoff directly enters the conveyance system.

MR6 - Runoff Treatment

Runoff treatment for the project will be provided by a proposed Contech Stormfilter. The sizing of the stormfilter is provided with this report. See Section 4.4 and Figure 8.

MR7 - Flow Control

No flow control is proposed or required for this site. The site discharges through manmade conveyances all the way to the Puyallup River; therefore, flow control is not required.

MR8 - Wetlands Protection

There are no wetlands on this site.

MR9 - Operation and Maintenance

A new Contech Stormfilter is proposed. The Operations and Maintenance Manual is attached as Appendix D.

Figure 5
Minimum
Requirements
Flowchart

Figure I-3.1: Flow Chart for Determining Requirements for New Development

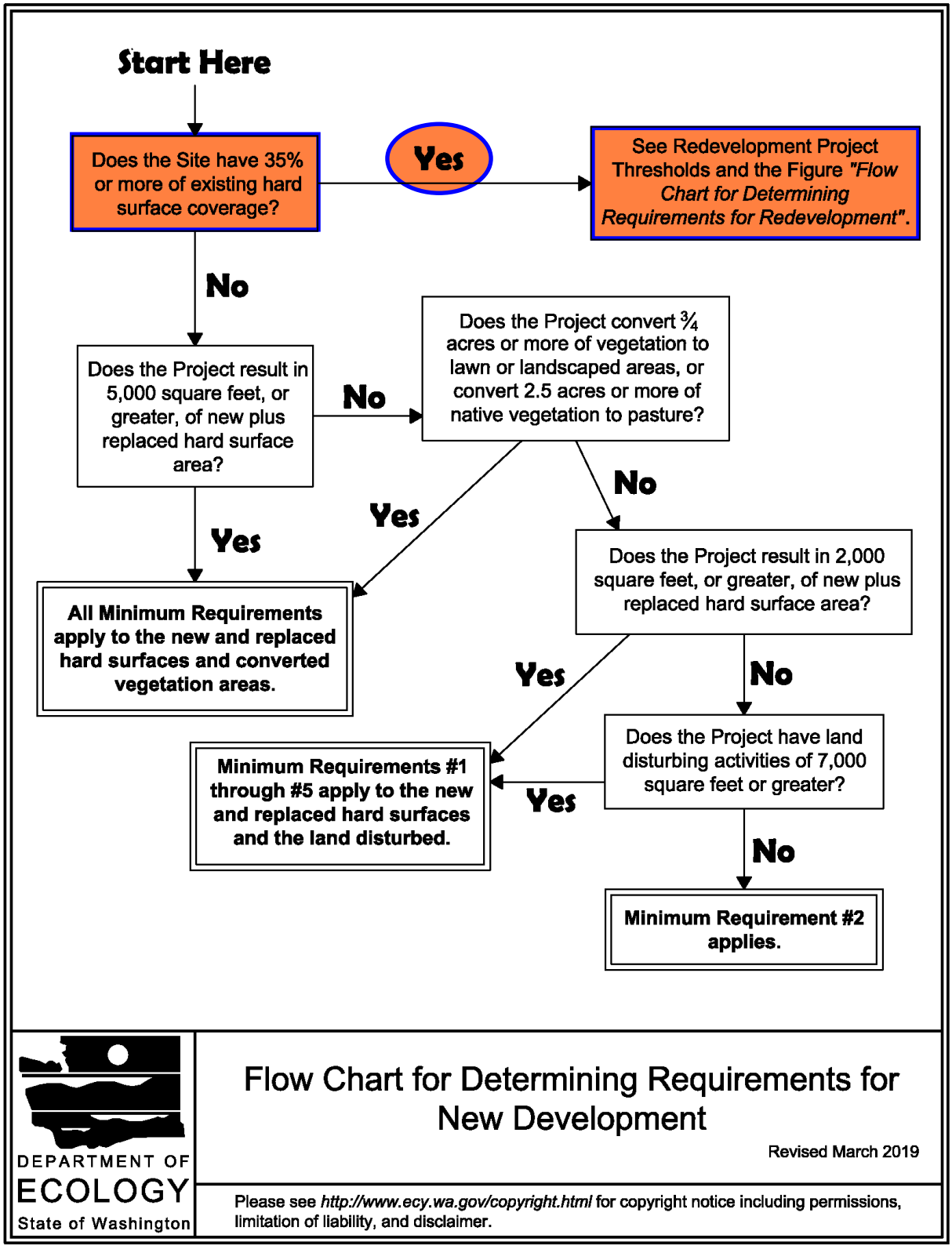
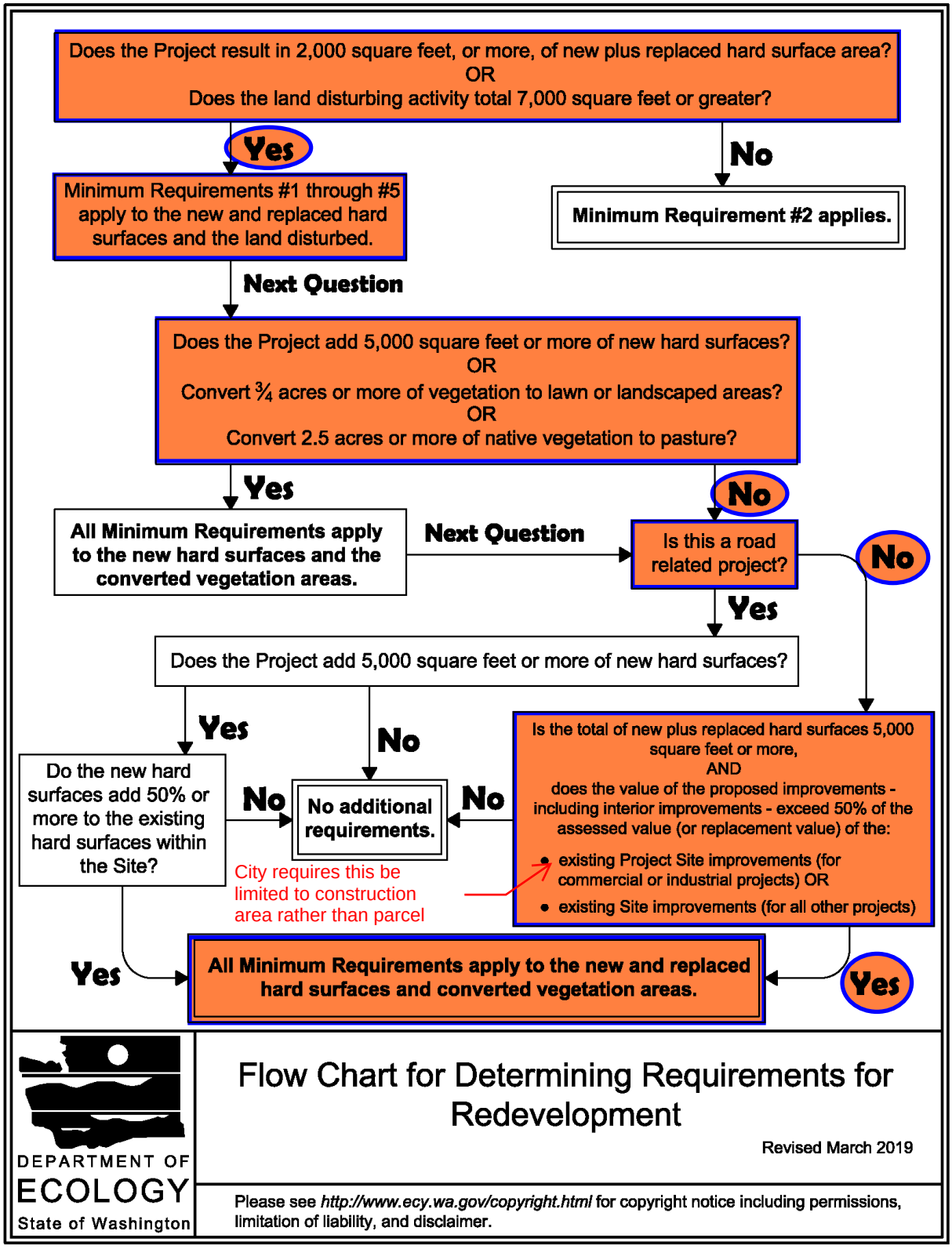


Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment



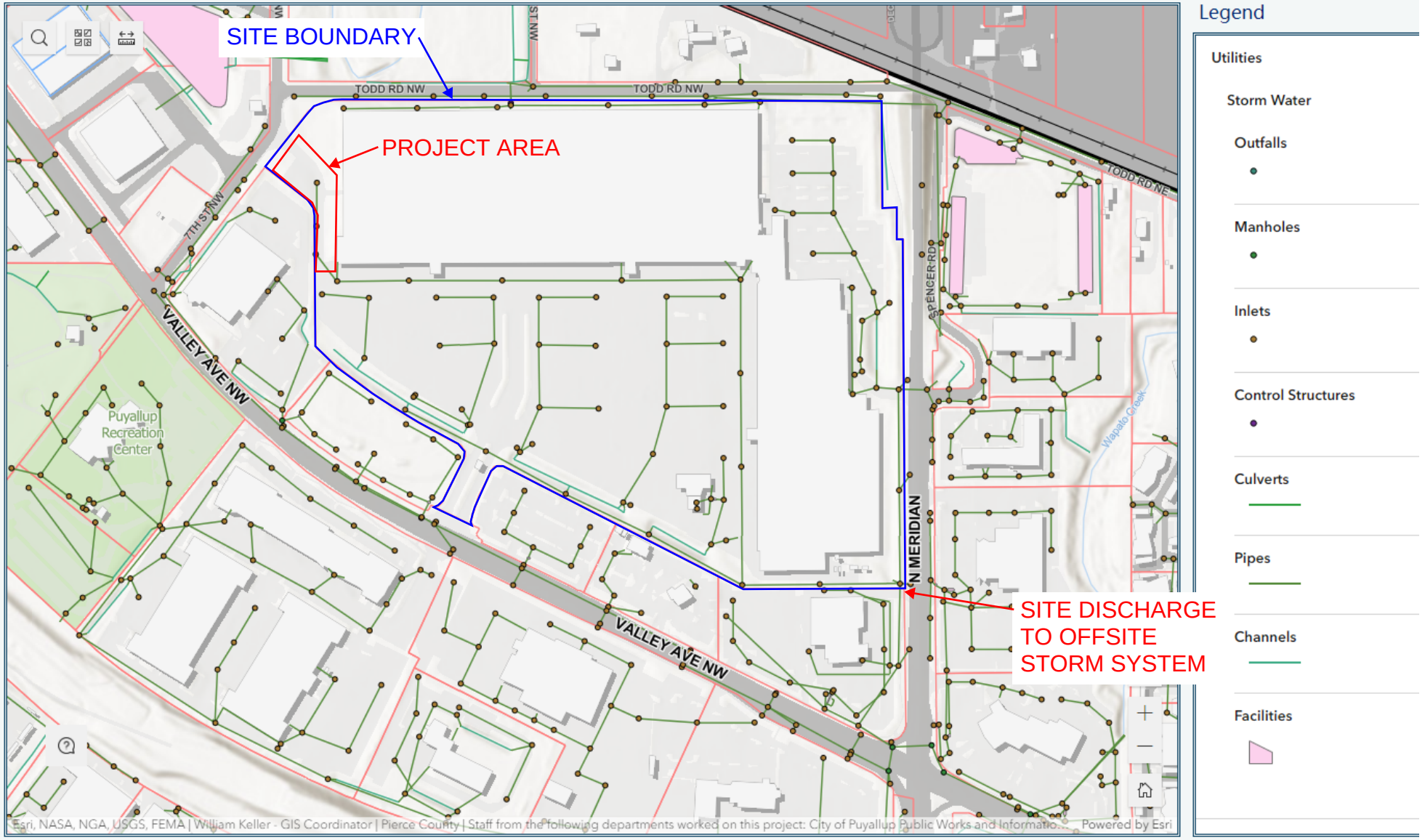
Tab 3.0

3.0 OFF-SITE ANALYSIS

The project site drains to existing onsite stormwater catch basins and piping, which discharge into the public stormwater system in Valley Avenue NW, ultimately discharging to the Puyallup River. See Figure 6 for a map of the downstream system as shown by City of Puyallup GIS. We are not aware of any known drainage issues with the existing downstream drainage system.

Figure 6
Downstream
Drainage
Map

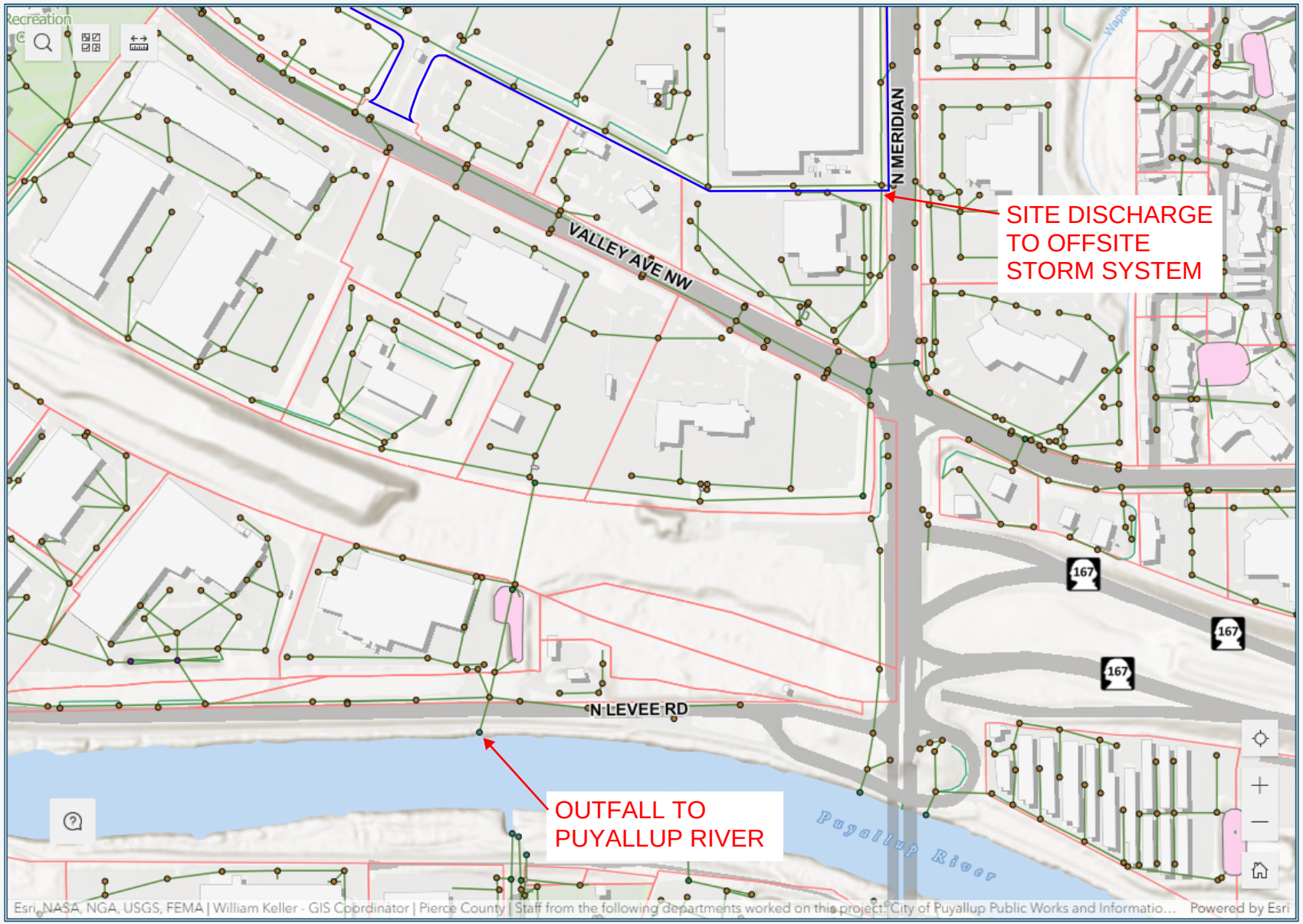
City of Puyallup Public Data Viewer



Legend

- Utilities
  - Storm Water
    - Outfalls
    - Manholes
    - Inlets
    - Control Structures
    - Culverts
    - Pipes
    - Channels
    - Facilities

City of Puyallup Public Data Viewer



Legend

- Utilities
  - Storm Water
    - Outfalls
    - Manholes
    - Inlets
    - Control Structures
    - Culverts
    - Pipes
    - Channels
    - Facilities

Tab 4.0

4.0 FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

4.1 Existing Site Hydrology

The predeveloped site condition for the site (0.38 acres) is paved with limited landscaping. In accordance with soil characteristics described in the geotechnical report prepared for this project, existing site soils are modeled as Type C. The total area of the predeveloped basin is 8.41 acres. See Figure 7.

Basin ID	Existing Basin Area	
Basin A	8.41 acres	1.92 ac impervious 6.20 ac roof 0.29 ac pervious

4.2 Developed Site Hydrology

The proposed improvements include 2035 SF of added impervious area. The total basin area of the developed basin remains as 8.41 acres. The pervious surface is modeled as lawn.

Basin ID	Basin Area	
Basin A	8.41 acres	1.97 ac impervious 6.20 ac roof 0.24 ac pervious

4.3 Flow Control System

Flow control is not required for this site as it discharges through manmade conveyances all the way to the Puyallup River.

4.4 Water Quality System

For commercial development, enhanced water quality treatment is required. Since this site discharges directly to the Puyallup River and the Puyallup River is a basic water quality treatment receiving water, only basic water quality is required.

There are two existing biofiltration swale 'A' from the previous site development that treat most of the site. These are not going to be treating the project area as the existing storm system doesn't route the project area to these swales. Instead, a Contech Stromfilter is proposed and will provide basic treatment.

Using equivalent areas, the new plus replaced hard surface proposed is less than the pollution generating hard surface (PGIS) area that will go to the stormfilter. The new plus replaced area is 0.37 acres while the PGIS is 0.45 acres. The total area being treated is 0.87 acres.

Please refer to Figure 8 for the stormfilter sizing calculations and basin map.

4.5 Wetland Protection

There are no wetlands within the project site so wetland protection is not required.

Figure 7
Proposed
Development
Plans

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

SITE IMPROVEMENT PLANS
CIVIL COVER SHEET

CONSTRUCTION SEQUENCE:

1. HOLD A PRECONSTRUCTION MEETING WITH THE CITY AND OBTAIN REQUIRED PERMITS.
2. INSTALL CATCH BASIN INLET PROTECTION AND OTHER EROSION CONTROL DEVICES AS SHOWN.
3. INSTALL TEMPORARY TREE PROTECTION FENCING.
4. SCHEDULE AN EROSION CONTROL INSPECTION WITH THE CITY.
5. NO UNCONTROLLED SURFACE WATER SHALL BE ALLOWED TO LEAVE THE SITE OR BE DISCHARGED TO A CRITICAL AREA AT ANY TIME DURING THE GRADING OPERATIONS.
6. GRADE SITE AND INSTALL UTILITIES PER PLANS.
7. INSTALL PAVING.
8. INSPECT AND MAINTAIN ALL BMP'S UNTIL SITE IS STABILIZED.

SURVEY DATA:

HORIZONTAL DATUM:
WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE NAD 83/91

BASIS OF BEARINGS:
NORTH 51°55'28" WEST, AS MEASURED BETWEEN WSDOT MONUMENTS ID 3194 (GP27167-76) AND 3193 (GP27167-75).

VERTICAL DATUM:
NAVD88

VERTICAL BENCHMARK:
WSDOT MONUMENT ID 3194 (GP27167-76), BEING THE TOP OF A FOUND 3" BRASSIE IN CONCRETE, APPROXIMATELY 14' WEST OF THE WEST EDGE OF FREEEMAN ROAD AT SW QUADRANT OF INTERSECTION WITH RAILROAD ELEV.=30.17 US FEET

ADDRESS:
2200 N MERIDIAN, PUYALLUP, WA 98371

TAX PARCEL NUMBER:
0420215004

REFERENCE SURVEYS:
R.O.S. REC. NO. 200709255006
R.O.S., REC. NO. 9906075005
CITY OF PUYALLUP SP 94-81-005, REC. NO. 9405100543

DATE OF SURVEY:
THIS SURVEY REPRESENTS VISIBLE PHYSICAL IMPROVEMENT CONDITIONS EXISTING ON JANUARY 8, 2023. ALL SURVEY CONTROL INDICATED AS "FOUND" WAS RECOVERED FOR THIS PROJECT IN JANUARY OF 2023.

HORIZONTAL CONTROL / SURVEY NOTE:

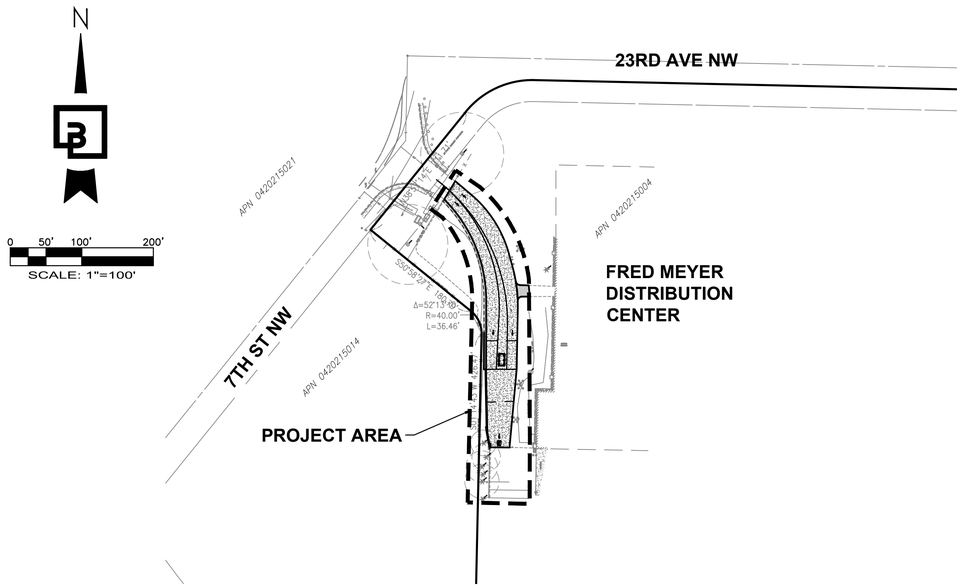
1. CONTRACTOR SHALL OBTAIN SERVICES OF A LICENSED LAND SURVEYOR TO STAKE HORIZONTAL AND VERTICAL CONTROL FOR ALL NEW IMPROVEMENTS. CONTRACTOR SHALL CONTACT BARGHAUSEN CONSULTING ENGINEERS, INC. TO OBTAIN ELECTRONIC CAD FILES FOR STAKING PURPOSES.
2. UNDERGROUND UTILITIES AND FEATURES DEPICTED HERON ARE BASED ON FIELD OBSERVATION, MARKINGS, DEVELOPMENT PLANS, AND/OR BEST AVALIBLE RECORD DOCUMENTS ONLY. CONTRACTOR SHALL FIELD VERIFY SIZE AND TYPE OF EXISTING UTILITIES PRIOR TO CONSTRUCTION. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF BARGHAUSEN CONSULTING ENGINEERS, INC. PRIOR TO WORK.

SOILS REPORT NOTES

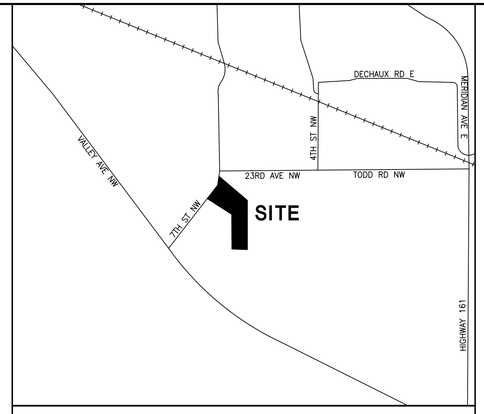
1. THE FOLLOWING SOILS REPORTS/ASSESSMENTS WERE PREPARED FOR THE SITE:
   A. GEOTECHNICAL EXPLORATION AND RECOMMENDATION, REPORT NO. 2017-206-2
   FRED MEYER DISTRIBUTION CENTER
   2200 NORTH MERIDIAN
   PUYALLUP, WASHINGTON

   PREPARED BY:
   THE RILEY GROUP
   17522 BOTHELL WAY NORTHEAST
   BOTHELL, WASHINGTON 98011
   PH: 425.415.0551
   DATED APRIL 9, 2024
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL PROVISIONS OF THE SOILS REPORT FOR THE SITE BE OBSERVED AND COMPLIED WITH DURING ALL PHASES OF THE SITE PREPARATION, GRADING OPERATIONS, AND PAVING CONSTRUCTION.
3. ANY PROVISIONS OF THE SOILS REPORT WHICH CONFLICT WITH INFORMATION SHOWN ELSEWHERE ON THESE DRAWINGS, OR WHICH REQUIRE FURTHER CLARIFICATION, SHALL BE BROUGHT TO THE ATTENTION OF BARGHAUSEN ENGINEERS.
4. A REPRESENTATIVE FOR THE SOILS ENGINEER SHALL OBSERVE AND APPROVE THE EARTHWORK OPERATIONS AND TO VERIFY FIELD CONDITIONS AS WORK PROCEEDS. THE SOILS ENGINEER SHALL SUBMIT FIELD REPORTS CERTIFYING THAT THE METHODS AND MATERIALS OF THE EARTHWORK OPERATIONS WERE IN ACCORDANCE WITH THE RECOMMENDATION OF THE SOILS INVESTIGATION AND THAT THE WORK WAS PERFORMED TO THE SATISFACTION OF THE ENGINEER. THE CONTRACTOR SHALL MAKE ALL PROVISIONS FOR SOILS INSPECTIONS AS RECOMMENDED WITHIN SOILS REPORT. AS A MINIMUM, THIS INCLUDES THE OBSERVATION OF THE FOLLOWING BY A SOILS ENGINEER:

   a. EXCAVATION TO REMOVE THE SILT AND FILL FROM THE PROPOSED PAVING LIMITS.
   b. SUBGRADE PREPARATION OF PAVEMENT SECTION,
   d. SUITABLE REUSE OF EXISTING ONSITE SOILS.
5. THE CONTRACTOR SHALL QUALIFY ANY LIMITATIONS TO SOILS INSPECTIONS WITHIN BID PROPOSAL.



SITE MAP
1"=100'



VICINITY MAP PUYALLUP,WASHINGTON

UTILITY CONFLICT NOTE:

CAUTION:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION, AND DEPTH OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT BY POTHOLING THE UTILITIES AND SURVEYING THE HORIZONTAL AND VERTICAL LOCATION PRIOR TO CONSTRUCTION. THIS SHALL INCLUDE CALLING UTILITY LOCATE @ 811 AND THEN POTHOLING ALL OF THE EXISTING UTILITIES AT LOCATIONS OF NEW UTILITY CROSSINGS TO PHYSICALLY VERIFY WHETHER OR NOT CONFLICTS EXIST. LOCATIONS OF SAID UTILITIES AS SHOWN ON THESE PLANS ARE BASED UPON THE UNVERIFIED PUBLIC INFORMATION AND ARE SUBJECT TO VARIATION. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.

CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR OBTAINING PERMITS FROM THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES FOR REMOVING AND REPLACING ALL SURVEY MONUMENTATION THAT MAY BE AFFECTED BY CONSTRUCTION ACTIVITY, PURSUANT TO WAC 332-120. APPLICATIONS MUST BE COMPLETED BY A REGISTERED LAND SURVEYOR. APPLICATIONS FOR PERMITS TO REMOVE MONUMENTS MAY BE OBTAINED FROM THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES, OR BY CONTACTING THEIR OFFICE BY TELEPHONE AT (360) 902-1190.

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
PUBLIC LAND SURVEY OFFICE
801 88th AVE S.E.
OLYMPIA, WASHINGTON 98501-7019

UPON COMPLETION OF CONSTRUCTION, ALL MONUMENTS DISPLACED, REMOVED, OR DESTROYED SHALL BE REPLACED BY A REGISTERED LAND SURVEYOR, AT THE COST AND AT THE DIRECTION OF THE CONTRACTOR, PURSUANT TO THESE REGULATIONS. THE APPROPRIATE FORMS FOR REPLACEMENT OF SAID MONUMENTATION SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR.

SITE ADDRESS

2200 N MERIDIAN
PUYALLUP, WA 98837

INDEX OF SHEETS:

TAX PARCEL NUMBER

0420215004

ZONING

ML – LIMITED MANUFACTURING

OWNER/APPLICANT

DOUG HARDY
WEST REGION ENGINEER – KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

CIVIL ENGINEER:

BARGHAUSEN CONSULTING ENGINEERS
18215 72ND AVENUE SOUTH
KENT, WA. 98032
(425) 251-6222
JASON HUBBELL
EMAIL: jhubbell@barghausen.com

GEOTECHNICAL ENGINEER:

THE RILEY GROUP, LLC.
17522 BOTHELL WAY NE
BOTHELL, WA. 98011
(425) 415-0551
ERIC L. WOODS, LG
EMAIL: ewoods@riley-group.com

SITE SURVEYOR:

BARGHAUSEN CONSULTING ENGINEERS
18215 72ND AVENUE SOUTH
KENT, WA. 98032
(425) 251-6222
RYAN LEE
EMAIL: rlee@barghausen.com

PROJECT INFO:

TOTAL SITE AREA= 346,555 SF
TOTAL IMPERVIOUS AREA= 289,069 SF (83.4%)
TOTAL PERVIOUS AREA= 57,486 SF (16.6%)

UTILITIES/SERVICES

STORM/SEWER/WATER:
CITY OF PUYALLUP WATER DIVISION
1100 39TH AVE. SE
PUYALLUP, WA 98374
(253) 841-5505

POWER:
PUGET SOUND ENERGY
8001 SOUTH 212TH STREET
KENT, WA 98032
(253) 395-7065

GAS:
PUGET SOUND ENERGY
8001 SOUTH 212TH STREET
KENT, WA 98032
(253) 395-7065

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

ESTIMATED EARTHWORK VOLUMES:

(FOR PERMITTING ONLY. NOT FOR BID PURPOSES)

CUT/EXPORT	=800 CY
FILL/IMPORT	= 800 CY
TOTAL EARTHWORK	= 1600 CY

IMPERVIOUS SURFACE CALCULATIONS:

DISTURBED AREA	= 16,000 SF
EXISTING AND NEW IMPERVIOUS AREA	= 16,000 SF
PERVIOUS AREA REMOVED/ CONVERTED TO IMPERVIOUS AREA	= 2,035 SF

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: SITE IMPROVEMENT PLANS
CIVIL COVER SHEET

FRED MEYER - DISTRIBUTION CENTER

For: DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=100' Vertical N/A

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C1 of 7

P:\18000s\18510\engineering\2024 CIVIL SET\18510-0.dwg 4/17/2025 3:14 PM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

NOTES AND LEGEND

STORMWATER NOTES:

1. ALL WORK IN CITY RIGHT-OF-WAY REQUIRES A PERMIT FROM THE CITY OF PUYALLUP. PRIOR TO ANY WORK COMMENCING, THE GENERAL CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING AT THE DEVELOPMENT SERVICES CENTER TO BE ATTENDED BY ALL CONTRACTORS THAT WILL PERFORM WORK SHOWN ON THE ENGINEERING PLANS, REPRESENTATIVES FROM ALL APPLICABLE UTILITY COMPANIES, THE PROJECT OWNER AND APPROPRIATE CITY STAFF. CONTACT ENGINEERING SERVICES TO SCHEDULE THE MEETING (253) 841-5568. THE CONTRACTOR IS RESPONSIBLE TO HAVE THEIR OWN APPROVED SET OF PLANS AT THE MEETING.
2. AFTER COMPLETION OF ALL ITEMS SHOWN ON THESE PLANS AND BEFORE ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBTAIN A "PUNCH LIST" PREPARED BY THE CITY'S INSPECTOR DETAILING REMAINING ITEMS OF WORK TO BE COMPLETED. ALL ITEMS OF WORK SHOWN ON THESE PLANS SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY PRIOR TO ACCEPTANCE OF THE WATER SYSTEM AND PROVISION OF SANITARY SEWER SERVICE.
3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS"), WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND AMERICAN PUBLIC WORKS ASSOCIATION, WASHINGTON STATE CHAPTER, LATEST EDITION, UNLESS SUPERSEDED OR AMENDED BY THE CITY OF PUYALLUP CITY STANDARDS FOR PUBLIC WORKS ENGINEERING AND CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "CITY STANDARDS").
4. A COPY OF THESE APPROVED PLANS AND APPLICABLE CITY DEVELOPER SPECIFICATIONS AND DETAILS SHALL BE ON SITE DURING CONSTRUCTION.
5. ANY REVISIONS MADE TO THESE PLANS MUST BE REVIEWED AND APPROVED BY THE DEVELOPER'S ENGINEER AND THE ENGINEERING SERVICES STAFF PRIOR TO ANY IMPLEMENTATION IN THE FIELD. THE CITY SHALL NOT BE RESPONSIBLE FOR ANY ERRORS AND/OR OMISSIONS ON THESE PLANS.
6. THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL (811) AT LEAST TWO WORKING DAYS IN ADVANCE. THE OWNER AND HIS/HER ENGINEER SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT EXISTS.
7. ANY STRUCTURE AND/OR OBSTRUCTION WHICH REQUIRE REMOVAL OR RELOCATION RELATING TO THIS PROJECT, SHALL BE DONE SO AT THE DEVELOPER'S EXPENSE.
8. DURING CONSTRUCTION, ALL EXISTING AND NEWLY INSTALLED DRAINAGE STRUCTURES SHALL BE PROTECTED FROM SEDIMENTS.
9. ALL STORM MANHOLES SHALL CONFORM TO CITY STANDARD DETAIL NO. 02.01.01. FLOW CONTROL MANHOLE/OIL WATER SEPARATOR SHALL CONFORM TO CITY STANDARD DETAIL NO. 02.01.06 AND 02.01.07.
10. MANHOLE RING AND COVER SHALL CONFORM TO CITY STANDARD DETAIL 06.01.02.
11. CATCH BASINS TYPE I SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.02 AND 02.01.03 AND SHALL BE USED ONLY FOR DEPTHS LESS THAN 5 FEET FROM TOP OF THE GRATE TO THE INVERT OF THE STORM PIPE.
12. CATCH BASINS TYPE II SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.04 AND SHALL BE USED FOR DEPTHS GREATER THAN 5 FEET FROM TOP OF THE GRATE TO THE INVERT OF THE STORM PIPE.
13. CAST IRON OR DUCTILE IRON FRAME AND GRATE SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.05. GRATE SHALL BE MARKED WITH "DRAINS TO STREAM". SOLID CATCH BASIN LIDS (SQUARE UNLESS NOTED AS ROUND) SHALL CONFORM TO WSDOT STANDARD PLAN B-30.20-04 (OLYMPIC FOUNDRY NO. SM60 OR EQUAL). VANED GRATES SHALL CONFORM TO WSDOT STANDARD PLAN B-30.30-03 (OLYMPIC FOUNDRY NO. SM60V OR EQUAL).
14. STORMWATER PIPE SHALL BE ONLY PVC, CONCRETE, DUCTILE IRON, OR DUAL WALLED POLYPROPYLENE PIPE.
    A. THE USE OF ANY OTHER TYPE SHALL BE REVIEWED AND APPROVED BY THE ENGINEERING SERVICES STAFF PRIOR TO INSTALLATION.
    B. PVC PIPE SHALL BE PER ASTM D3034, SDR 35 FOR PIPE SIZE 15-INCH AND SMALLER AND F679 FOR PIPE SIZES 18 TO 27 INCH. MINIMUM COVER ON PVC PIPE SHALL BE 3.0 FEET.
    C. CONCRETE PIPE SHALL CONFORM TO THE WSDOT STANDARD SPECIFICATIONS FOR CONCRETE UNDERDRAIN PIPE. MINIMUM COVER ON CONCRETE PIPE SHALL NOT LESS THAN 3.0 FEET.
    D. DUCTILE IRON PIPE SHALL BE CLASS 50, CONFORMING TO AWWA C151. MINIMUM COVER ON DUCTILE IRON PIPE SHALL BE 1.0 FOOT.
    E. POLYPROPYLENE PIPE (PP) SHALL BE DUAL WALLED, HAVE A SMOOTH INTERIOR AND EXTERIOR CORRUGATIONS AND MEET WSDOT 9-05.24(1). 12-INCH THROUGH 30-INCH PIPE SHALL MEET OR EXCEED ASTM F2736 AND AASHTO M330, TYPE S, OR TYPE D. 36-INCH THROUGH 60-INCH PIPE SHALL MEET OR EXCEED ASTM F2881 AND AASHTO M330, TYPE S, OR TYPE D. TESTING SHALL BE PER ASTM F1417. MINIMUM COVER OVER POLYPROPYLENE PIPE SHALL BE 3-FEET.
15. TRENCHING, BEDDING, AND BACKFILL FOR PIPE SHALL CONFORM TO CITY STANDARD DETAIL NO. 06.01.01.
16. STORM PIPE SHALL BE A MINIMUM OF 10 FEET AWAY FROM BUILDING FOUNDATIONS AND/OR ROOF LINES.
17. ALL STORM DRAIN MAINS SHALL BE TESTED AND INSPECTED FOR ACCEPTANCE AS OUTLINED IN SECTION 406 OF THE CITY OF PUYALLUP SANITARY SEWER SYSTEM STANDARDS.
18. ALL TEMPORARY SEDIMENTATION AND EROSION CONTROL MEASURES, AND PROTECTIVE MEASURES FOR CRITICAL AREAS AND SIGNIFICANT TREES SHALL BE INSTALLED PRIOR TO INITIATING ANY CONSTRUCTION ACTIVITIES.

GRADING, EROSION AND SEDIMENTATION CONTROL NOTES:

1. ALL WORK IN CITY RIGHT-OF-WAY REQUIRES A PERMIT FROM THE CITY OF PUYALLUP. PRIOR TO ANY WORK COMMENCING, THE GENERAL CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING AT THE DEVELOPMENT SERVICES CENTER TO BE ATTENDED BY ALL CONTRACTORS THAT WILL PERFORM WORK SHOWN ON THE ENGINEERING PLANS, REPRESENTATIVES FROM ALL APPLICABLE UTILITY COMPANIES, THE PROJECT OWNER AND APPROPRIATE CITY STAFF. CONTACT ENGINEERING SERVICES TO SCHEDULE THE MEETING (253) 841-5568. THE CONTRACTOR IS RESPONSIBLE TO HAVE THEIR OWN APPROVED SET OF PLANS AT THE MEETING.
2. AFTER COMPLETION OF ALL ITEMS SHOWN ON THESE PLANS AND BEFORE ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBTAIN A "PUNCH LIST"PREPARED BY THE CITY'S INSPECTOR DETAILING REMAINING ITEMS OF WORK TO BE COMPLETED. ALL ITEMS OF WORK SHOWN ON THESE PLANS SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY PRIOR TO ACCEPTANCE OF THE WATER SYSTEM AND PROVISION OF SANITARY SEWER SERVICE.
3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS"), WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND AMERICAN PUBLIC WORKS ASSOCIATION, WASHINGTON STATE CHAPTER, LATEST EDITION, UNLESS SUPERSEDED OR AMENDED BY THE CITY OF PUYALLUP CITY STANDARDS FOR PUBLIC WORKS ENGINEERING AND CONSTRUCTION (HERINAFTER REFERRED TO AS THE "CITY STANDARDS").
4. A COPY OF THESE APPROVED PLANS AND APPLICABLE CITY DEVELOPER SPECIFICATIONS AND DETAILS SHALL BE ON SITE DURING CONSTRUCTION.
5. ANY REVISIONS MADE TO THESE PLANS MUST BE REVIEWED AND APPROVED BY THE DEVELOPER'S ENGINEER AND THE CITY ENGINEER PRIOR TO ANY IMPLEMENTATION IN THE FIELD. THE CITY SHALL NOT BE RESPONSIBLE FOR ANY ERRORS AND/OR OMISSIONS ON THESE PLANS.
6. THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL (811) AT LEAST TWO WORKING DAYS HOURS IN ADVANCE. THE OWNER AND HIS/HER ENGINEER SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT EXISTS.
7. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.
8. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITTEE.
9. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITTEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.
10. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.
11. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITTEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.
12. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.
13. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

GENERAL SITE NOTES:

1. THE CONTRACTOR SHALL OBTAIN AND HAVE AVAILABLE COPIES OF THE APPLICABLE GOVERNING AGENCY STANDARDS AT THE JOB SITE DURING THE RELATED CONSTRUCTION OPERATIONS.
2. CONTRACTOR SHALL ENSURE THAT ALL NECESSARY PERMITS HAVE BEEN OBTAINED PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION WHETHER SHOWN ON THESE PLANS OR NOT. UTILITIES OTHER THAN THOSE SHOWN MAY EXIST ON THIS SITE. ONLY THOSE UTILITIES WITH EVIDENCE OF THEIR INSTALLATION VISIBLE AT GROUND SURFACE OR SHOWN ON RECORD DRAWING PROVIDED BY OTHERS ARE SHOWN HEREON. EXISTING UNDERGROUND UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY AND ARE SUBJECT TO A DEGREE OF UNKNOWN VARIATION. SOME UNDERGROUND LOCATIONS SHOWN HEREON MAY HAVE BEEN TAKEN FROM PUBLIC RECORDS. BARGHAUSEN CONSULTING ENGINEERS, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF PUBLIC RECORDS OR RECORDS OF OTHERS. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW ALL OF THE DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THE PROJECT WORK SCOPE PRIOR TO THE INITIATION OF CONSTRUCTION. SHOULD THE CONTRACTOR FIND A CONFLICT WITH THE DOCUMENTS RELATIVE TO THE SPECIFICATIONS OR THE RELATIVE CODES, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE PROJECT ENGINEER OF RECORD IN WRITING PRIOR TO THE START OF CONSTRUCTION. FAILURE BY THE CONTRACTOR TO NOTIFY THE PROJECT ENGINEER SHALL CONSTITUTE ACCEPTANCE OF FULL RESPONSIBILITY BY THE CONTRACTOR TO COMPLETE THE SCOPE OF WORK AS DEFINED BY THE DRAWINGS AND IN FULL COMPLIANCE WITH LOCAL REGULATIONS AND CODES.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE APPROPRIATE UTILITIES INVOLVED PRIOR TO CONSTRUCTION.
6. INSPECTION OF SITE WORK WILL BE ACCOMPLISHED BY A REPRESENTATIVE OF THE GOVERNING JURISDICTION. INSPECTION OF PRIVATE FACILITIES WILL BE ACCOMPLISHED BY A REPRESENTATIVE OF THE OWNER. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE INSPECTOR 24 HOURS IN ADVANCE OF BACKFILLING ALL CONSTRUCTION.
7. PRIOR TO ANY CONSTRUCTION OR DEVELOPMENT ACTIVITY THE CONTRACTOR SHALL CONTACT THE AGENCY AND/OR UTILITY INSPECTION PERSONNEL AND ARRANGE ANY REQUIRED PRE-CONSTRUCTION MEETING(S). CONTRACTOR SHALL PROVIDE ONE WEEK MINIMUM ADVANCE NOTIFICATION TO OWNER, FIELD ENGINEER AND ENGINEER OF PRE-CONSTRUCTION MEETINGS.
8. THE CONTRACTOR IS RESPONSIBLE FOR WORKER AND SITE SAFETY AND SHALL COMPLY WITH THE LATEST OSHA STANDARDS AND REGULATIONS, OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURES. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE "MEANS AND METHODS" REQUIRED TO MEET THE INTENT AND PERFORMANCE CRITERIA OF OSHA, AS WELL AS ANY OTHER ENTITY THAT HAS JURISDICTION FOR EXCAVATION AND/OR TRENCHING PROCEDURES.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED.
10. PROTECTIVE MEASURES SHALL BE TAKEN BY THE CONTRACTOR TO PROTECT ALL ADJACENT PUBLIC AND PRIVATE PROPERTIES AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF ALL EXISTING UTILITY SERVICES THAT ARE TO REMAIN OPERATIONAL WITHIN THE CONSTRUCTION AREA WHETHER SHOWN OR NOT SHOWN ON THE PLANS.
11. TWO (2) COPIES OF THESE APPROVED PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS. ONE (1) SET WITH RECORDS OF AS-BUILT INFORMATION SHALL BE SUBMITTED TO BARGHAUSEN CONSULTING ENGINEERS, INC. AT COMPLETION OF PROJECT.
12. CONTRACTOR SHALL OBTAIN SERVICES OF A LICENSED LAND SURVEYOR TO STAKE HORIZONTAL CONTROL FOR ALL NEW IMPROVEMENTS. STAKING CONTROL SHALL BE TAKEN FROM ELECTRONIC PLAN FILES PROVIDED BY BARGHAUSEN CONSULTING ENGINEERS, INC.
13. CONTRACTOR SHALL REQUEST FROM BARGHAUSEN CONSULTING ENGINEERS, INC., PRIOR TO ANY CONSTRUCTION STAKING OR CONSTRUCTION WORK, A FORMAL CONSTRUCTION RELEASE PLAN SET OR SPECIFIC RELEASE IN WRITING. THE APPROVED AGENCY PERMIT DRAWINGS WILL NOT BE CONSIDERED CONSTRUCTION RELEASE PLANS BY BARGHAUSEN CONSULTING ENGINEERS, INC. UNLESS BARGHAUSEN CONSULTING ENGINEERS, INC. HAS GIVEN A FORMAL WRITTEN RELEASE OR ISSUED A CONSTRUCTION RELEASE PLAN SET.

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
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No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: NOTES AND LEGEND

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal NA Vertical N/A

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen
Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number 18510

Sheet C2 of 7

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

DEMOLITION / TESC PLAN

0 10' 20' 40'

SCALE: 1"=20'

EXISTING LEGEND:

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (AS NOTED)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- BENCHMARK
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER POLE
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- CLEANOUT (AS NOTED)
- GAS METER
- GAS VALVE
- WATER VALVE (WV)
- FIRE HYDRANT(FH) / CONNECTION(FDC)
- WATER MANHOLE
- WATER METER
- BLOW-OFF / AIRVAC
- MONITOR WELL
- SIGN
- DIRECTIONAL ARROW
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- SILT FENCE
- METAL/IRON FENCE
- GUARD RAIL/CABLE FENCE
- WATER LINE
- GAS LINE
- STEAM LINE
- T(XXX) TELEPHONE LINE (OH) OR (UG)
- P(XXX) POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- DECIDUOUS TREE
- CONIFEROUS TREE

DEMOLITION AND EXCAVATION NOTES:

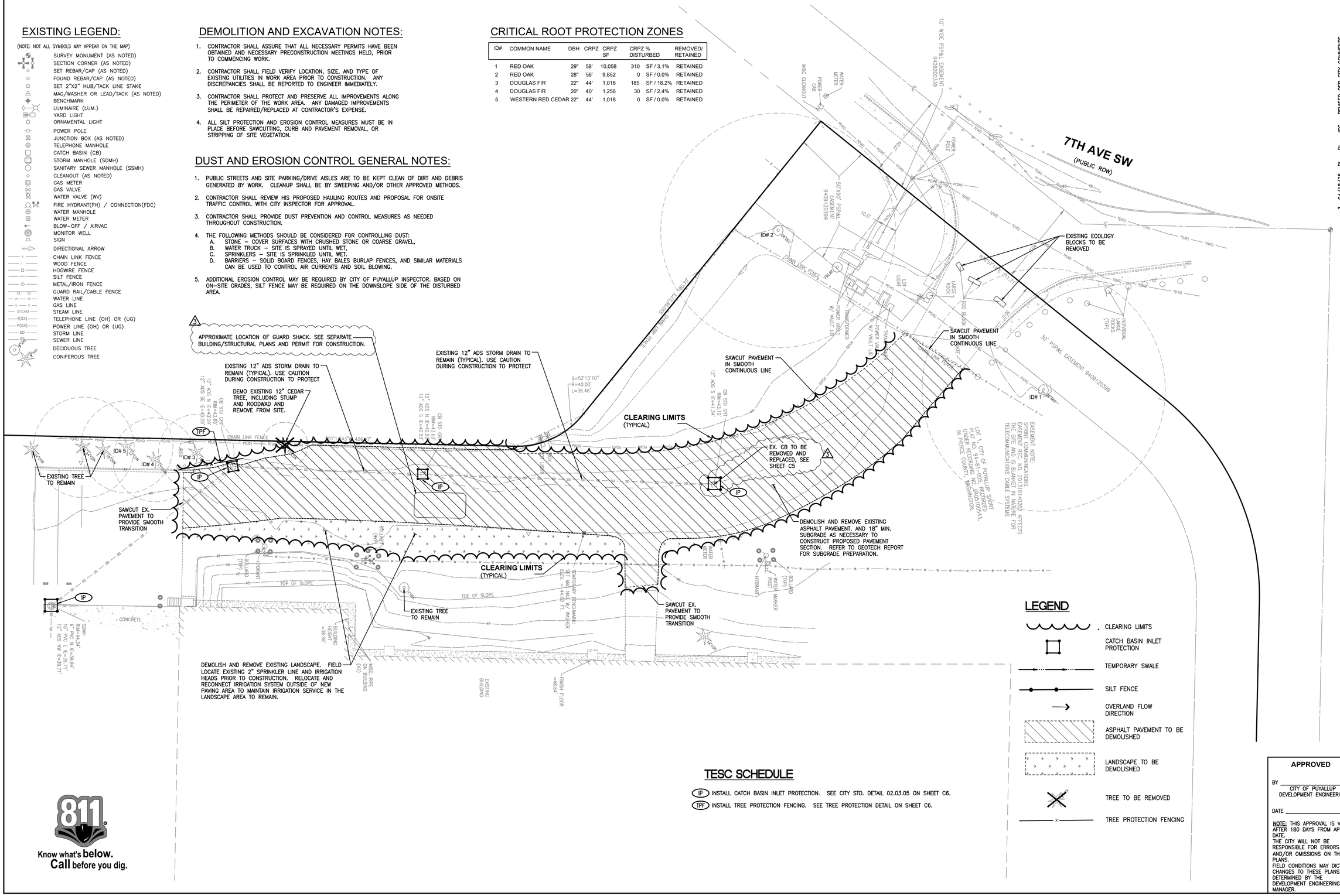
1. CONTRACTOR SHALL ASSURE THAT ALL NECESSARY PERMITS HAVE BEEN OBTAINED AND NECESSARY PRECONSTRUCTION MEETINGS HELD, PRIOR TO COMMENCING WORK.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION, SIZE, AND TYPE OF EXISTING UTILITIES IN WORK AREA PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO ENGINEER IMMEDIATELY.
3. CONTRACTOR SHALL PROTECT AND PRESERVE ALL IMPROVEMENTS ALONG THE PERIMETER OF THE WORK AREA. ANY DAMAGED IMPROVEMENTS SHALL BE REPAIRED/REPLACED AT CONTRACTOR'S EXPENSE.
4. ALL SILT PROTECTION AND EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE SAWCUTTING, CURB AND PAVEMENT REMOVAL, OR STRIPPING OF SITE VEGETATION.

DUST AND EROSION CONTROL GENERAL NOTES:

1. PUBLIC STREETS AND SITE PARKING/DRIVE AISLES ARE TO BE KEPT CLEAN OF DIRT AND DEBRIS GENERATED BY WORK. CLEANUP SHALL BE BY SWEEPING AND/OR OTHER APPROVED METHODS.
2. CONTRACTOR SHALL REVIEW HIS PROPOSED HAULING ROUTES AND PROPOSAL FOR ONSITE TRAFFIC CONTROL WITH CITY INSPECTOR FOR APPROVAL.
3. CONTRACTOR SHALL PROVIDE DUST PREVENTION AND CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.
4. THE FOLLOWING METHODS SHOULD BE CONSIDERED FOR CONTROLLING DUST:
   A. STONE – COVER SURFACES WITH CRUSHED STONE OR COARSE GRAVEL,
   B. WATER TRUCK – SITE IS SPRAYED UNTIL WET,
   C. SPRINKLERS – SITE IS SPRINKLED UNTIL WET,
   D. BARRIERS – SOLID BOARD FENCES, HAY BALES BURLAP FENCES, AND SIMILAR MATERIALS CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.
5. ADDITIONAL EROSION CONTROL MAY BE REQUIRED BY CITY OF PUYALLUP INSPECTOR. BASED ON ON-SITE GRADES, SILT FENCE MAY BE REQUIRED ON THE DOWNSLOPE SIDE OF THE DISTURBED AREA.

CRITICAL ROOT PROTECTION ZONES

ID#	COMMON NAME	DBH	CRPZ	CRPZ SF	CRPZ % DISTURBED	REMOVED/ RETAINED
1	RED OAK	29"	58'	10,058	310 SF / 3.1%	RETAINED
2	RED OAK	28"	56'	9,852	0 SF / 0.0%	RETAINED
3	DOUGLAS FIR	22"	44'	1,018	185 SF / 18.2%	RETAINED
4	DOUGLAS FIR	20"	40'	1,256	30 SF / 2.4%	RETAINED
5	WESTERN RED CEDAR	22"	44'	1,018	0 SF / 0.0%	RETAINED



TESC SCHEDULE

(IP) INSTALL CATCH BASIN INLET PROTECTION. SEE CITY STD. DETAIL 02.03.05 ON SHEET C6.

(TPF) INSTALL TREE PROTECTION FENCING. SEE TREE PROTECTION DETAIL ON SHEET C6.

LEGEND

- CLEARING LIMITS
- CATCH BASIN INLET PROTECTION
- TEMPORARY SWALE
- SILT FENCE
- OVERLAND FLOW DIRECTION
- ASPHALT PAVEMENT TO BE DEMOLISHED
- LANDSCAPE TO BE DEMOLISHED
- TREE TO BE REMOVED
- TREE PROTECTION FENCING

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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

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Title: **DEMOLITION / TESC PLAN**

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JASON GUY HUGHES — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER — 04/18/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

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Job Number 18510

Sheet C3 of 7

P:\18000s\18510\engineering\2024 CIVIL SET\18510-EXCON.dwg 4/18/2025 2:48 PM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

SITE PLAN

N

0 10' 20' 40'

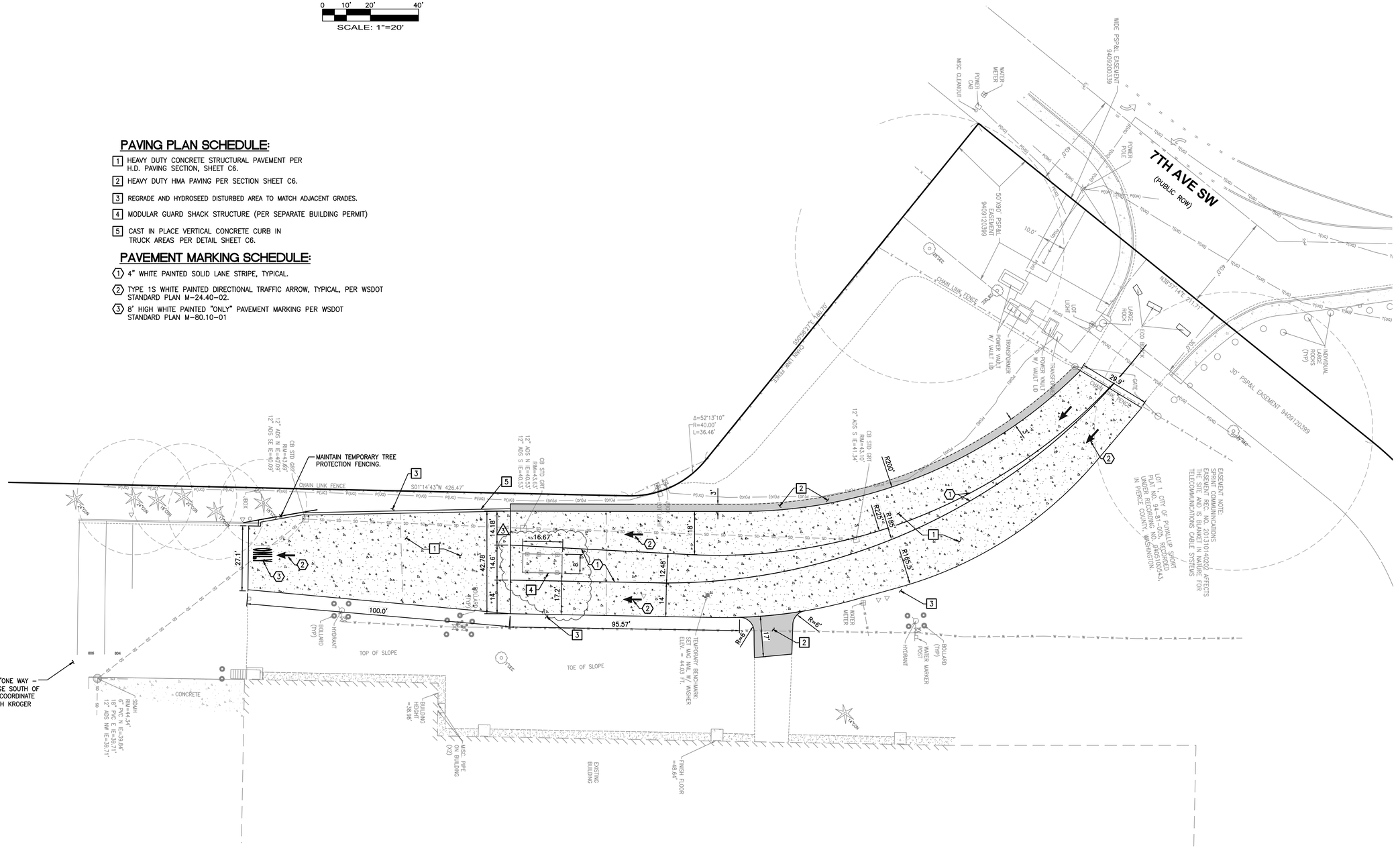
SCALE: 1"=20'

PAVING PLAN SCHEDULE:

1. HEAVY DUTY CONCRETE STRUCTURAL PAVEMENT PER H.D. PAVING SECTION, SHEET C6.
2. HEAVY DUTY HMA PAVING PER SECTION SHEET C6.
3. REGRADE AND HYDROSEED DISTURBED AREA TO MATCH ADJACENT GRADES.
4. MODULAR GUARD SHACK STRUCTURE (PER SEPARATE BUILDING PERMIT)
5. CAST IN PLACE VERTICAL CONCRETE CURB IN TRUCK AREAS PER DETAIL SHEET C6.

PAVEMENT MARKING SCHEDULE:

1. 4" WHITE PAINTED SOLID LANE STRIPE, TYPICAL.
2. TYPE 1S WHITE PAINTED DIRECTIONAL TRAFFIC ARROW, TYPICAL, PER WSDOT STANDARD PLAN M-24.40-02.
3. 8' HIGH WHITE PAINTED "ONLY" PAVEMENT MARKING PER WSDOT STANDARD PLAN M-80.10-01



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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **SITE PLAN**

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBARD — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number **18510**

Sheet **C4** of **7**

P:\18000s\18510\engineering\2024 CIVIL SET\18510-A.dwg 2/17/2025 10:59 AM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

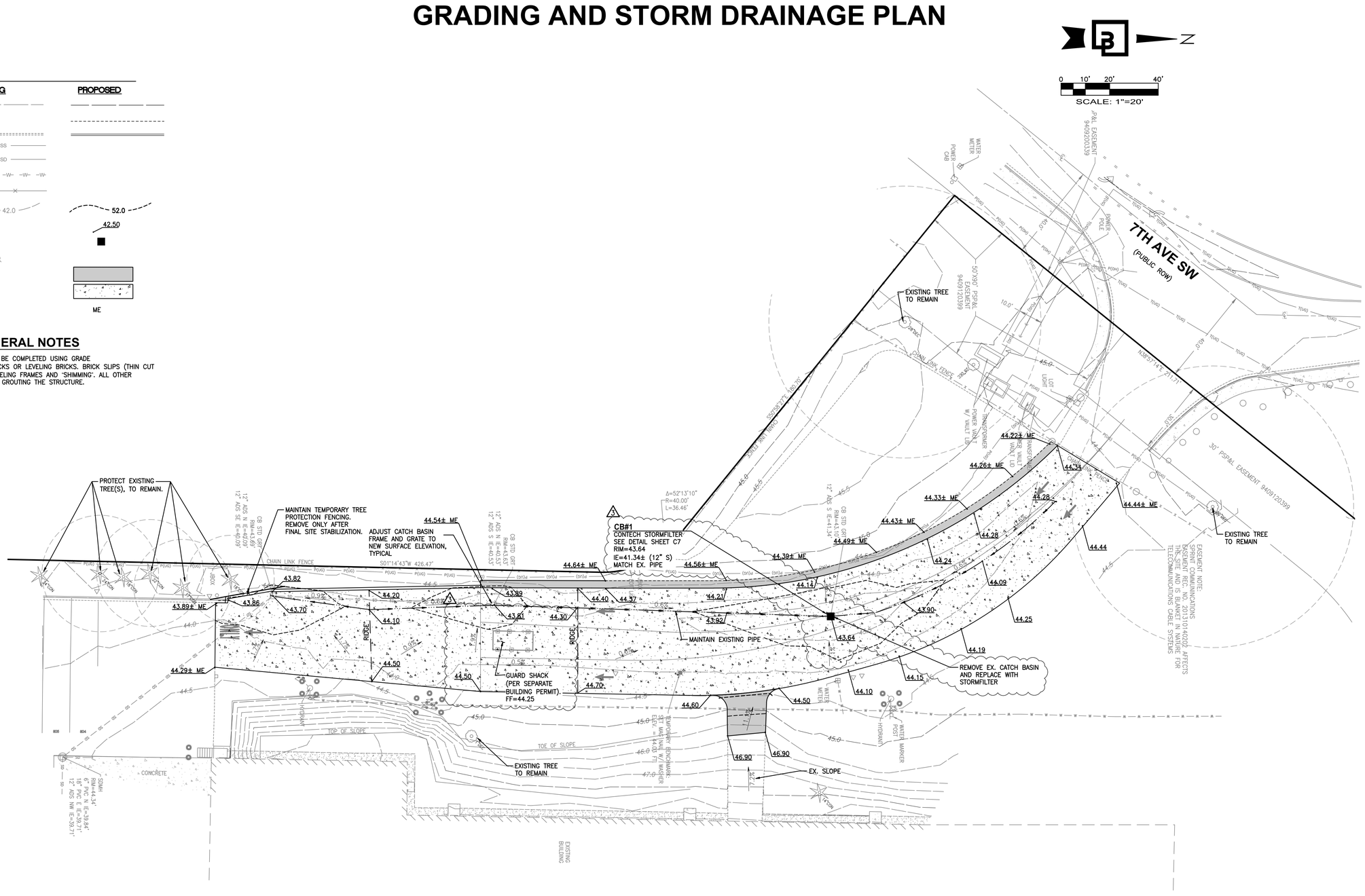
GRADING AND STORM DRAINAGE PLAN

LEGEND

DESCRIPTION	EXISTING	PROPOSED
EASEMENT		
SAWCUT LINE		
CURB		
SANITARY SEWER	SS	
STORM	SD	
WATER	-W-	
FENCE		
GROUND CONTOUR	42.0	52.0
SPOT ELEVATION		42.50
CATCH BASIN (CB)		
FIRE HYDRANT		
ASPHALT PAVEMENT		
CONCRETE PAVEMENT		
MATCH EXISTING ELEVATION		ME

CONSTRUCTION GENERAL NOTES

1. FRAME AND GRATE ADJUSTMENTS SHALL BE COMPLETED USING GRADE RINGS, RISER SECTIONS, AND RISER BRICKS OR LEVELING BRICKS. BRICK SLIPS (THIN CUT RISER BRICKS) MAY BE USED WHEN LEVELING FRAMES AND 'SHIMMING'. ALL OTHER MATERIAL SHALL BE REMOVED PRIOR TO GROUTING THE STRUCTURE.



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

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BY _____
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DEVELOPMENT ENGINEERING

DATE _____

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No.	Date	By	Ckd.	Appr.	Revision
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2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **GRADING AND STORM DRAINAGE PLAN**

FRED MEYER - DISTRIBUTION CENTER

For: **DOUG HARDY**
WEST REGION ENGINEER
KROGER LOGISTICS
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2201 SOUTH WILMINGTON AVE.
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Scale: Horizontal 1"=20' Vertical NA

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Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

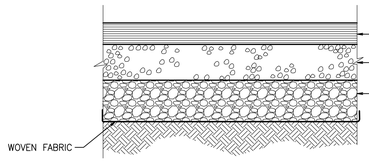
Job Number **18510**

Sheet **C5** of **7**

P:\18000s\18510\engineering\2024 CIVIL SET\18510-GM.dwg 4/18/2025 2:08 PM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

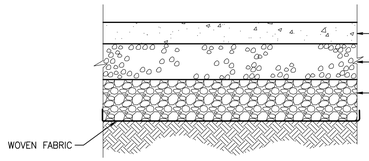
CONSTRUCTION DETAILS



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR HMA, AND CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

ASPHALT PAVEMENT SECTION

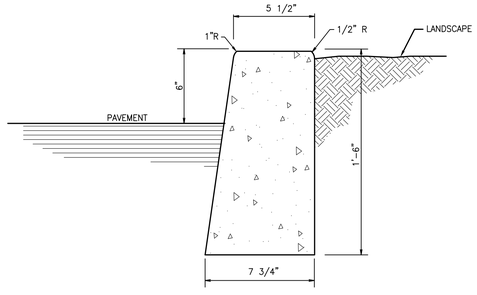
NOT TO SCALE



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

CONCRETE PAVEMENT SECTION

NOT TO SCALE



ONSITE BARRIER CURB

NOT TO SCALE

MATERIALS OF CONSTRUCTION

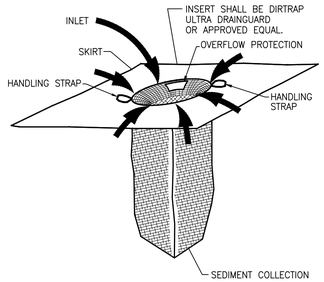
FABRIC:	NEEDLE PUNCHED NON-WOVEN GEOTEXTILE MATERIAL. FABRIC IS IS RESISTANT TO ULTRAVIOLET AND BIOLOGICAL DEGRADATION AND A BROAD RANGE OF CHEMICALS.
APPARENT OPENING SIZE (AOS):	80 US STANDARD SIEVE (0.180 MM)
GRAB TENSILE STRENGTH:	200 LBS
PUNCTURE STRENGTH:	130 LBS
MULLEN BURST:	400 PSI
TRAPEZOIDAL TEAR:	85 LBS
WATER FLOW RATE:	110 GPM/FT2
PERMEABILITY:	0.38 CM/SECOND

DIMENSIONS:

SKIRT:	24"x36"
SOCK FILTER/SEPARATOR:	10" D x 24" L

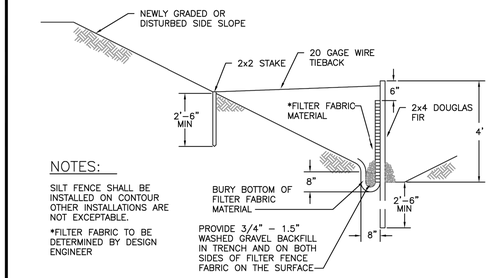
DISPOSAL REQUIREMENTS:

CONSULT FEDERAL, STATE, AND LOCAL REGULATIONS FOR DISPOSAL OF INSERTS



CATCH BASIN INSERT

NOT TO SCALE

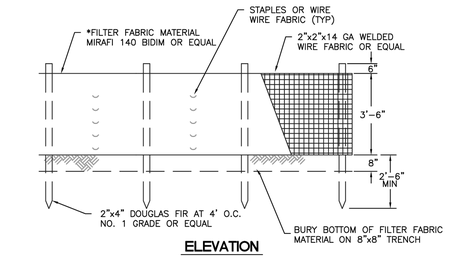


NOTES:

SILT FENCE SHALL BE INSTALLED ON CONTOUR OTHER INSTALLATIONS ARE NOT EXCEPTABLE.

*FILTER FABRIC TO BE DETERMINED BY DESIGN ENGINEER

TYPICAL CROSS SECTION



ELEVATION

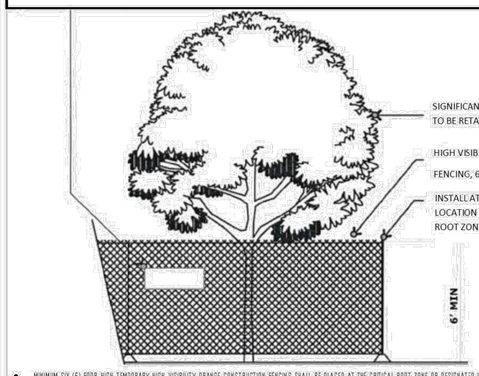
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SILTATION FENCE

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	02.03.02
FILE NAME: P:\DWG\COMMON\STDS\CITY\200502_SD202.03.02		DATE APPROVED: 06/01/1992	DATE REVISED: 06/01/2003	SCALE: NTS

TREE PROTECTION ZONE (TPZ)

NO ENTRY. NO GRADE CHANGES, STORAGE/STOCKPILING OF MATERIALS OR EQUIPMENT, PLACEMENT OF FILL OR TOP SOIL, TRENCHING OR VEHICULAR/FOOT TRAFFIC PERMITTED WITHIN THE TPZ. THIS TREE BARRIER SHALL NOT BE REMOVED WITHOUT AUTHORIZATION FROM PUYALLUP PLANNING DEPARMENT—SUBJECT TO FINES AND ENFORCEMENT ACTION BY THE CITY—TO REPORT VIOLATIONS OR FOR MORE INFORMATION—CALL (253) 864.4165



- MINIMUM SIX (6) FOOT HIGH TEMPORARY HIGH VISIBILITY ORANGE CONSTRUCTION FENCING SHALL BE PLACED AT THE CRITICAL ROOT ZONE OR DESIGNATED LIMIT OF DISTURBANCE ON APPROVED FINAL LANDSCAPE PLAN SET. FENCING SHALL BE INSTALLED USING POSTS DRIVEN INTO GROUND—PIER BLOCKS SHALL NOT BE USED. AVOID POSTS DRIVEN INTO ROOTS LARGER THAN 1" DIAMETER. FENCING SHALL BE INSTALLED PRIOR TO WORK COMMENCING ON SITE AND REMAIN IN PLACE THROUGHOUT ALL PHASES ON CONSTRUCTION—CALL THE CITY'S PLANNING DIVISION WITH REQUESTS TO MODIFY THE LOCATION OF THE TREE PROTECTION FENCING—(253) 864-4165
- TREATMENT OF ROOTS EXPOSED DURING CONSTRUCTION: FOR ROOTS OVER ONE (1) INCH DIAMETER DAMAGED DURING CONSTRUCTION, MAKE A CLEAN STRAIGHT CUT TO REMOVE DAMAGED PORTION OF ROOT. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING AND COVERED WITH SOIL AS SOON AS POSSIBLE. OTHER PRE-TREATMENT MEASURES MAY BE REQUIRED TO PROTECT ROOT SYSTEM—SEE APPROVED TREE PROTECTION OR FINAL LANDSCAPE PLAN FOR FURTHER DETAILS
- NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, PLACEMENT OF TOP SOIL OR FILL MATERIAL, STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMITS OF THE ESTABLISHED FENCING. FENCING SHALL NOT BE MOVED OR REMOVED UNLESS APPROVED BY THE CITY PLANNING DIVISION. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY UNDER THE SUPERVISION OF THE ON-SITE ARBORIST WITH PRIOR WRITTEN APPROVAL BY THE CITY PLANNING DIVISION.
- THE ABOVE REFERENCED TPZ SIGNS SHALL BE PLACED EVERY 15 FEET ALONG THE FENCING AND SHALL REMAIN IN PLACE THROUGHOUT ALL PHASES OF CONSTRUCTION.

TREE PROTECTION FENCING DETAIL
(for public and private trees)

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.

3. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.

4. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.

5. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.

6. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.

7. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

GRADING, EROSION, AND SEDIMENTATION CONTROL NOTES

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM DEWEY-SVOBODA	LINDA LIAN	COLLEEN HARRIS	LINDA LIAN	05.02.01
FILE NAME: P:\DWG\COMMON\STDS\CITY\200905_GRD05.01\05.02.01		DATE APPROVED: 03/01/2009	DATE REVISED: 11/18/2014	SCALE: 0:1

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
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No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: CONSTRUCTION DETAILS

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal AS SHOWN Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C6 of 7

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PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

CONSTRUCTION DETAILS

STORMFILTER STEEL CATCHBASIN DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. 3 CARTRIDGE CATCHBASIN HAS A MAXIMUM OF THREE CARTRIDGES. SYSTEM IS SHOWN WITH A 27" CARTRIDGE, AND IS ALSO AVAILABLE WITH AN 18" CARTRIDGE. STORMFILTER CATCHBASIN CONFIGURATIONS ARE AVAILABLE WITH A DRY INLET BAY FOR VECTOR CONTROL.
PEAK HYDRAULIC CAPACITY PER TABLE BELOW. IF THE SITE CONDITIONS EXCEED PEAK HYDRAULIC CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

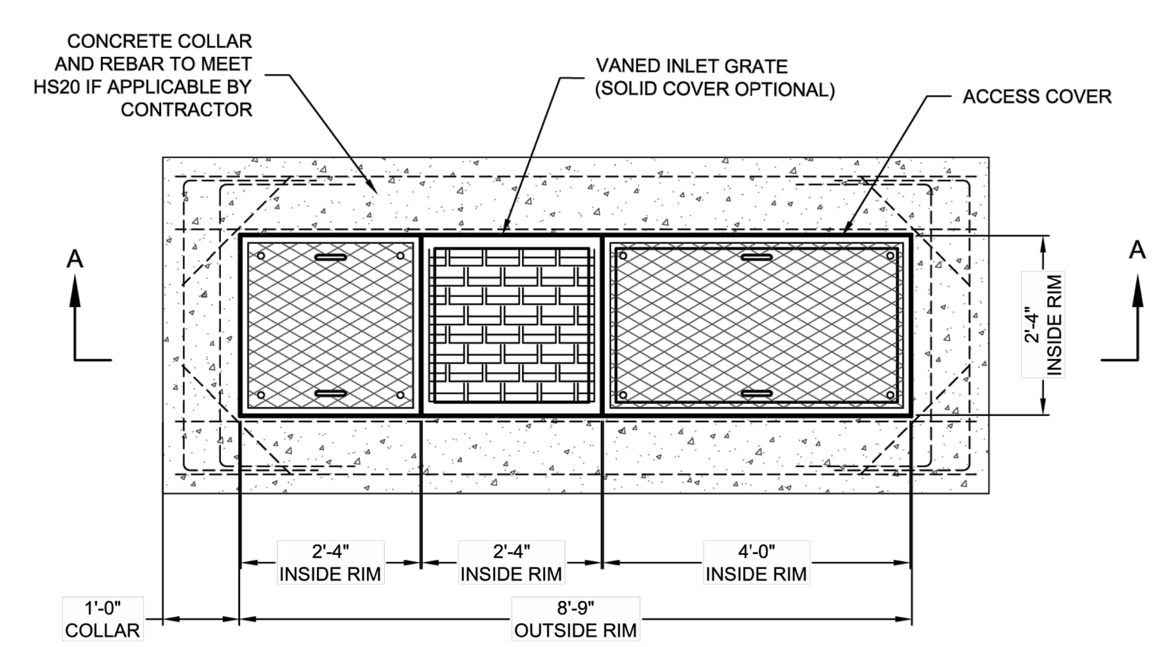
CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			18" DEEP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			3.3'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	15	12.53	7.5
PEAK HYDRAULIC CAPACITY	1.0			1.0			1.8		
INLET PERMANENT POOL LEVEL (A)	1'-0"			1'-0"			2'-0"		
OVERALL STRUCTURE HEIGHT (B)	4'-9"			3'-9"			4'-9"		

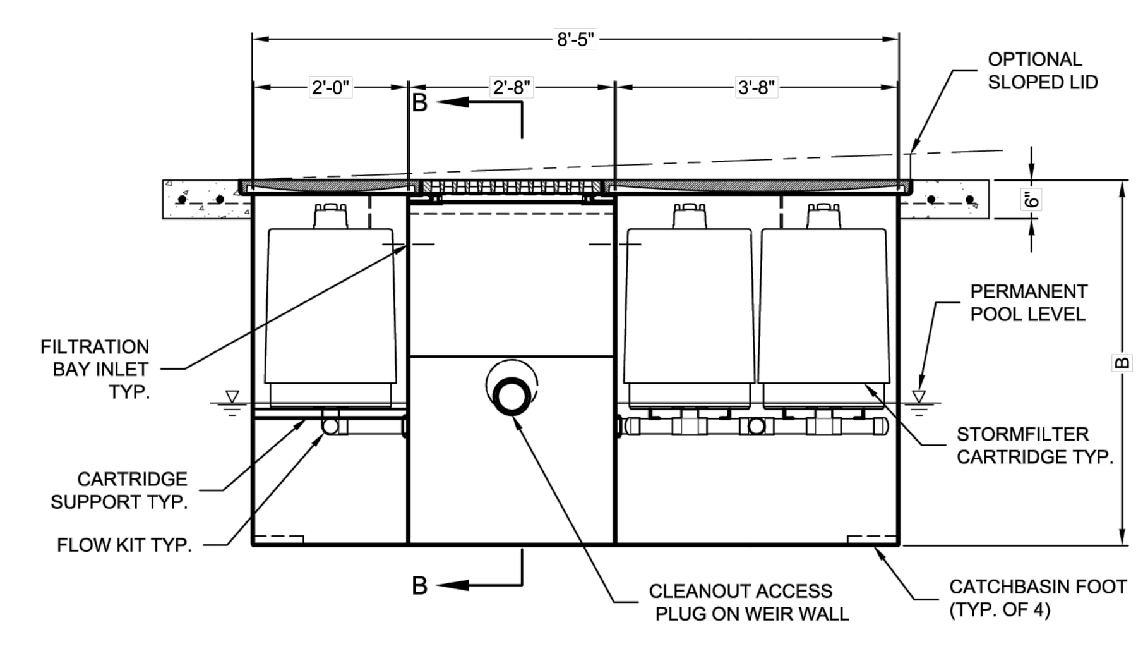
* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB ® (PSORB) MEDIA ONLY

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER CATCHBASIN STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ANGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
5. MANUFACTURER TO APPLY A SURFACE BEAD WELD IN THE SHAPE OF THE LETTER "O" ABOVE THE OUTLET PIPE STUB ON THE EXTERIOR SURFACE OF THE STEEL SFCB.
6. STORMFILTER CATCHBASIN EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
7. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO M306 LOAD RATING. TO MEET HS20 LOAD RATING ON STRUCTURE, A CONCRETE COLLAR IS REQUIRED. WHEN REQUIRED, CONCRETE COLLAR WITH #4 REINFORCING BARS TO BE PROVIDED BY CONTRACTOR.
8. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
9. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

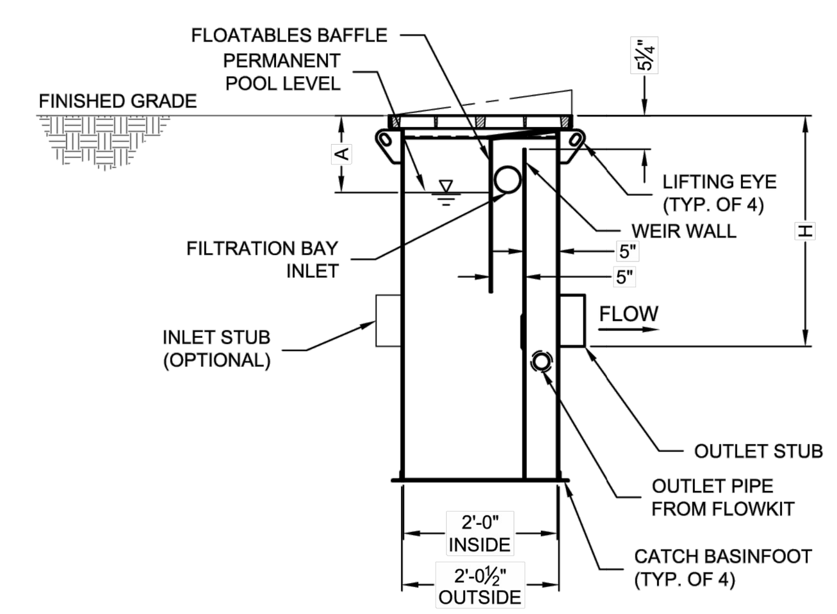
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CATCHBASIN (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.



PLAN VIEW



SECTION A-A



SECTION B-B

3-CARTRIDGE CATCHBASIN STORMFILTER DATA

STRUCTURE ID	CB#1
WATER QUALITY FLOW RATE (cfs)	0.0438 CFS
PEAK FLOW RATE (<1 cfs)	0.5519
RETURN PERIOD OF PEAK FLOW (yrs)	100
CARTRIDGE FLOW RATE (gpm)	7.5
MEDIA TYPE (PERLITE, ZPG, PSORB)	ZPG
RIM ELEVATION	43.64'

PIPE DATA:	I.E.	DIAMETER
INLET STUB	XXX.XX'	N/A
OUTLET STUB	41.34	12"

CONFIGURATION
OUTLET / INLET
OUTLET / INLET

SLOPED LID	YES\NO
SOLID COVER	YES\NO

NOTES/SPECIAL REQUIREMENTS:

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

3 CARTRIDGE CATCHBASIN
STORMFILTER
STANDARD DETAIL

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
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Title: CONSTRUCTION DETAILS
FRED MEYER - DISTRIBUTION CENTER

For: DOUG HARDY
WEST REGION ENGINEER
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MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL, STATE OF WASHINGTON, 38950, REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal AS SHOWN, Vertical NA

Designed DL
Drawn RDC
Checked DL
Approved JGH
Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

APPROVED
BY ______ CITY OF PUYALLUP DEVELOPMENT ENGINEERING
DATE ______
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Job Number 18510
Sheet C6 of 7

P:\18000s\18510\engineering\2024 CIVIL SET\18510-D.dwg 4/18/2025 2:07 PM KHARRIS

Figure 8
Water Quality Calculations

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

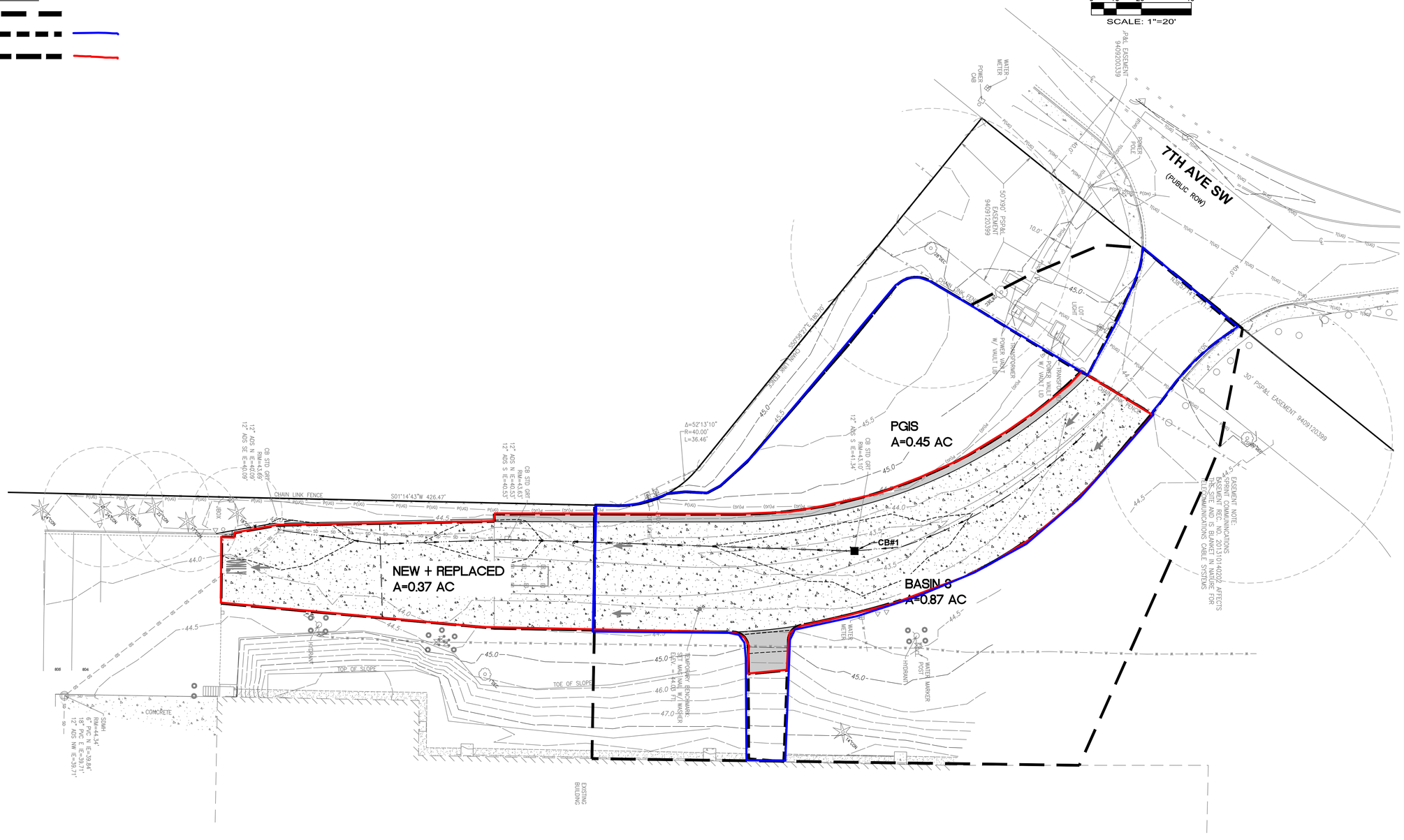
BASIN MAP

LEGEND

- BASIN LINE
- POLLUTION GENERATING IMPERVIOUS SURFACE (PGIS)
- NEW + REPLACED HARD SURFACE

N

0 10' 20' 40'
SCALE: 1"=20'



APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

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

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **BASIN MAP**

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=20' Vertical NA

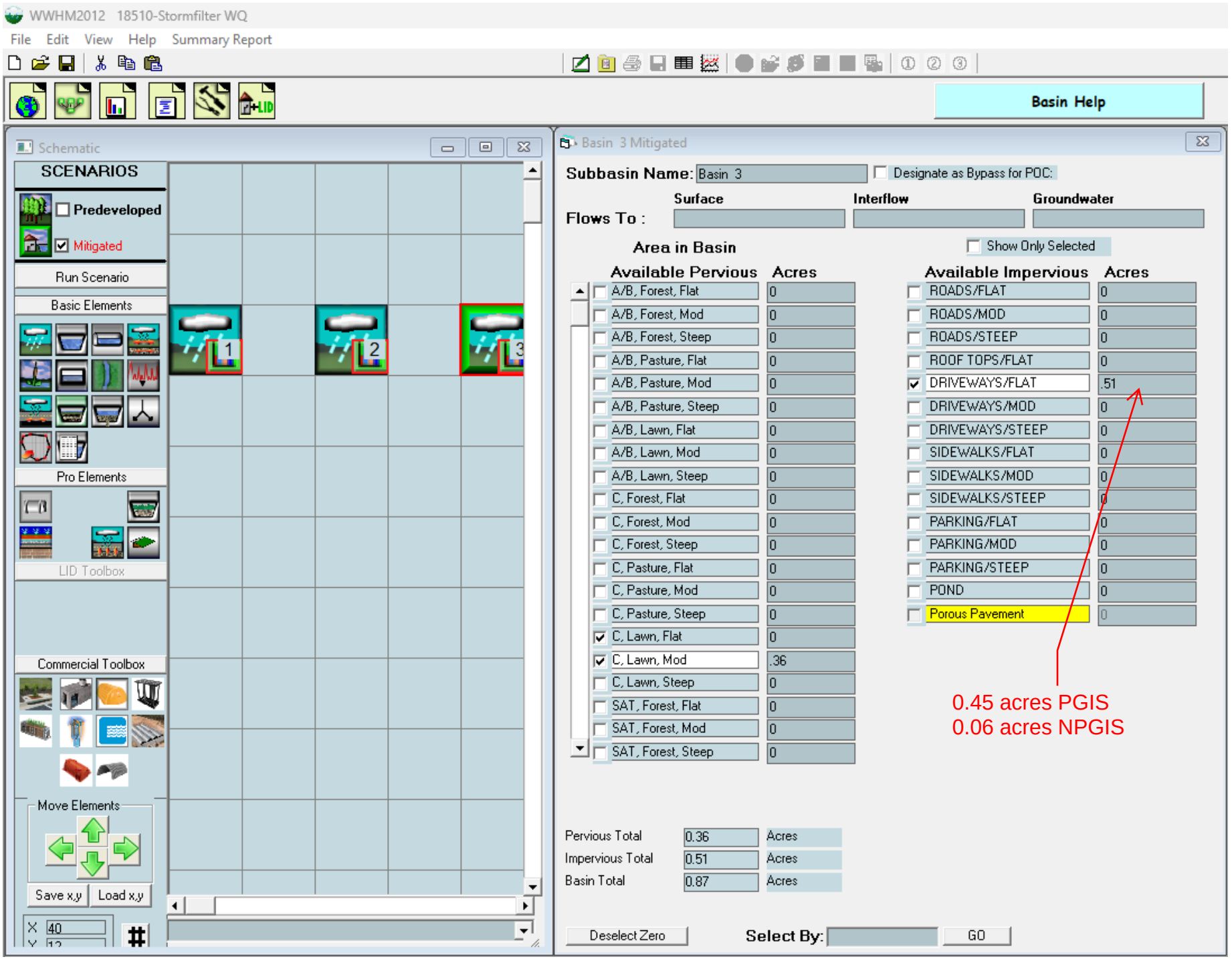
Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

Job Number **18510**

Sheet **C5** of 7

P:\18000s\18510\exhibit\18510-2024 BASIN MAP.dwg 4/21/2025 8:22 AM NHUBBELL


WWHM2012 18510-Stormfilter WQ
File Edit View Help Summary Report
Basin Help
Schematic
SCENARIOS
Predeveloped
Mitigated
Run Scenario
Basic Elements
Pro Elements
LID Toolbox
Commercial Toolbox
Move Elements
Save x,y
Load x,y
Basin 3 Mitigated
Subbasin Name: Basin 3
Designate as Bypass for POC:
Flows To :
Surface
Interflow
Groundwater
Area in Basin
Show Only Selected
Available Pervious
Acres
A/B, Forest, Flat 0
A/B, Forest, Mod 0
A/B, Forest, Steep 0
A/B, Pasture, Flat 0
A/B, Pasture, Mod 0
A/B, Pasture, Steep 0
A/B, Lawn, Flat 0
A/B, Lawn, Mod 0
A/B, Lawn, Steep 0
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C, Pasture, Flat 0
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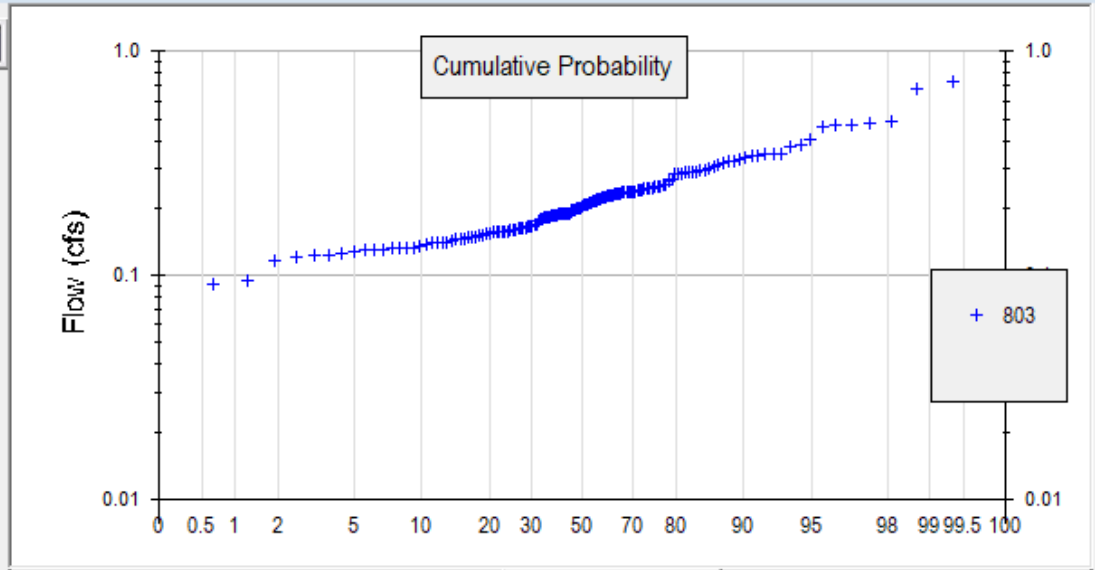
C, Pasture, Steep 0
C, Lawn, Flat 0
C, Lawn, Mod .36
C, Lawn, Steep 0
SAT, Forest, Flat 0
SAT, Forest, Mod 0
SAT, Forest, Steep 0
Available Impervious
Acres
ROADS/FLAT 0
ROADS/MOD 0
ROADS/STEEP 0
ROOF TOPS/FLAT 0
DRIVEWAYS/FLAT .51
DRIVEWAYS/MOD 0
DRIVEWAYS/STEEP 0
SIDEWALKS/FLAT 0
SIDEWALKS/MOD 0
SIDEWALKS/STEEP 0
PARKING/FLAT 0
PARKING/MOD 0
PARKING/STEEP 0
POND 0
Porous Pavement 0
0.45 acres PGIS
0.06 acres NPGIS
Pervious Total 0.36 Acres
Impervious Total 0.51 Acres
Basin Total 0.87 Acres
Deselect Zero
Select By:
GO

WWHM2012 18510-Stormfilter WQ

File Edit View Help Summary Report

Analysis Help

Analysis



Stream Protection Duration | LID Duration | Flow Frequency | Water Quality | Hydrograph

Wetland Input Volumes | LID Report | Recharge Duration | Recharge Predeveloped | Recharge Mitigated

Analyze datasets Compact WDM | Delete Selected | Monthly FF | Duration Chart

1 158 YR EVAP TIMESERIES, 40 IN EAST, 24 HR
2 158 YR PRECIP TIMESERIES, 40 IN EAST, 15 MIN
801 POC 1 Mitigated flow
802 POC 2 Mitigated flow
803 POC 3 Mitigated flow

All Datasets | Flow | Stage | Precip

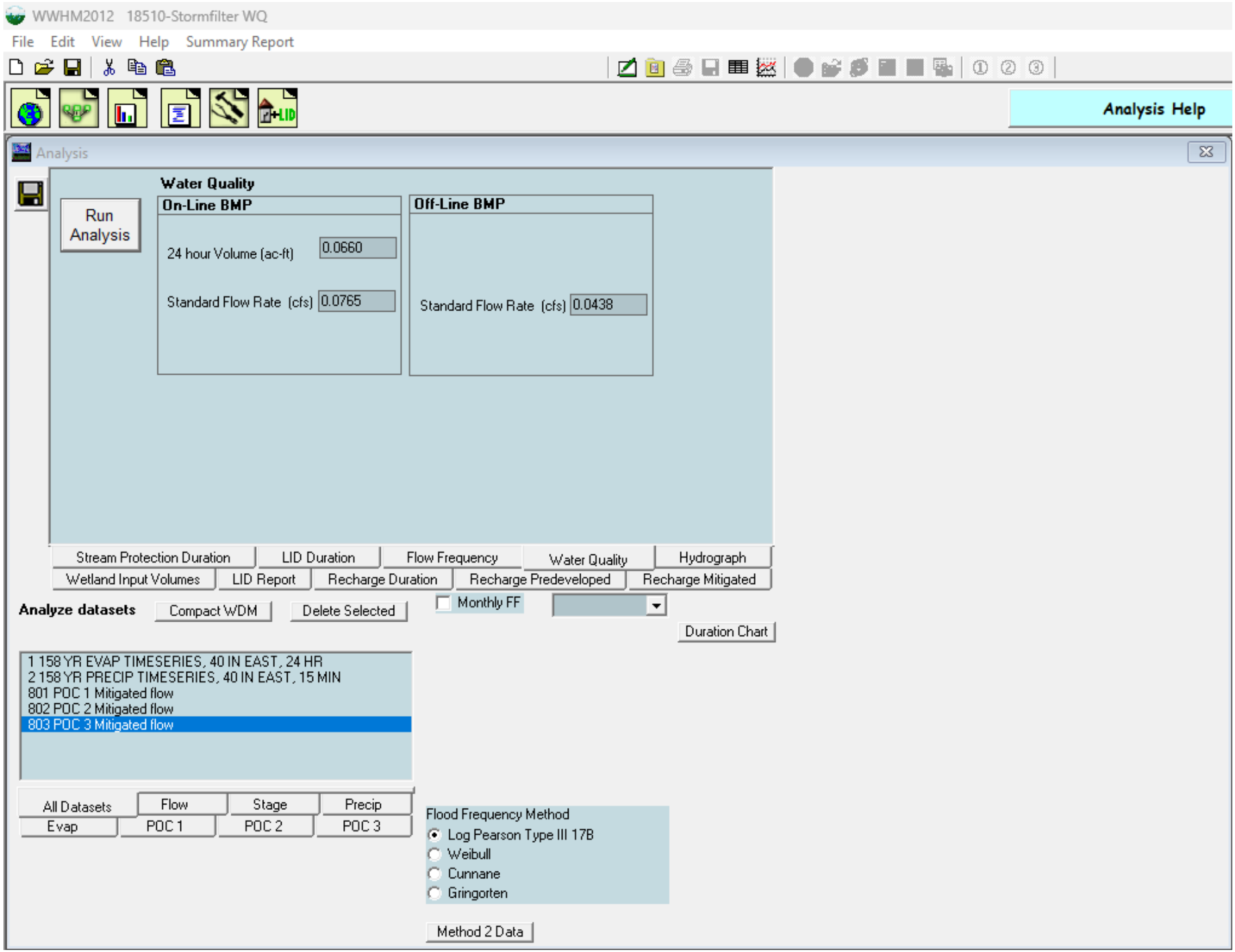
Evap | POC 1 | POC 2 | POC 3

Flood Frequency Method

- (•) Log Pearson Type III 17B
- ( ) Weibull
- ( ) Cunnane
- ( ) Gringorten

Method 2 Data

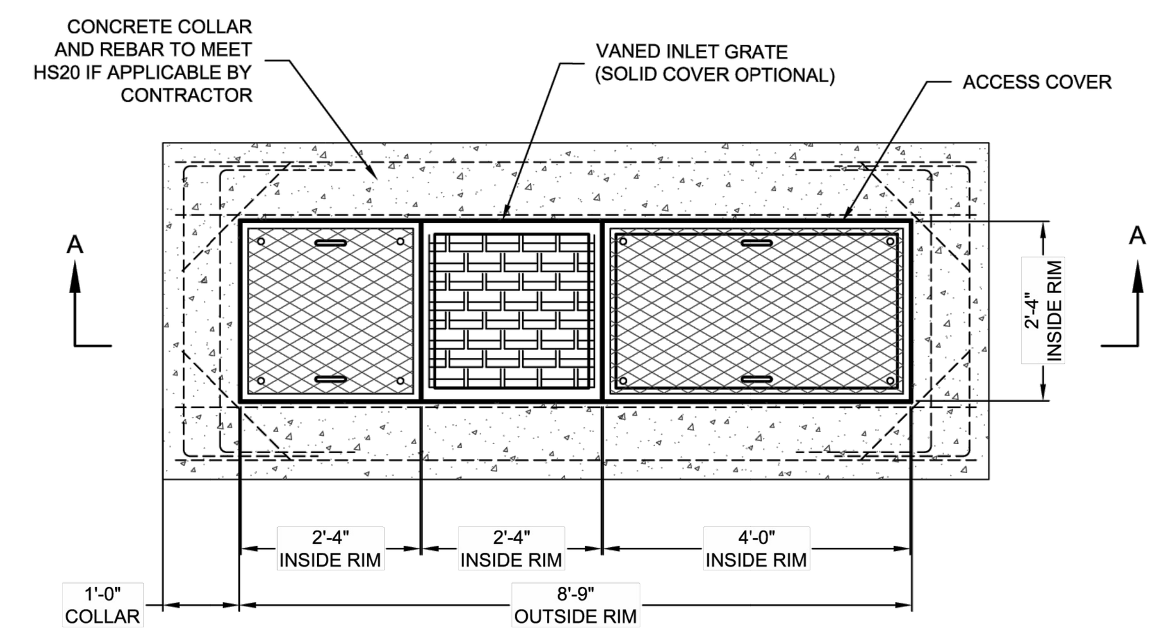
```
Flow Frequency
Flow(cfs)  0803 15m
2 Year   =    0.2013
5 Year   =    0.2786
10 Year  =    0.3360
25 Year  =    0.4161
50 Year  =    0.4815
100 Year =    0.5519
200 Year =    0.6327
500 Year =    0.7253

Annual Peaks
 1902          0.2177
 1903          0.2430
 1904          0.3472
 1905          0.1289
 1906          0.1401
 1907          0.2206
 1908          0.1657
 1909          0.1848
 1910          0.2102
 1911          0.2290
 1912          0.4672
 1913          0.1442
 1914          0.7317
 1915          0.1335
 1916          0.2323
 1917          0.0913
 1918          0.1834
 1919          0.1270
 1920          0.1794
 1921          0.1484
 1922          0.2525
 1923          0.1617
 1924          0.2707
 1925          0.1213
 1926          0.2163
 1927          0.1873
```


WWHM2012 18510-Stormfilter WQ
File Edit View Help Summary Report
Analysis Help
Analysis
Water Quality
Run Analysis
On-Line BMP
24 hour Volume (ac-ft) 0.0660
Standard Flow Rate (cfs) 0.0765
Off-Line BMP
Standard Flow Rate (cfs) 0.0438
Stream Protection Duration
LID Duration
Flow Frequency
Water Quality
Hydrograph
Wetland Input Volumes
LID Report
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
Compact WDM
Delete Selected
Monthly FF
Duration Chart
1 158 YR EVAP TIMESERIES, 40 IN EAST, 24 HR
2 158 YR PRECIP TIMESERIES, 40 IN EAST, 15 MIN
801 POC 1 Mitigated flow
802 POC 2 Mitigated flow
803 POC 3 Mitigated flow
All Datasets
Flow
Stage
Precip
Evap
POC 1
POC 2
POC 3
Flood Frequency Method
Log Pearson Type III 17B
Weibull
Cunnane
Gringorten
Method 2 Data

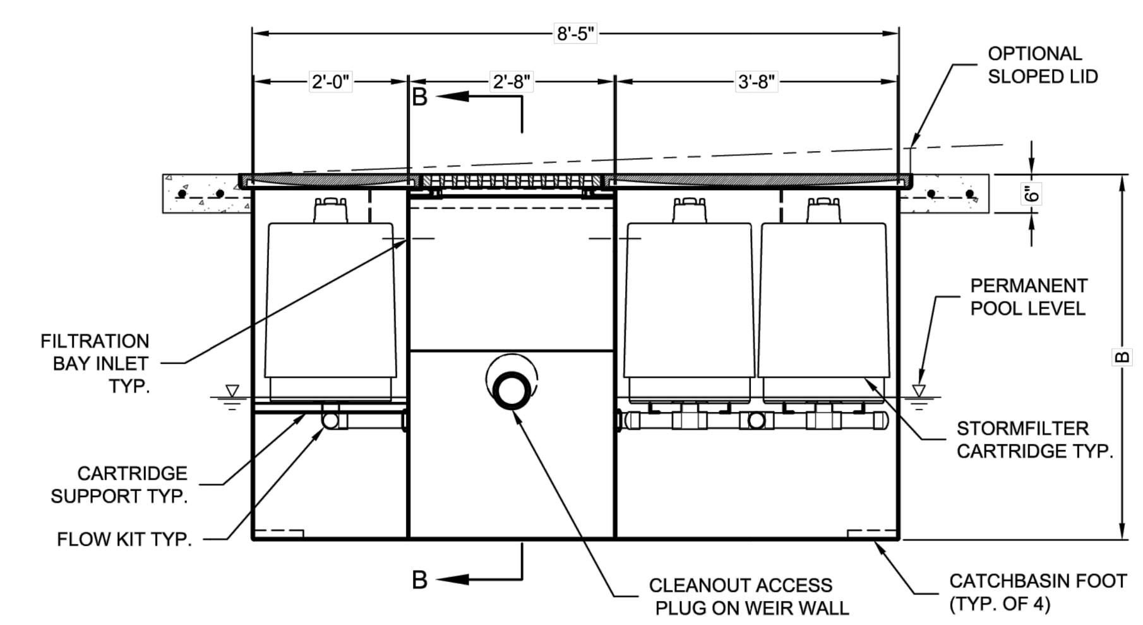
PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

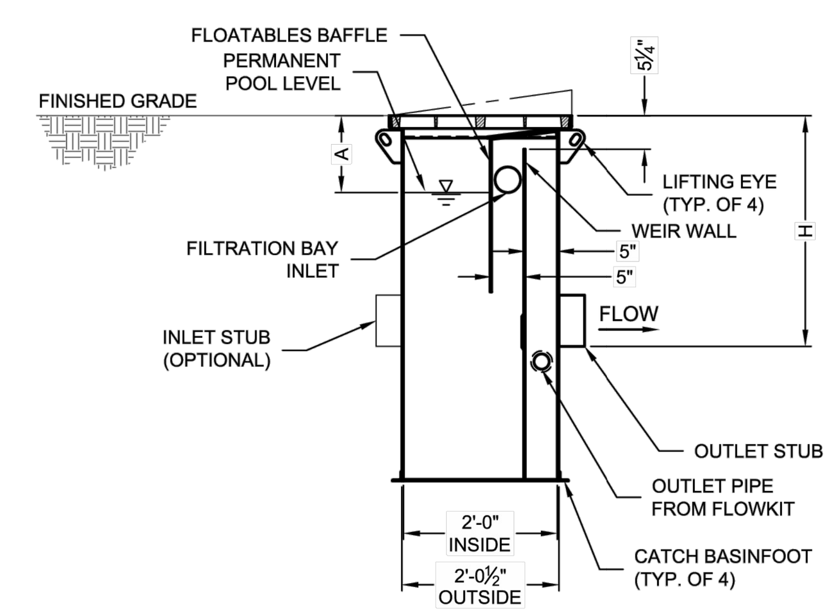
CONSTRUCTION DETAILS



PLAN VIEW



SECTION A-A



SECTION B-B

STORMFILTER STEEL CATCHBASIN DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. 3 CARTRIDGE CATCHBASIN HAS A MAXIMUM OF THREE CARTRIDGES. SYSTEM IS SHOWN WITH A 27" CARTRIDGE, AND IS ALSO AVAILABLE WITH AN 18" CARTRIDGE. STORMFILTER CATCHBASIN CONFIGURATIONS ARE AVAILABLE WITH A DRY INLET BAY FOR VECTOR CONTROL.

PEAK HYDRAULIC CAPACITY PER TABLE BELOW. IF THE SITE CONDITIONS EXCEED PEAK HYDRAULIC CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			18" DEEP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			3.3'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	15	12.53	7.5
PEAK HYDRAULIC CAPACITY	1.0			1.0			1.8		
INLET PERMANENT POOL LEVEL (A)	1'-0"			1'-0"			2'-0"		
OVERALL STRUCTURE HEIGHT (B)	4'-9"			3'-9"			4'-9"		

* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB ® (PSORB) MEDIA ONLY

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER CATCHBASIN STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ANGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
5. MANUFACTURER TO APPLY A SURFACE BEAD WELD IN THE SHAPE OF THE LETTER "O" ABOVE THE OUTLET PIPE STUB ON THE EXTERIOR SURFACE OF THE STEEL SFCB.
6. STORMFILTER CATCHBASIN EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
7. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO M306 LOAD RATING. TO MEET HS20 LOAD RATING ON STRUCTURE, A CONCRETE COLLAR IS REQUIRED. WHEN REQUIRED, CONCRETE COLLAR WITH #4 REINFORCING BARS TO BE PROVIDED BY CONTRACTOR.
8. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
9. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CATCHBASIN (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

3-CARTRIDGE CATCHBASIN STORMFILTER DATA

STRUCTURE ID	CB#1
WATER QUALITY FLOW RATE (cfs)	0.0438 CFS
PEAK FLOW RATE (<1 cfs)	0.5519
RETURN PERIOD OF PEAK FLOW (yrs)	100
CARTRIDGE FLOW RATE (gpm)	7.5
MEDIA TYPE (PERLITE, ZPG, PSORB)	ZPG
RIM ELEVATION	43.64'

PIPE DATA:	I.E.	DIAMETER
INLET STUB	XXX.XX'	N/A
OUTLET STUB	41.34	12"

CONFIGURATION

OUTLET / INLET — OUTLET / INLET

SLOPED LID	YES\NO
SOLID COVER	YES\NO

NOTES/SPECIAL REQUIREMENTS:

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

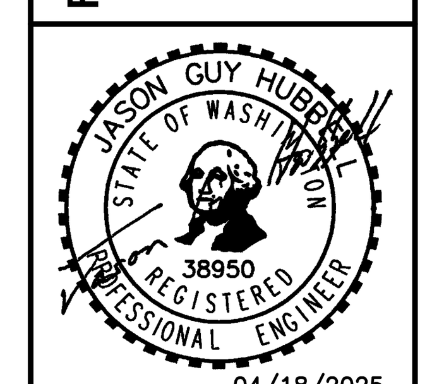
3 CARTRIDGE CATCHBASIN STORMFILTER STANDARD DETAIL

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: CONSTRUCTION DETAILS

FRED MEYER - DISTRIBUTION CENTER

For: DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220



04/18/2025

Scale: Horizontal AS SHOWN; Vertical NA

Designed DL
Drawn RDC
Checked DL
Approved JGH
Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

APPROVED

BY ____________
CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

Job Number 18510

Sheet C6 of 7

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

April 2025

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS) TREATMENT

For

CONTECH Engineered Solutions Stormwater Management StormFilter® with ZPG Media

Ecology's Decision:

Based on the CONTECH Engineered Solutions' (CONTECH) application submissions for the StormFilter® with ZPG Media (StormFilter ZPG) Ecology hereby issues the following use level designation:

1. General Use Level Designation (GULD) for Basic Treatment (total suspended solids).
   - Using ZPG™ media (zeolite/perlite/granular activated carbon), with the size distribution described below,
   - Sized at a hydraulic loading rate of 1 gpm/ft^2 of media surface area, per Table 1, and
   - Internal bypassing needs to be consistent with the design guidelines in CONTECH's current product design manual.

   Table 1. StormFilter Design Flow Rates per Cartridge

Effective Cartridge Height (inches)	12	18	27
Cartridge Flow Rate (gpm/cartridge)	5	7.5	11.3

2. Maintenance data collected during the initial TAPE GULD testing and the post GULD maintenance assessment demonstrated the system was able to treat the following percentage of a water year before needing maintenance:

	Site Location	**Land Use**	**Average TSS (mg/L)**	**D_{50} PSD (µm)**	**Maintenance Cycle[1] (% water year)**
GULD Testing	Vancouver, WA	Commercial	114	<62.5[2]	100[3]
	Lake Stevens, WA	Roadway	115	<62.5[2]	80[3]
Maintenance[4] Assessment					

[1] Ecology recommends considering maintenance cycle information when sizing the system. Sizing may need to be increased to meet the project, permit, or jurisdiction maintenance cycle.

[2] D_{50} PSD was not reported. On average 90% of the particles captured at the Vancouver site and 67% of the particles captured at the Lake Stevens site were less than 62.5 µm. A D_{50} of less than 62.5 µm (meaning greater than 50% of particles are less than 62.5 µm) is considered representative of Pacific Northwest stormwater.

[3] Maintenance was not needed during the GULD testing. Testing at Vancouver, WA lasted 12 months (100% of a water year) while testing at Lake Stevens, WA lasted 9.5 months (80% of a water year). It is possible the Lake Stevens system could have demonstrated a longer maintenance cycle if testing had continued.
[3] Maintenance assessment data are collected after issuing of the GULD. Maintenance assessment results for the StormFilter with ZPG will be based on testing completed on the StormFilter with PhosphoSorb. Assessment shall be completed by February 28, 2028.

3. Ecology approves StormFilter systems containing ZPG™ media for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system when using an external bypass vault or a treatment vault with an internal bypass. Contech designs their StormFilter systems to maintain treatment of the water quality design flow while routing excess flows around the treatment chamber during periods of peak bypass. The water quality design flow rates are calculated using the following procedures:
    - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model and as described in Section III-2.6 of the 2024 Stormwater Management Manual for Western Washington (SWMMWW).
    - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 6.5.1 of the 2024 Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
    - Entire State: For treatment installed downstream of the detention, the water quality design flow rate is full 2-year release rate of the detention facility.
4. The GULD designation has no expiration date but it may be amended or revoked by Ecology and is subject to the conditions specified below.

Ecology's Conditions of Use:

The StormFilter with ZPG media shall comply with the following conditions:

1. Design, install, operate, and maintain the StormFilter with ZPG media in accordance with applicable Contech Engineered Solutions manuals, documents, and the Ecology Decision.
2. Install StormFilter systems to bypass flows exceeding the water quality treatment rate. Additionally, high flows will not re-suspend captured sediments. Design StormFilter systems in accordance with the performance goals in Ecology's most recent Stormwater Manual and CONTECH's most recent Product Design Manual, unless otherwise specified.
3. Owners must follow the design, pretreatment, land use application, and maintenance criteria in CONTECH's Design Manual.
4. Pretreatment of TSS and oil and grease may be necessary, and designers shall provide pre-treatment in accordance with the most current versions of the CONTECH's Product Design Manual or the applicable Ecology Stormwater Manual.

5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.
    - Typically, CONTECH designs StormFilter systems for a target filter media replacement interval of 12 months. Maintenance includes removing accumulated sediment from the vault, and replacing spent cartridges with recharged cartridges.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate, as indicated by the scumline above the shoulder of the cartridge.
    - Owners/operators must inspect StormFilter with ZPG media for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.
    - Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
    - When inspections are performed, the following findings typically serve as maintenance triggers:
        - Accumulated vault sediment depths exceed an average of 2 inches, or
        - Accumulated sediment depths on the tops of the cartridges exceed an average of 0.5 inches, or
        - Standing water remains in the vault between rain events, or
        - Bypass occurs during storms smaller than the design storm.
    - Note: If excessive floatables (trash and debris) are present, perform a minor maintenance consisting of gross solids removal, not cartridge replacement.
6. CONTECH shall maintain readily available reports listed under "Application Documents" (below) as public, as well as the documentation submitted with its previous conditional use designation application. CONTECH shall provide links to this information from its corporate website, and make this information available upon request, at no cost and in a timely manner.
7. ZPG™ media used shall conform with the following specifications:
    - Each cartridge contains a total of approximately 2.6 cubic feet of media. The ZPG™ cartridge consists of an outer layer of perlite that is approximately 1.3 cubic feet in volume and an inner layer, consisting of a mixture of 90% zeolite and 10% granular activated carbon, which is approximately 1.3 cubic feet in volume.

- Perlite Media: Perlite media shall be made of natural siliceous volcanic rock free of any debris or foreign matter. The expanded perlite shall have a bulk density ranging from 6.5 to 8.5 lbs per cubic foot and particle sizes ranging from 0.09" (#8 mesh) to 0.38" (3/8" mesh).
- Zeolite Media: Zeolite media shall be made of naturally occurring clinoptilolite. The zeolite media shall have a bulk density ranging from 44 to 50 lbs per cubic foot and particle sizes ranging from 0.13" (#6 mesh) to 0.19" (#4 mesh). Additionally, the cation exchange capacity (CEC) of zeolite shall range from approximately 1.0 to 2.2 meq/g.
- Granular Activated Carbon: Granular activated carbon (GAC) shall be made of lignite coal that has been steam-activated. The GAC media shall have a bulk density ranging from 28 to 31 lbs per cubic foot and particle sizes ranging from a 0.09" (#8 mesh) to 0.19" (#4 mesh).

Approved Alternate Configurations

Peak Diversion StormFilter

1. The Peak Diversion StormFilter allows for off-line bypass within the StormFilter structure. Design capture flows and peak flows enter the inlet bay which contains an internal weir. The internal weir allows design flows to enter the cartridge bay through a transfer hole located at the bottom of the inlet bay while the unit routs higher flows around the cartridge bay.
2. To select the size of the Peak Diversion StormFilter unit, the designer must determine the number of cartridges required and size of the standard StormFilter using the site-specific water quality design flow and the StormFilter Design Flow Rates per Cartridge as described above.
3. New owners may not install the Peak Diversion StormFilter at an elevation or in a location where backwatering may occur.

Applicant: Contech Engineered Solutions

Applicant's Address: 11835 NE Glenn Widing Dr.
Portland, OR 97220

Application Documents:

The applicant's master report, titled, "The Stormwater Management StormFilter Basic Treatment Application for General Use Level Designation in Washington", Stormwater Management, Inc., November 1, 2004, includes the following reports. Documents noted as "public" are available by contacting CONTECH:

(Public) Evaluation of the Stormwater Management StormFilter Treatment System: Data Validation Report and Summary of the Technical Evaluation Engineering Report (TEER) by Stormwater Management Inc., October 29, 2004 Ecology's technology assessment protocol requires the applicant to hire an independent consultant to complete the following work:

1. Complete the data validation report.
2. Prepare a TEER summary, including a testing summary and conclusions compared with the supplier's performance claims.
3. Provide a recommendation of the appropriate technology use level.
4. Work with Ecology to post recommend relevant information on Ecology's website.
5. Provide additional testing recommendations, if needed."
6. This report, authored by Dr. Gary Minton, Ph. D., P.E., Resource Planning Associates, satisfies the Ecology requirement.

(Public) "Performance of the Stormwater Management StormFilter Relative to the Washington State Department of Ecology Performance Goals for Basic Treatment," is a summary of StormFilter performance that strictly adheres to the criteria listed in the Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology (TAPE).

"Heritage Marketplace Field Evaluation: Stormwater Management StormFilter with ZPG™ Media," is a report showing all of the information collected at Site A as stated in the SMI Quality Assurance Project Plan (QAPP). This document contains detailed information regarding each storm event collected at this site, and it provided a detailed overview of the data and project.

"Lake Stevens Field Evaluation: Stormwater Management StormFilter with ZPG™ Media," is a report that corresponds to Site E as stated in the SMI QAPP. This document contains detailed information regarding each storm collected at this site, and includes a detailed overview of the data and project.

(Public) "Evaluation of the Stormwater Management StormFilter for the removal of SIL-CO-SIL 106, a standardized silica product: ZPG™ at 7.5 GPM" is a report that describes laboratory testing at full design flow.

"Factors Other Than Treatment Performance."

"State of Washington Installations."

"Peak Diversion StormFilter" is a technical document demonstrating the Peak Diversion StormFilter system complies with the Stormwater Management Manual for Western Washington Volume V Section 4.5.1.

Applicant's Use Level Request:

That Ecology grant a General Use Level Designation for Basic Treatment for the StormFilter using ZPG™ media (zeolite/perlite/granular activated carbon) at a hydraulic loading rate of 1 gpm/ft^2 of media surface area in accordance with Ecology's 2011 *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE).*

Applicant's Performance Claim:

The combined data from the two field sites reported in the TER (Heritage Marketplace and Lake Stevens) indicate that the performance of a StormFilter system configured for inline bypass with ZPG™ media and a hydraulic loading rate of 1 gpm/ft^2 of media surface area meets Ecology performance goals for Basic Treatment.

Ecology's Recommendations:

Based on the weight of the evidence and using its best professional judgment, Ecology finds that:

- StormFilter, using ZPG™ media and operating at a hydraulic loading rate of no more than 1 gpm/ft^2 of media surface area, is expected to provide effective stormwater treatment achieving Ecology's Basic Treatment (TSS removal) performance goals. Contech demonstrated this through field and laboratory testing performed in accordance with the approved protocol.

Findings of Fact:

- Influent TSS concentrations and particle size distributions were generally within the range of what Ecology considers "typical" for western Washington (silt-to-silt loam).
- Contech sampled thirty-two (32) storm events at two sites for storms from April 2003 to March 2004, of which Contech deemed twenty-two (22) as "qualified" and were therefore included in the data analysis set.
- Statistical analysis of these 22 storm events verifies the data set's adequacy.
- Analyzing all 22 qualifying events, the average influent and effluent concentrations and aggregate pollutant load reduction are 114 mg/L, 25 mg/L, and 82%, respectively.
- Analyzing all 22 qualifying events based on the *estimated average* flow rate during the event (versus the *measured peak* flow rate), and more heavily weighting those events near the design rate (versus events either far above or well below the design rate) does not significantly affect the reported results.
- For the 7 qualifying events with influent TSS concentrations greater than 100 mg/L, the average influent and effluent concentrations and aggregate pollutant load reduction are 241 mg/L, 34 mg/L, and 89%, respectively. If we exclude the 2 of 7 events that exceed the maximum 300 mg/L specified in Ecology's guidelines, the average influent and effluent concentrations and aggregate pollutant load reduction are 158 mg/L, 35 mg/L, and 78%, respectively.
- For the 15 qualifying events with influent TSS concentrations less than 100 mg/L, the average influent and effluent concentrations and aggregate pollutant load reduction are 55 mg/L, 20 mg/L, and 61%, respectively. If the 6 of 15 events that fall below the minimum 33 mg/L TSS specified in Ecology's guidelines are excluded, the average influent and effluent concentrations and aggregate pollutant load reduction are 78 mg/L, 26 mg/L, and 67%, respectively.
- For the 8 qualifying events with peak discharge exceeding design flow (ranging from 120 to 257% of the design rate), results ranged from 52% to 96% TSS removal, with an average of 72%.

- Due to the characteristics of the hydrographs, the field results generally reflect flows below (ranging between 20 and 60 percent of) the tested facilities' design rate. During these sub-design flow rate periods, some of the cartridges operate at or near their *individual* full design flow rate (generally between 4 and 7.5 GPM for an 18" cartridge effective height) because their float valves have opened. Float valves remain closed on the remaining cartridges, which operate at their base "trickle" rate of 1 to 1.5 GPM.
- Laboratory testing using U.S. Silica's Sil-Co-Sil 106 fine silica product showed an average 87% TSS removal for testing at 7.5 GPM per cartridge (100% design flow rate).
- Other relevant testing at I-5 Lake Union, Greenville Yards (New Jersey), and Ski Run Marina (Lake Tahoe) facilities shows consistent TSS removals in the 75 to 85% range. *Note that the evaluators operated the I-5 Lake Union at 50%, 100%, and 125% of design flow*.
- SMI's application included a satisfactory "Factors other than treatment performance" discussion.

  Note: Ecology's 80% TSS removal goal applies to 100 mg/l and greater influent TSS. Below 100 mg/L influent TSS, the goal is 20 mg/L effluent TSS.

Technology Description:

The Stormwater Management StormFilter® (StormFilter), a flow-through stormwater filtration system, improves the quality of stormwater runoff from the urban environment by removing pollutants. The StormFilter can treat runoff from a wide variety of sites including, but not limited to: retail and commercial development, residential streets, urban roadways, freeways, and industrial sites such as shipyards, foundries, etc.

Operation:

The StormFilter is typically comprised of a vault that houses rechargeable, media-filled, filter cartridges. Various media may be used, but this designation covers only the zeolite-perlite-granulated activated carbon (ZPG™) medium. Stormwater from storm drains percolates through these media-filled cartridges, which trap particulates and may remove pollutants such as dissolved metals, nutrients, and hydrocarbons. During the filtering process, the StormFilter system also removes surface scum and floating oil and grease. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharged to an open channel drainage way.

This document includes a bypass schematic for flow rates exceeding the water quality design flow rate on page 8.

StormFilter Configurations:

Contech offers the StormFilter in multiple configurations: precast, high flow, catch basin, curb inlet, linear, volume, corrugated metal pipe, drywell, and CON/Span form. Most configurations use pre-manufactured units to ease the design and installation process. Systems may be either uncovered or covered underground units.

The typical precast StormFilter unit is composed of three sections: the energy dissipater, the filtration bay, and the outlet sump. As Stormwater enters the inlet of the StormFilter vault through the inlet pipe, piping directs stormwater through the energy dissipater into the filtration bay where treatment will take place. Once in the filtration bay, the stormwater ponds and percolates horizontally through the media contained in the StormFilter cartridges. After passing through the media, the treated water in each cartridge collects in the cartridge's center tube from where piping directs it into the outlet sump by a High Flow Conduit under-drain manifold. The treated water in the outlet sump discharges through the single outlet pipe to a collection pipe or to an open channel drainage way. In some applications where you anticipate heavy grit loads, pretreatment by settling may be necessary.

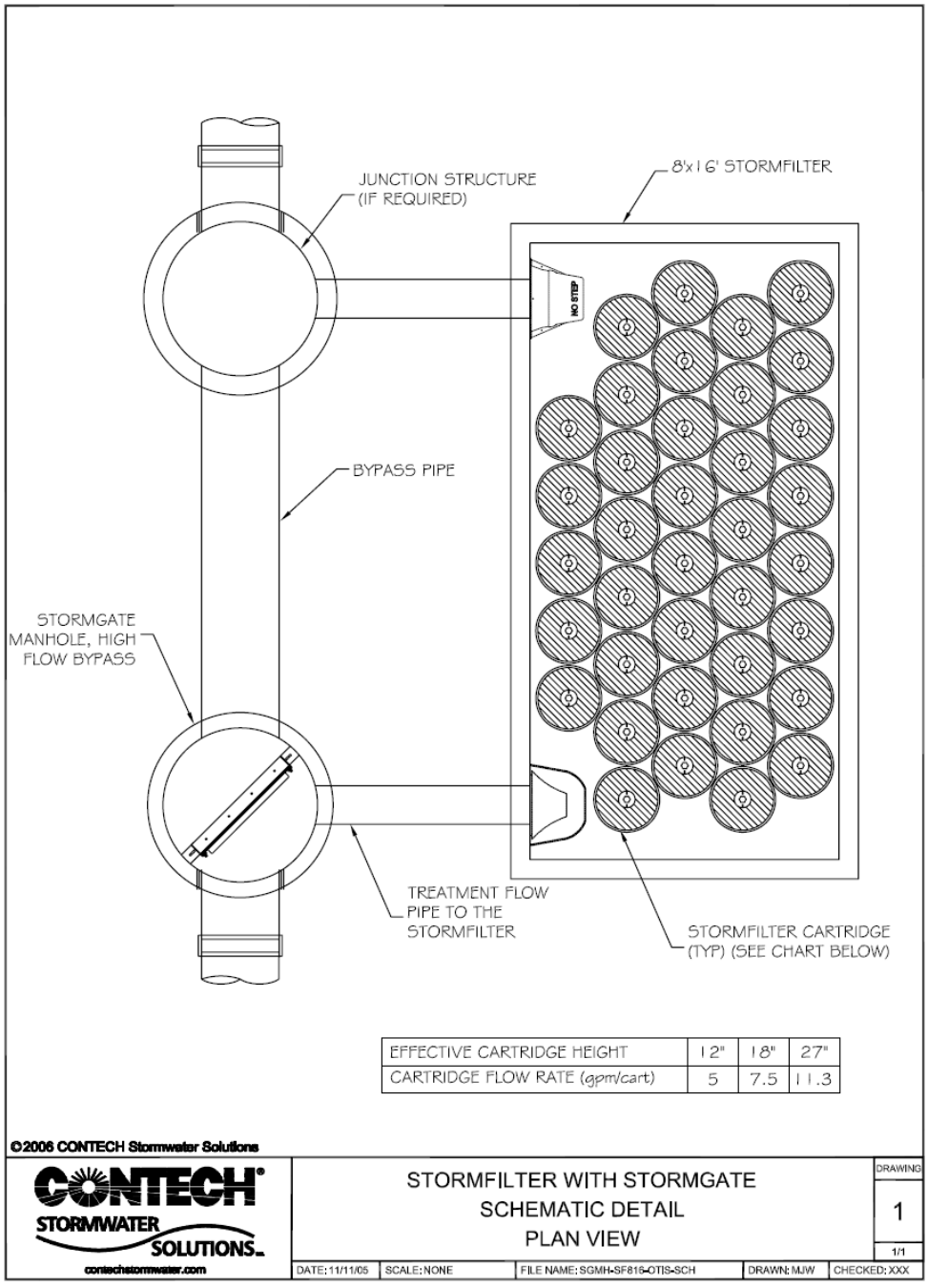

Figure 1. Stormwater Management StormFilter Configuration with Bypass

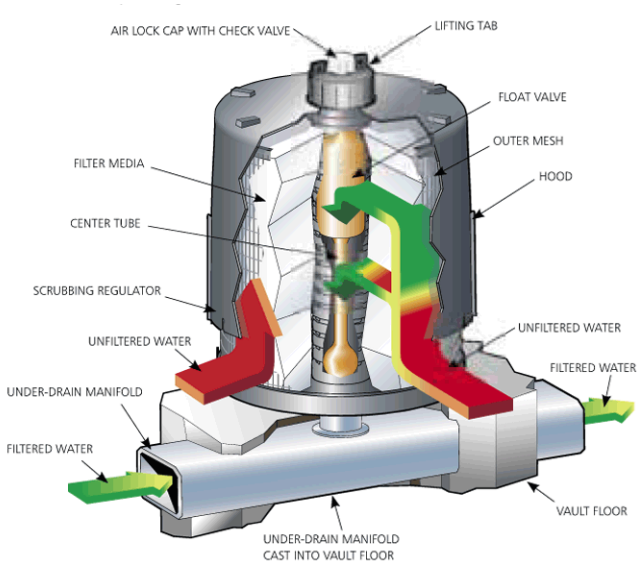

Figure 2. The StormFilter Cartridge

Cartridge Operation:

As the water level in the filtration bay begins to rise, stormwater enters the StormFilter cartridge. Stormwater in the cartridge percolates horizontally through the filter media and passes into the cartridge's center tube, where the float in the cartridge is in a closed (downward) position. As the water level in the filtration bay continues to rise, more water passes through the filter media and into the cartridge's center tube. Water displaces the air in the cartridge and it purges from beneath the filter hood through the one-way check valve located in the cap. Once water fills the center tube there is enough buoyant force on the float to open the float valve and allow the treated water to flow into the under-drain manifold. As the treated water drains, it tries to pull in air behind it. This causes the check valve to close, initiating a siphon that draws polluted water throughout the full surface area and volume of the filter. Thus, water filters through the entire filter cartridge throughout the duration of the storm, regardless of the water surface elevation in the filtration bay. This continues until the water surface elevation drops to the elevation of the scrubbing regulators. At this point, the siphon begins to break and air quickly flows beneath the hood through the scrubbing regulators, causing energetic bubbling between the inner surface of the hood and the outer surface of the filter. This bubbling agitates and cleans the surface of the filter, releasing accumulated sediments on the surface, flushing them from beneath the hood, and allowing them to settle to the vault floor.

Adjustable cartridge flow rate:

Inherent to the design of the StormFilter is the ability to control the individual cartridge flow rate with an orifice-control disc placed at the base of the cartridge. Depending on the treatment requirements and on the pollutant characteristics of the influent stream as specified in the CONTECH *Product Design Manual*, operators may adjust the flow rate through the filter cartridges. By decreasing the flow rate through the filter cartridges, the influent contact time

with the media is increased and the water velocity through the system is decreased, thus increasing both the level of treatment and the solids removal efficiencies of the filters, respectively (de Ridder, 2002).

Other StormFilter with ZPG items the Company should address:

1. Conduct hydraulic testing on a StormFilter with Phosphosorb at one site in the Pacific Northwest as outlined in the 2024 TAPE Guidance Document to obtain information about maintenance longevity and requirements. Complete testing by February 28, 2028.

Contact Information:

Applicant Contact: Jeremiah Lehman
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11835 NE Glenn Widing Drive
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503-258-3136
jlehman@conteches.com

Applicant Web link http://www.conteches.com/

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology Contact: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	Revision
Jan 2005	Original Use Level Designation
Dec 2007	Revision
May 2012	Maintenance requirements updated
November 2012	Design Storm and Maintenance requirements updated
January 2013	Updated format to match Ecology standard format
September 2014	Added Peak Diversion StormFilter Alternate Configuration
November 2016	Revised Contech contact information
April 2017	Revised sizing language to note sizing based on Off-line calculations
April 2025	Added requirement for maintenance assessment

Tab 5.0

5.0 CONVEYANCE SYSTEM ANALYSIS AND DESIGN

No changes to the storm conveyance system are proposed. The project area will continue to be served by the existing onsite stormwater system.

Tab 6.0

6.0 SPECIAL REPORTS AND STUDIES

Geotechnical Exploration and Recommendation prepared by Riley Group, dated April 9, 2024.

Geotechnical Response Letter by The Riley Group, Inc. dated January 6, 2025.

Tab 7.0

7.0 OTHER PERMITS

Other permits that may be required for this project include:

- SEPA Environmental Checklist (PLPSP20240062)
- Civil Construction Permit
- Building Permits
- Construction Stormwater General Permit - not needed since the site is less than 1 acre of disturbance

Tab 8.0

8.0 ESC ANALYSIS AND DESIGN

An erosion and sediment control plan is included as part of the civil construction plan set. The plan follows the measures outlined in the Erosion and Sediment Control Standards. The measures outlined in the Manual are discussed below.

Clearing Limits: Prior to any site clearing or grading, the construction limits will be clearly marked with a combination of silt fencing and/or brightly colored survey tape.

Cover Measures: Temporary and permanent cover measures shall be provided when necessary to protect disturbed areas. Temporary cover shall be installed if an area is to remain unworked for more than seven days during the dry season (May 1 to September 30) or for more than two days during the wet season (October 1 to April 30), unless otherwise noted by the City. Any area to remain unworked for more than 30 days shall be seeded or sodded, unless the City determines that winter weather makes vegetation establishment unfeasible. During the wet season, slopes and stockpiles 3H:1V or steeper with more than 10 feet of vertical relief shall be covered if they are to remain unworked for more than 12 hours. The CESCL lead shall be responsible for determining what specific measures to implement to suit changing site conditions.

Perimeter Protection: Silt fence shall be installed as needed along the project limits prior to any upstream grading to prevent and filter sediment sheet flow onto adjacent areas.

Traffic Area Stabilization: The construction entrance will be stabilized with rock to minimize erosion tracking of sediment offsite. Should there be parking areas used by construction traffic onsite they shall also require stabilization.

Sediment Retention: Surface water collected from disturbed areas of the site shall be routed through a sediment removal device prior to release from the site. The existing catch basins onsite will include sediment bags to filter runoff.

Surface Water Controls: The site is very small so runoff will continue to sheet flow to the existing catch basins.

Dust Control: Preventative measures to minimize the wind transport of soil shall be taken as necessary depending on site conditions. The most common method shall be to spray exposed soils until wet, but not so wet as to cause the soils to generate runoff from the spraying.

Tab 9.0

9.0 BOND QUANTITIES, FACILITY SUMMARIES, AND DECLARATION OF COVENANT

All required bonding and financial guarantees will be provided as required by the City of Puyallup.

Tab 10.0

10.0 OPERATIONS AND MAINTENANCE MANUAL

A new Contech Stormfilter is proposed. The Operations and Maintenance Manual is attached as Appendix D.

Appendix A
Construction Stormwater Pollution Prevention Plan

Construction Stormwater General Permit (CSWGP)

Stormwater Pollution Prevention Plan (SWPPP)

for

Fred Meyer – Distribution Center – Puyallup

Prepared for:

Washington State Department of Ecology

3190 160th Avenue S.E., Bellevue, WA 98008-5452

Permittee / Owner	Developer	Operator / Contractor
Doug Hardy West Region Engineer Kroger Logistics Maintenance and Engineering 2201 South Wilmington Ave. Compton, CA 90220	Same as Owner	TBD

Site Location

2200 North Meridian
Puyallup, WA 98371

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
Not applicable, site is less than 1 acre.		

SWPPP Prepared By

Name	Organization	Contact Phone Number
Karen Harris, PE	Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032	425-251-6222

SWPPP Preparation Date

January 2, 2025

Project Construction Dates

Activity / Phase	Start Date	End Date
Site Grading	TBD	TBD

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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: Fred Meyer - Distribution Center - Puyallup
Street/Location: 2200 North Meridian, Puyallup

Receiving waterbody: Puyallup River and Puget Sound

1.1 Existing Conditions

Total acreage: 56.53 acres

Disturbed acreage: 0.37 acres

Existing structures: The existing site contains two warehouse buildings.

Landscape topography: The site has flat topography.

Drainage patterns: The developed portion of the site drains to existing stormwater catch basins and piping that drain to existing onsite bioswales, which discharge into the public stormwater system in Valley Avenue NW, ultimately discharging to the Puyallup River.

Existing Vegetation: The majority of the site has been developed with buildings and pavement.

Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):

There are no critical areas onsite.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: The Puyallup River downstream of the site is listed for temperature and Mercury.

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
The existing site features are to remain and a portion of the pavement in the driveway located in the northwest corner of the site is to be removed and replaced. A new guard house is to be constructed as well.

Description of construction activities (example: site preparation, demolition, excavation):
Demolition, grade the site, excavate and install utilities, construct building, pave the site.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Runoff from the site drains to existing stormwater catch basins and piping that drain to existing onsite bioswales, which discharge into the public stormwater system in Valley Avenue NW, ultimately discharging to the Puyallup River.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The disturbed areas will be stabilized with impervious surfaces and landscaping.

Contaminated Site Information:
To our knowledge there is no onsite soil or groundwater contamination.

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 has noted a deficiency in BMPs or deviation from original design.

2.1 The 12 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:

- **Silt Fence (BMP C233)**
  - Clearly mark the construction limits with fencing only if needed. Disturbed areas are at a lower elevation than the surrounding areas so runoff is not expected to leave the site. See TESC plan.

Installation Schedules: Prior to commencement of any construction activity

Inspection and Maintenance plan: **Inspect weekly and after storm events**. Repair any damaged silt fence immediately. Remove sediment or install additional fence when sediment accumulates to height of 1/3rd of the fence.

Responsible Staff: CESCL Lead

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/Exit (BMP C105)**
  - The existing paved driveway and parking lot provide stabilized entrances to the site

Installation Schedules: ASAP after project start

Inspection and Maintenance plan: **Inspect weekly and after storm events**. Vacuum as needed to prevent tracking of sediments onto pavement.

Responsible Staff: CESCL Lead

2.1.3 Element 3: Control Flow Rates

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:

No flow control is required on this site as it has direct discharge to the Puyallup River.

Installation Schedules: TBD

Inspection and Maintenance plan: **Inspect weekly**. **Daily after storm events**. Clean/remove sediments that have accumulated to a depth of 1-foot. Repair damaged pond embankments.

Responsible Staff: CESCL Lead

2.1.4 Element 4: Install Sediment Controls

All stormwater runoff from disturbed areas shall pass through an appropriate sediment removal BMP before leaving the construction site.

In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical vacuums, 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.

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.

List and describe BMPs:

- **Silt Fence (BMP C233)**
  - Silt fence is to be installed along the perimeter of the site, wherever onsite grades are higher than the adjacent properties.
- **Storm Drain Inlet Protection (BMP C220)**
  - Catch basin inlet protection is to be installed on all new and existing catch basins within the construction limits until the site is fully stabilized.

Installation Schedules: Install Silt Fences and Storm Drain Protection as one of the first things after construction starts.

Inspection and Maintenance plan: **Inspect weekly. Daily after storm events**. Repair damaged fence or inlet protection immediately. Clean sediments according to manufacturer recommendations.

Responsible Staff: CESCL Lead

2.1.5 Element 5: Stabilize Soils

Exposed and unworked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project.

All areas disturbed by construction activities shall be hydro-seeded upon completion of grading activities or if they will be unworked for more than 2 days in the wet season or 7 days in the dry season.

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: TBD End date: TBD

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

List and describe BMPs:

- **Temporary and Permanent Seeding (BMP C120)**
  - Use to reduce erosion from any unworked, exposed areas or to stabilize areas that have reached final grade.
- **Dust Control (BMP C140)**
  - Use to limit wind transport of dust onto roadway and other areas.

Installation Schedules: Installed as needed to any soils unworked per the schedule.

Inspection and Maintenance plan: **Inspect weekly. Daily during storm events**. Repair eroded soils immediately.

Responsible Staff: CESCL Lead

2.1.6 Element 6: Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion.

Steep slopes will be protected from erosion by not directing runoff toward them. When necessary, such as where the interceptor ditches enter the detention pond, riprap is to be used to limit the bank erosion.

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

List and describe BMPs:

There are no steep slopes present onsite.

Installation Schedules: Install as needed during construction.

Inspection and Maintenance plan: **Inspect weekly. Daily during storm events**. Repair eroded slopes immediately.

Responsible Staff: CESCL Lead

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 Drain Inlet Protection (BMPC220)**
  - This site will primarily entail the use catch basin filters. Additional measures such as culvert sediment traps, excavated inlet protection, or wooden weirs or block and gravel protection may also be necessary.

Installation Schedules: At start of construction for existing inlets and upon installation for new inlets.

Inspection and Maintenance plan: **Inspect weekly. Inspect daily during storm events**. Clean and remove/replace any devices that have filled to 1/3 or as specified by manufacturer. Culvert sediment traps are expected to last approximately 18 months but shall be inspected weekly.

Responsible Staff: CESCL Lead

2.1.8 Element 8: Stabilize Channels and Outlets

Where site runoff is to be conveyed in channels, or discharged to a stream or some other natural drainage point, efforts will be taken to prevent downstream erosion.

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.

List and describe BMPs:

All outfalls are existing and already stabilized.

Installation Schedules: Install outlet protection prior to allowing runoff to discharge from ponds.

Inspection and Maintenance plan: **Inspect Weekly. Daily during storm events**. Repair any damaged or failed BMPs immediately.

Responsible Staff: CESCL Lead

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)
Sanitary Wastewater from construction workers
Solid wastes such as wood, metals, plastics from demolition/construction
Dust from excavating and grading activities.
Polluted waters and slurry from sawcutting
Agricultural chemicals such as fertilizers
Chemicals such as asphalt sealants
Site soils
Site groundwater generated during dewatering, as necessary

All pollutants, including waste materials and demolition debris, that are generated on site during construction activities 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.

Chemical storage:

- Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume II of the DOE Stormwater Management Manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment

- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application procedures and rates shall be followed.

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 sawcutting and surfacing operations will be prevented from entering the waters of the State by implementing Sawcutting and Surfacing Pollution Prevention measures (BMP C152).

Concrete and grout:

- Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

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.

List and describe BMPs: BMPs are described above for various types of pollutants above.

Installation Schedules: Proper storage and cover measures shall be implemented throughout construction.

Inspection and Maintenance plan: **Inspect solid pollutants weekly, daily after storm events. Inspect watery pollutants such as from saw-cutting continually while the activity is taking place.**

Responsible Staff: CESCL Lead

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:]

Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures. Adjust pH of stormwater if outside range of 6.5 to 8.5 su.

Obtain written approval from Ecology before using chemical treatment with the exception of CO_2 or dry ice to modify pH.

List and describe BMPs:

- **Sawcutting and Surfacing Pollution Prevention (BMP C152)**
  - Contingent based on demolition procedures used and CESCL lead.
- **Material Delivery, Storage and Containment (BMP C153)**
  - Contingent based on site activities and CESCL lead.
- **Construction Stormwater Treatment (BMP C250)**
  - If required to treat contaminated soil or groundwater onsite
- **Construction Stormwater Filtration (BMP C251)**
  - If required to treat contaminated soil or groundwater onsite

Installation Schedules: As needed.

Inspection and Maintenance plan: **Inspect continuously during construction activities that produce water and/or slurry**.

Responsible Staff: CESCL Lead

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.

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

Dewatering should not be required as groundwater was not encountered to depths of 12.5 feet.

If dewatering is required, water generated by dewatering will be filtered by sedimentation bags or transported offsite.

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)

List and describe BMPs:

- **Sedimentation Bag/Vacuum Truck**
  - Dewatering water should be stored in a vehicle for offsite disposal or sent through a sedimentation bag. Only clean, non-turbid water may be discharged from the site.

Installation Schedules: As needed.

Inspection and Maintenance plan: **Monitor dewatering water continuously during dewatering operations.**

Responsible Staff: CESCL Lead

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)

Optional: Fill out Table 6 by listing the BMP associated with specific construction activities. Identify the phase of the project (if applicable). To increase awareness of seasonal requirements, indicate if the activity falls within the wet or dry season.

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

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

No Low Impact Developments BMPs are proposed for this project.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Not applicable – Site is less than 1 acre	
Resident Engineer	Jason G. Hubbell, PE	425-251-6222
Emergency Ecology Contact		
Emergency Permittee/ Owner Contact		
Non-Emergency Owner Contact		
Monitoring Personnel		
Ecology Regional Office	WSDOE Lacey Regional Office	(360) 407-6300

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

A blank form can be found under Appendix D.

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.

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 benchmark 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. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

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 benchmark. 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.

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 benchmark. 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 or recycled concrete over the life of the project).The use of 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:

Table 9 – pH Sampling Method

	pH meter
	pH test kit
	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

The Puyallup River is listed for temperature and Mercury

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

N/A

List and describe BMPs:

N/A

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 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

6.1.2 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.

6.1.3 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.

6.2 Reporting

6.2.1 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.

To sign up for WQWebDMR go to:
http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html

6.2.2 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.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

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.

Appendix/Glossary

A. Site Map

The site map must meet the requirements of Special Condition S9.E of the CSWGP

B. BMP Detail

Insert BMPs specification sheets here.
Download BMPs from the Ecology Construction Stormwater website at:
https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

Create your own or download Ecology's template:
https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

E. Construction Stormwater General Permit (CSWGP)

Download CSWGP: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

F. 303(d) List Waterbodies / TMDL Waterbodies Information

Proposed New Discharge to an Impaired Water Body form
SWPPP Addendum addressing impairment

G. Contaminated Site Information

Administrative Order
Sanitary Discharge Permit
Soil Management Plan
Soil and Groundwater Reports
Maps and Figures Depicting Contamination

H. Engineering Calculations

Appendix A
Site Plans

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

DEMOLITION / TESC PLAN

0 10' 20' 40'

SCALE: 1"=20'

EXISTING LEGEND:

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (AS NOTED)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- BENCHMARK
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER POLE
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- CLEANOUT (AS NOTED)
- GAS METER
- GAS VALVE
- WATER VALVE (WV)
- FIRE HYDRANT(FH) / CONNECTION(FDC)
- WATER MANHOLE
- WATER METER
- BLOW-OFF / AIRVAC
- MONITOR WELL
- SIGN
- DIRECTIONAL ARROW
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- SILT FENCE
- METAL/IRON FENCE
- GUARD RAIL/CABLE FENCE
- WATER LINE
- GAS LINE
- STEAM LINE
- T(XXX) TELEPHONE LINE (OH) OR (UG)
- P(XXX) POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- DECIDUOUS TREE
- CONIFEROUS TREE

DEMOLITION AND EXCAVATION NOTES:

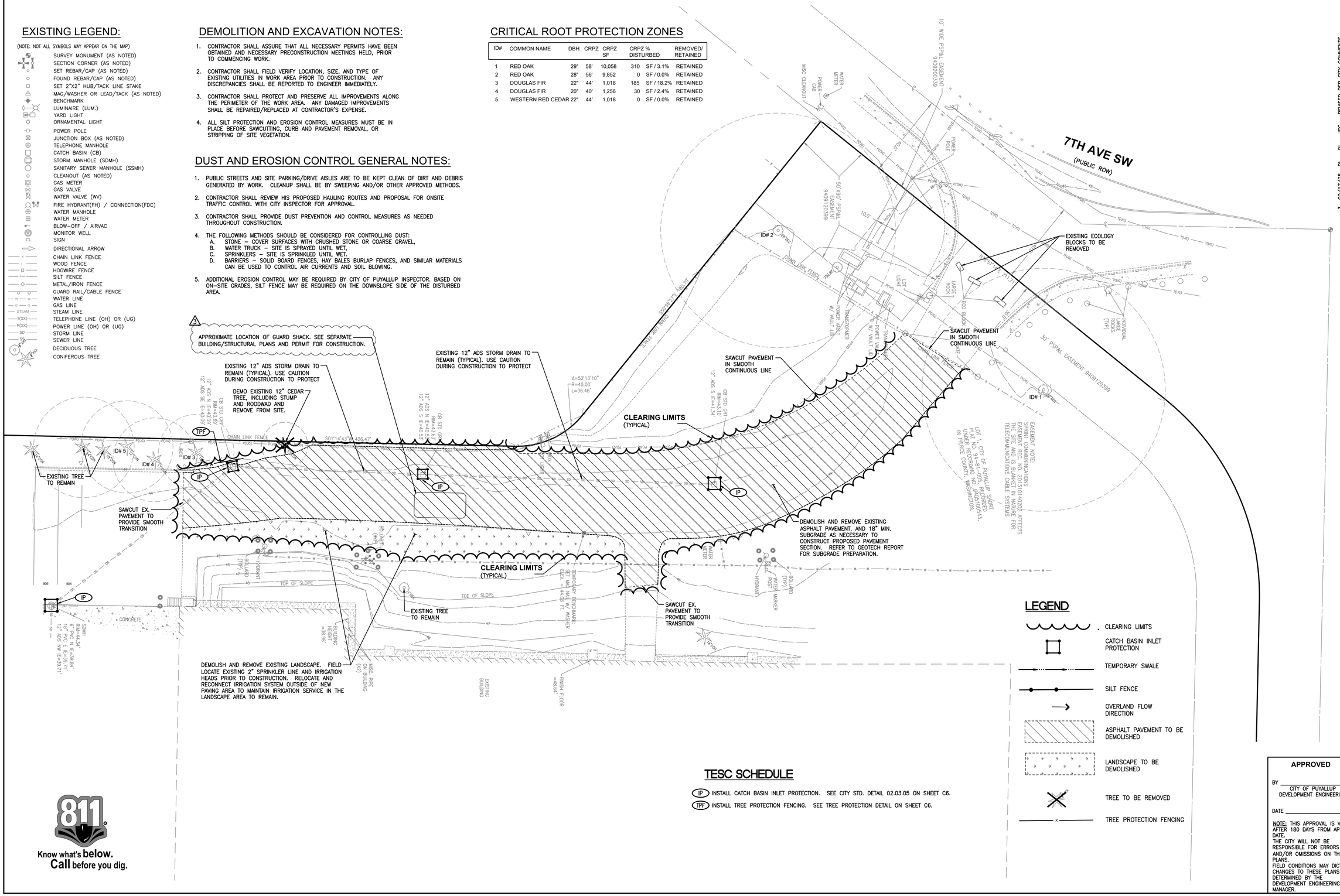
1. CONTRACTOR SHALL ASSURE THAT ALL NECESSARY PERMITS HAVE BEEN OBTAINED AND NECESSARY PRECONSTRUCTION MEETINGS HELD, PRIOR TO COMMENCING WORK.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION, SIZE, AND TYPE OF EXISTING UTILITIES IN WORK AREA PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO ENGINEER IMMEDIATELY.
3. CONTRACTOR SHALL PROTECT AND PRESERVE ALL IMPROVEMENTS ALONG THE PERIMETER OF THE WORK AREA. ANY DAMAGED IMPROVEMENTS SHALL BE REPAIRED/REPLACED AT CONTRACTOR'S EXPENSE.
4. ALL SILT PROTECTION AND EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE SAWCUTTING, CURB AND PAVEMENT REMOVAL, OR STRIPPING OF SITE VEGETATION.

DUST AND EROSION CONTROL GENERAL NOTES:

1. PUBLIC STREETS AND SITE PARKING/DRIVE AISLES ARE TO BE KEPT CLEAN OF DIRT AND DEBRIS GENERATED BY WORK. CLEANUP SHALL BE BY SWEEPING AND/OR OTHER APPROVED METHODS.
2. CONTRACTOR SHALL REVIEW HIS PROPOSED HAULING ROUTES AND PROPOSAL FOR ONSITE TRAFFIC CONTROL WITH CITY INSPECTOR FOR APPROVAL.
3. CONTRACTOR SHALL PROVIDE DUST PREVENTION AND CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.
4. THE FOLLOWING METHODS SHOULD BE CONSIDERED FOR CONTROLLING DUST:
   A. STONE – COVER SURFACES WITH CRUSHED STONE OR COARSE GRAVEL,
   B. WATER TRUCK – SITE IS SPRAYED UNTIL WET,
   C. SPRINKLERS – SITE IS SPRINKLED UNTIL WET,
   D. BARRIERS – SOLID BOARD FENCES, HAY BALES BURLAP FENCES, AND SIMILAR MATERIALS CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.
5. ADDITIONAL EROSION CONTROL MAY BE REQUIRED BY CITY OF PUYALLUP INSPECTOR. BASED ON ON-SITE GRADES, SILT FENCE MAY BE REQUIRED ON THE DOWNSLOPE SIDE OF THE DISTURBED AREA.

CRITICAL ROOT PROTECTION ZONES

ID#	COMMON NAME	DBH	CRPZ	CRPZ SF	CRPZ % DISTURBED	REMOVED/ RETAINED
1	RED OAK	29"	58'	10,058	310 SF / 3.1%	RETAINED
2	RED OAK	28"	56'	9,852	0 SF / 0.0%	RETAINED
3	DOUGLAS FIR	22"	44'	1,018	185 SF / 18.2%	RETAINED
4	DOUGLAS FIR	20"	40'	1,256	30 SF / 2.4%	RETAINED
5	WESTERN RED CEDAR	22"	44'	1,018	0 SF / 0.0%	RETAINED



TESC SCHEDULE

(IP) INSTALL CATCH BASIN INLET PROTECTION. SEE CITY STD. DETAIL 02.03.05 ON SHEET C6.

(TPF) INSTALL TREE PROTECTION FENCING. SEE TREE PROTECTION DETAIL ON SHEET C6.

LEGEND

- CLEARING LIMITS
- CATCH BASIN INLET PROTECTION
- TEMPORARY SWALE
- SILT FENCE
- OVERLAND FLOW DIRECTION
- ASPHALT PAVEMENT TO BE DEMOLISHED
- LANDSCAPE TO BE DEMOLISHED
- TREE TO BE REMOVED
- TREE PROTECTION FENCING

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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	02/17/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **DEMOLITION / TESC PLAN**

FRED MEYER - DISTRIBUTION CENTER

For: **DOUG HARDY**
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER — 02/17/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

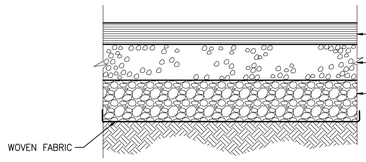
Sheet C3 of 6

P:\18000s\18510\engineering\2024 CIVIL SET\18510-EXCON.dwg 2/17/2025 8:20 AM NHUBBELL

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

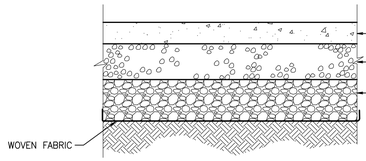
CONSTRUCTION DETAILS



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR HMA, AND CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

ASPHALT PAVEMENT SECTION

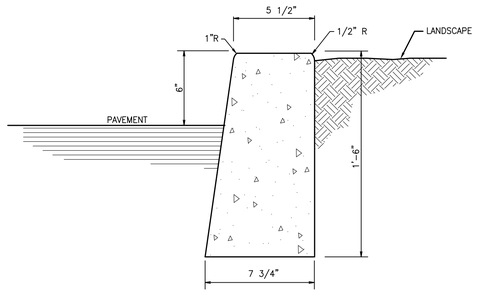
NOT TO SCALE



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

CONCRETE PAVEMENT SECTION

NOT TO SCALE



ONSITE BARRIER CURB

NOT TO SCALE

MATERIALS OF CONSTRUCTION

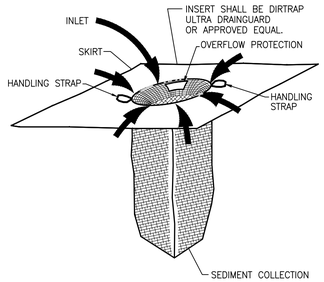
FABRIC:	NEEDLE PUNCHED NON-WOVEN GEOTEXTILE MATERIAL. FABRIC IS IS RESISTANT TO ULTRAVIOLET AND BIOLOGICAL DEGRADATION AND A BROAD RANGE OF CHEMICALS.
APPARENT OPENING SIZE (AOS):	80 US STANDARD SIEVE (0.180 MM)
GRAB TENSILE STRENGTH:	200 LBS
PUNCTURE STRENGTH:	130 LBS
MULLEN BURST:	400 PSI
TRAPEZOIDAL TEAR:	85 LBS
WATER FLOW RATE:	110 GPM/FT2
PERMEABILITY:	0.38 CM/SECOND

DIMENSIONS:

SKIRT:	24"x36"
SOCK FILTER/SEPARATOR:	10" D x 24" L

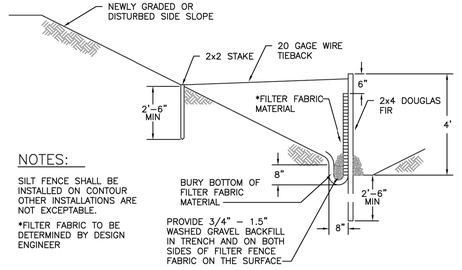
DISPOSAL REQUIREMENTS:

CONSULT FEDERAL, STATE, AND LOCAL REGULATIONS FOR DISPOSAL OF INSERTS



CATCH BASIN INSERT

NOT TO SCALE

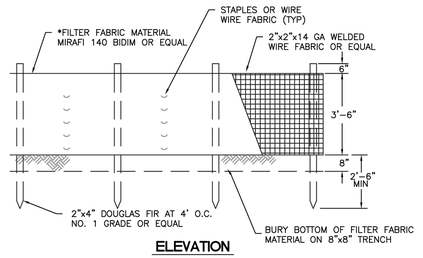


NOTES:

SILT FENCE SHALL BE INSTALLED ON CONTOUR OTHER INSTALLATIONS ARE NOT EXCEPTABLE.

*FILTER FABRIC TO BE DETERMINED BY DESIGN ENGINEER

TYPICAL CROSS SECTION



ELEVATION

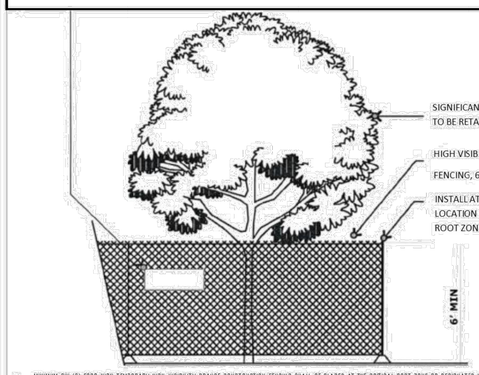
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SILTATION FENCE

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	02.03.02
FILE NAME: P:\DWG\COMMON\STDS\CITY\200905_SD502.03.02		DATE APPROVED: 06/01/1992	DATE REVISED: 06/01/2003	SCALE: NTS

TREE PROTECTION ZONE (TPZ)

NO ENTRY. NO GRADE CHANGES, STORAGE/STOCKPILING OF MATERIALS OR EQUIPMENT, PLACEMENT OF FILL OR TOP SOIL, TRENCHING OR VEHICULAR/FOOT TRAFFIC PERMITTED WITHIN THE TPZ. THIS TREE BARRIER SHALL NOT BE REMOVED WITHOUT AUTHORIZATION FROM PUYALLUP PLANNING DEPARMENT—SUBJECT TO FINES AND ENFORCEMENT ACTION BY THE CITY—TO REPORT VIOLATIONS OR FOR MORE INFORMATION—CALL (253) 864.4165



- MINIMUM SIX (6) FOOT HIGH TEMPORARY HIGH VISIBILITY ORANGE CONSTRUCTION FENCING SHALL BE PLACED AT THE CRITICAL ROOT ZONE OR DESIGNATED LIMIT OF DISTURBANCE ON APPROVED FINAL LANDSCAPE PLAN SET. FENCING SHALL BE INSTALLED USING POSTS DRIVEN INTO GROUND—PIER BLOCKS SHALL NOT BE USED. AVOID POSTS DRIVEN INTO ROOTS LARGER THAN 1" DIAMETER. FENCING SHALL BE INSTALLED PRIOR TO WORK COMMENCING ON SITE AND REMAIN IN PLACE THROUGHOUT ALL PHASES ON CONSTRUCTION—CALL THE CITY'S PLANNING DIVISION WITH REQUESTS TO MODIFY THE LOCATION OF THE TREE PROTECTION FENCING—(253) 864-4165.
- TREATMENT OF ROOTS EXPOSED DURING CONSTRUCTION: FOR ROOTS OVER ONE (1) INCH DIAMETER DAMAGED DURING CONSTRUCTION, MAKE A CLEAN STRAIGHT CUT TO REMOVE DAMAGED PORTION OF ROOT. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING AND COVERED WITH SOIL AS SOON AS POSSIBLE. OTHER PRE-TREATMENT MEASURES MAY BE REQUIRED TO PROTECT ROOT SYSTEM—SEE APPROVED TREE PROTECTION OR FINAL LANDSCAPE PLAN FOR FURTHER DETAILS.
- NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, PLACEMENT OF TOP SOIL OR FILL MATERIAL, STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMITS OF THE ESTABLISHED FENCING. FENCING SHALL NOT BE MOVED OR REMOVED UNLESS APPROVED BY THE CITY PLANNING DIVISION. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY UNDER THE SUPERVISION OF THE ON-SITE ARBORIST WITH PRIOR WRITTEN APPROVAL BY THE CITY PLANNING DIVISION.
- THE ABOVE REFERENCED TPZ SIGNS SHALL BE PLACED EVERY 15 FEET ALONG THE FENCING AND SHALL REMAIN IN PLACE THROUGHOUT ALL PHASES OF CONSTRUCTION.

TREE PROTECTION FENCING DETAIL
(for public and private trees)

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.

3. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.

4. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.

5. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.

6. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.

7. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

GRADING, EROSION, AND SEDIMENTATION CONTROL NOTES

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM DEWEY-SVOBODA	LINDA LIAN	COLLEEN HARRIS	LINDA LIAN	05.02.01
FILE NAME: P:\DWG\COMMON\STDS\CITY\200905_GRD05.01\05.02.01		DATE APPROVED: 03/01/2009	DATE REVISED: 11/18/2014	SCALE: 0:1

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	02/17/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: CONSTRUCTION DETAILS

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
02/17/2025

Scale: Horizontal AS SHOWN Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C6 of 6

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Appendix B
BMP Details

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½"	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

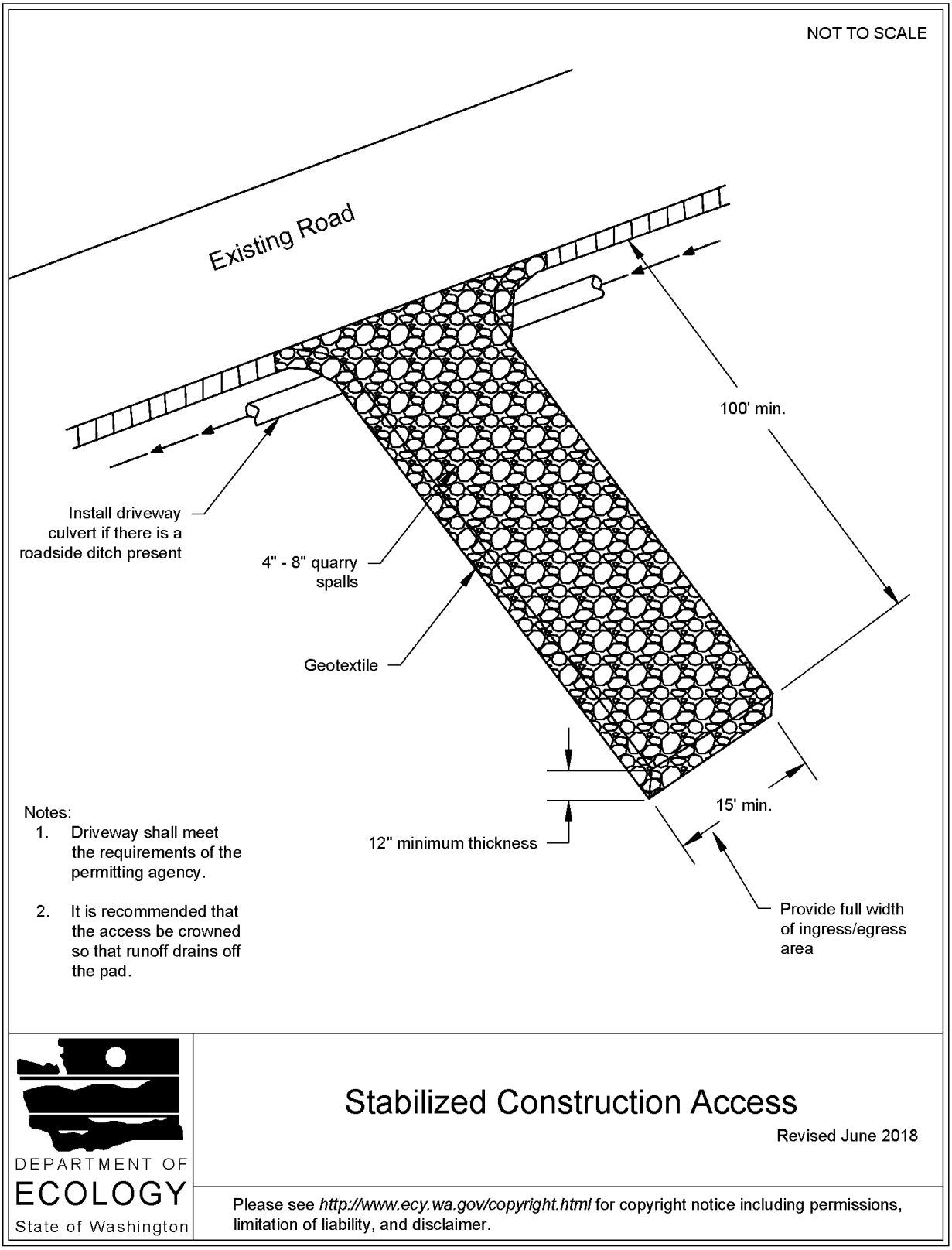
Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of BMP C106: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), BMP C103: High-Visibility Fence shall be installed to control traffic.

- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

Figure II-3.1: Stabilized Construction Access



Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by washing dirt from the wheels of motor vehicles prior to the motor vehicles leaving the construction site.

Conditions of Use

- Use a wheel wash when BMP C105: Stabilized Construction Access is not preventing sediment from being tracked off site.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Wheel wash wastewater is not stormwater. It is commonly called process water, and must be discharged to a separate on-site treatment system that prevents discharge to waters of the State, or to the sanitary sewer with local sewer district approval.
- Wheel washes may use closed-loop recirculation systems to conserve water use.
- Wheel wash wastewater shall not include wastewater from concrete washout areas.
- When practical, the wheel wash should be placed in sequence with BMP C105: Stabilized Construction Access. Locate the wheel wash such that vehicles exiting the wheel wash will enter directly onto BMP C105: Stabilized Construction Access. In order to achieve this, BMP C105: Stabilized Construction Access may need to be extended beyond the standard installation to meet the exit of the wheel wash.

Design and Installation Specifications

Suggested details are shown in Figure II-3.2: Wheel Wash. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121: Mulching for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See BMP T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
    - Irrigation.
    - Reapplication of mulch.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum,

permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C121: Mulching

Purpose

Mulching soils provides immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There are a variety of mulches that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 30 days on disturbed areas that require cover.
- At all times for seeded areas, especially during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.

Mulch may be applied at any time of the year and must be refreshed periodically.

For seeded areas, mulch may be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- 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 the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to BMP C105: Stabilized Construction Access and BMP C106: Wheel Wash.
- 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: Polyacrylamide (PAM) for Soil Erosion Protection) added to water at a rate of 0.5 pounds 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 reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

  Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.
- 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.

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- 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.
    - 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.
    - Limit dust-causing work on windy days.
    - Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252: Treating and Disposing of High pH Water for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (as defined in the CSWGP).
    - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds

- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3”x 4’
- 2-Oil Absorbent Socks 3”x 10’
- 12-Oil Absorbent Pads 17”x19”
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C154: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

  Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheel-barrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), use an engineered energy dissipator.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122: Nets and Blankets.

- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife. See I-2.11 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipator if sediment builds up.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.

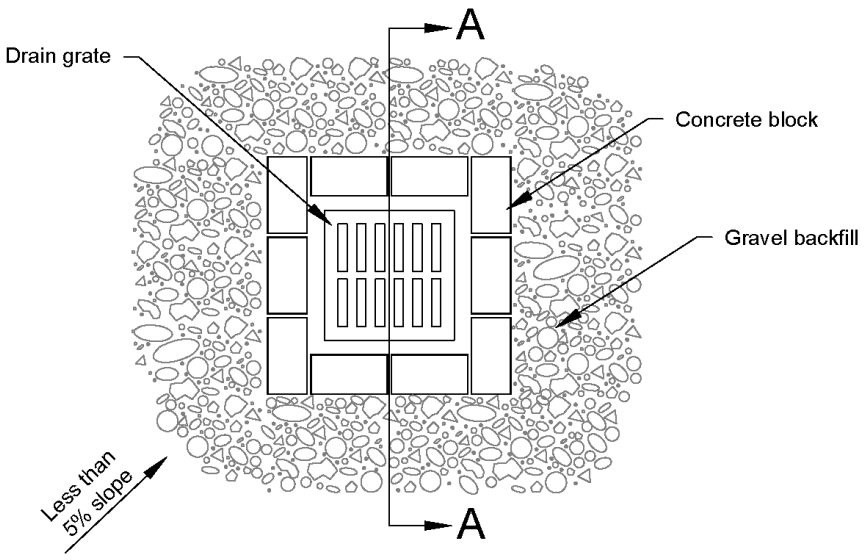
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

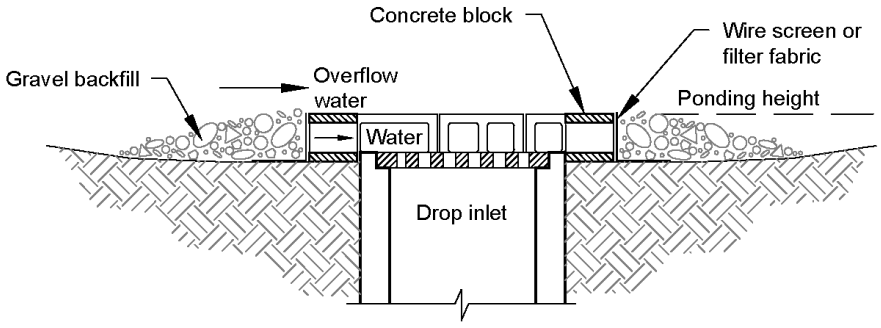
A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Plan View



Section A-A

Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

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Block and Gravel Filter

Revised June 2016

Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
    - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
    - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
    - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

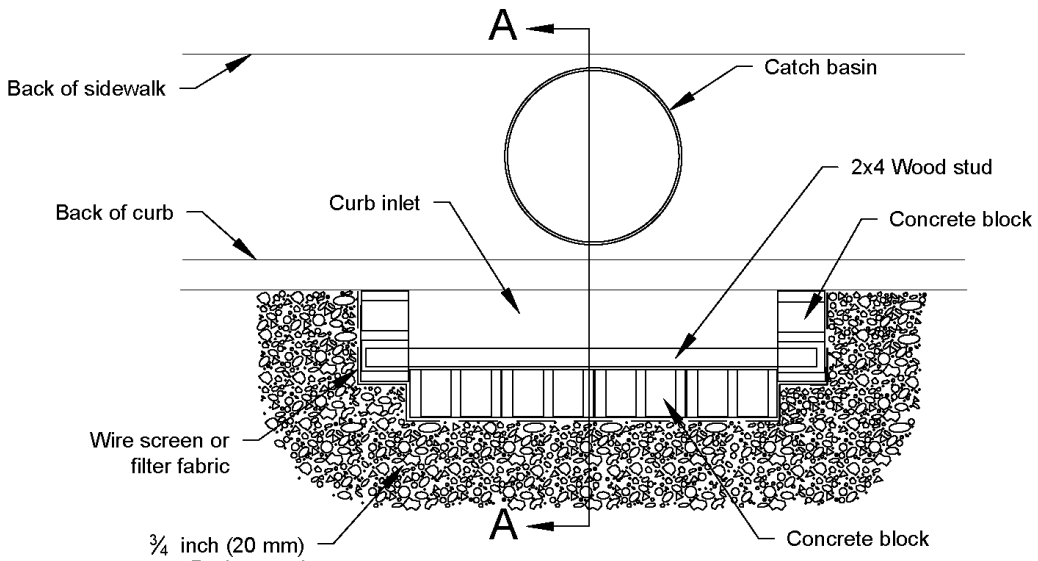
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

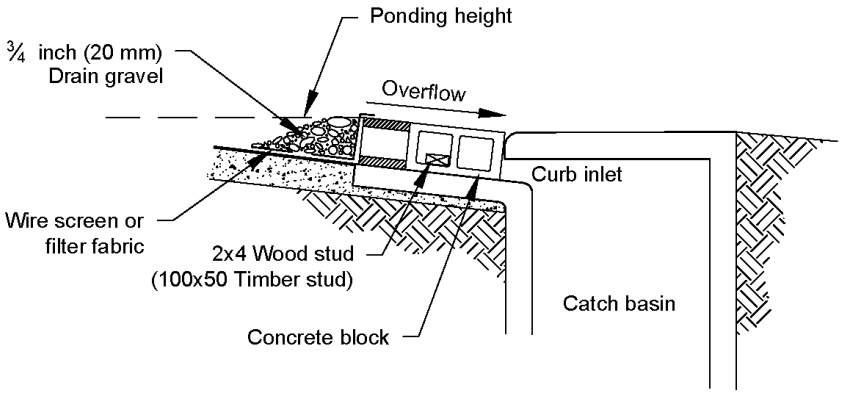
Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Plan View



Section A-A

Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Block and Gravel Curb Inlet Protection

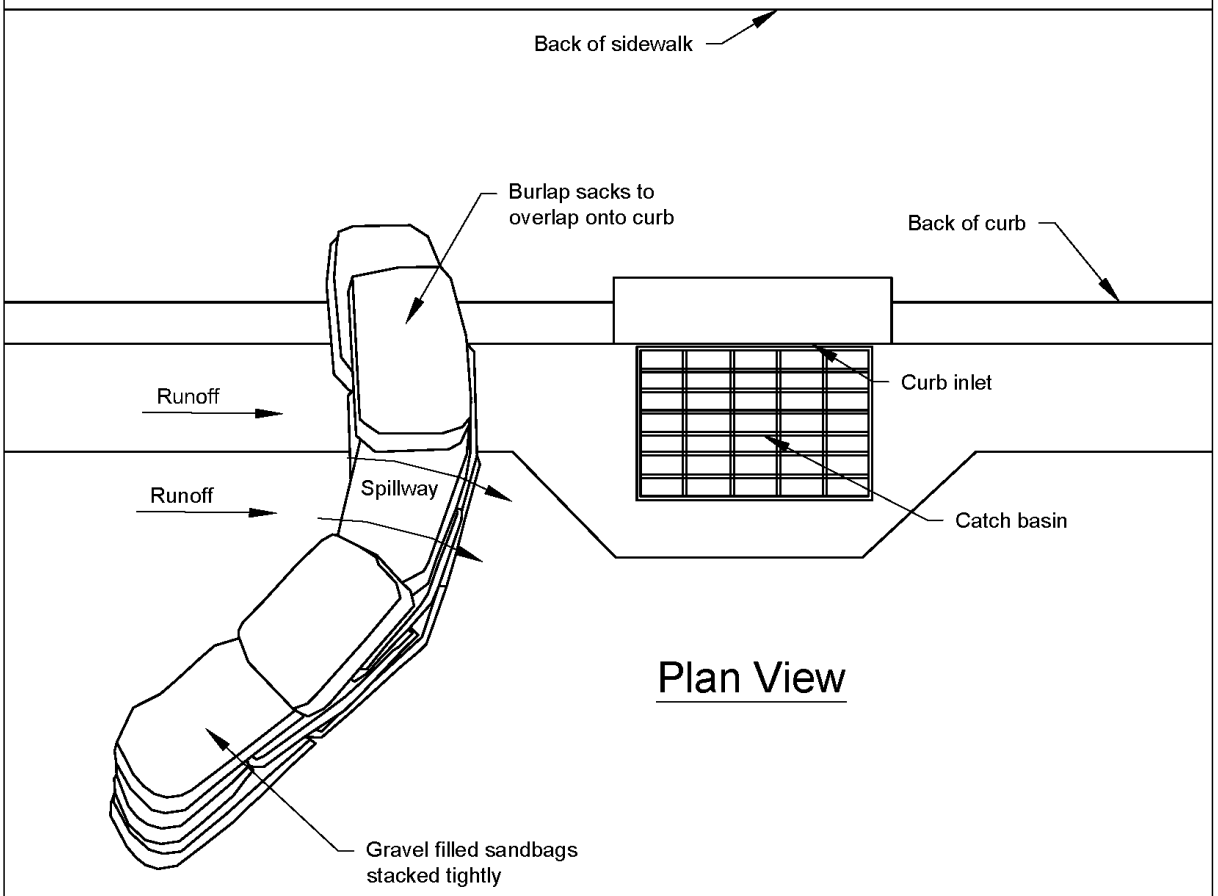
Revised June 2016

Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Curb and Gutter Barrier

Revised June 2016

Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C231: Brush Barrier

Purpose

The purpose of brush barriers is to reduce the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Brush barriers may be used downslope of disturbed areas that are less than one-quarter acre.
- Brush barriers are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be directed to a sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a brush barrier, rather than by a sediment trapping BMP, is when the area draining to the barrier is small.
- Brush barriers should only be installed on contours.

Design and Installation Specifications

- Height: 2 feet (minimum) to 5 feet (maximum).
- Width: 5 feet at base (minimum) to 15 feet (maximum).
- Filter fabric (geotextile) may be anchored over the brush berm to enhance the filtration ability of the barrier. Ten-ounce burlap is an adequate alternative to filter fabric.

BMP C233: Silt Fence

Purpose

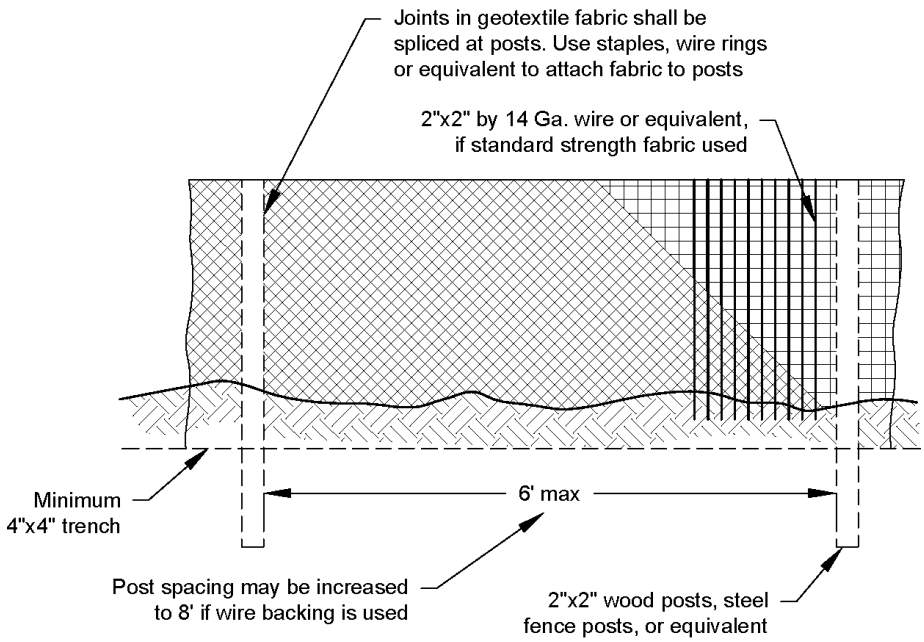
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

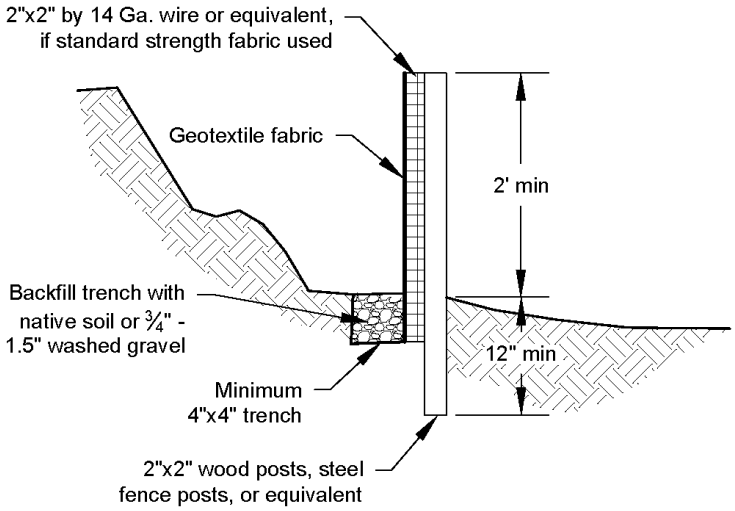
Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence





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State of Washington

Silt Fence

Revised July 2017

Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:

    1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
    2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those activities.

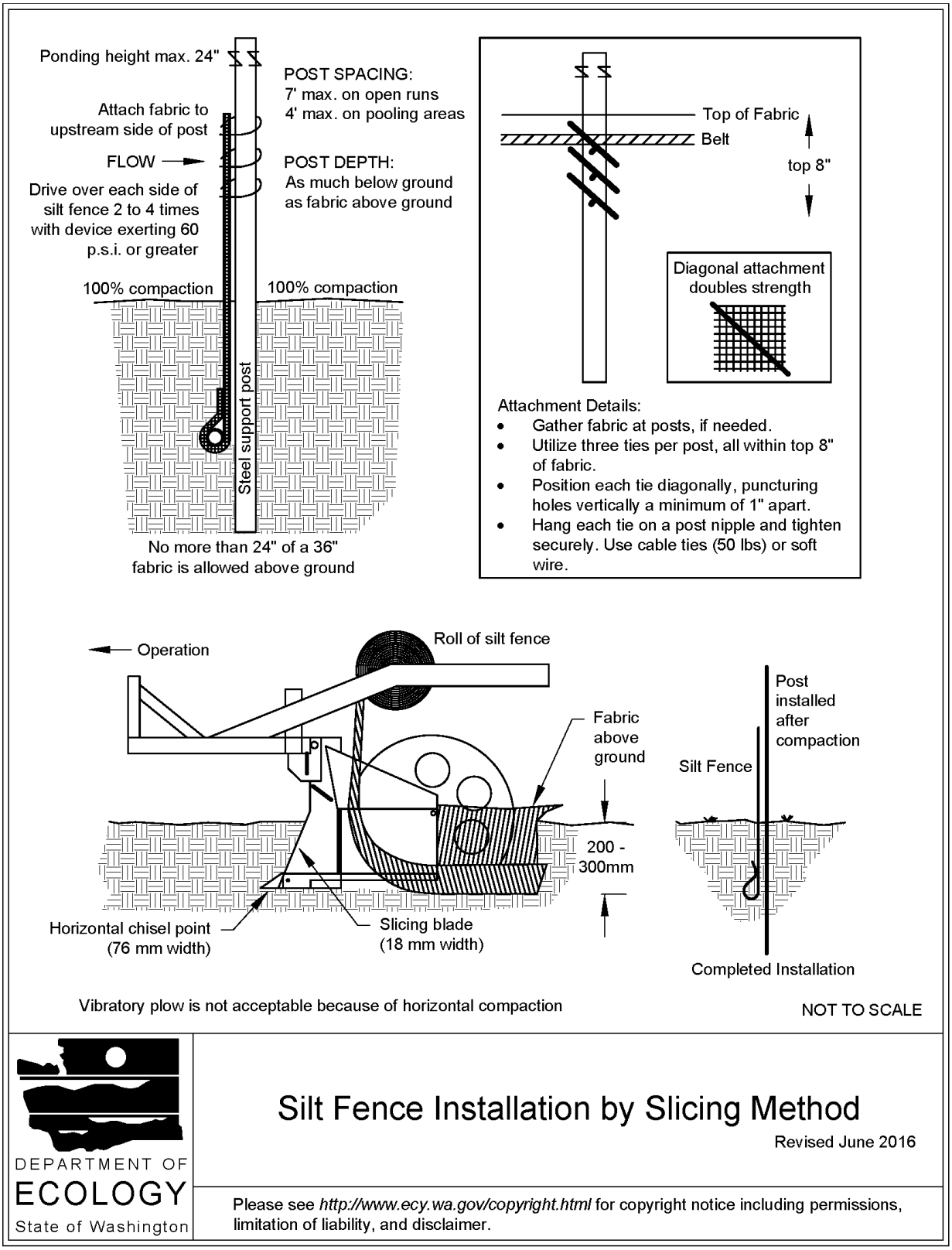
3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance to the post sizes listed above.
11. Locate silt fences on contour as much as possible, except at the ends of the fence,

where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.
    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:
    1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
    2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
    3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
    4. Install posts with the nipples facing away from the geotextile fabric.
    5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
    6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
    7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
    8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C234: Vegetated Strip

Purpose

Vegetated strips reduce the transport of coarse sediment from a construction site by providing a physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to BMP C241: Sediment Pond (Temporary) or other sediment trapping BMP. The only circumstance in which overland flow can be treated solely by a vegetated strip, rather than by a sediment trapping BMP, is when the following criteria are met (see Table II-3.12: Contributing Drainage Area for Vegetated Strips):

Table II-3.12: Contributing Drainage Area for Vegetated Strips

Average Contributing Area Slope	Average Contributing Area Percent Slope	Max Contributing area Flowpath Length
1.5H : 1V or flatter	67% or flatter	100 feet
2H : 1V or flatter	50% or flatter	115 feet
4H : 1V or flatter	25% or flatter	150 feet
6H : 1V or flatter	16.7% or flatter	200 feet
10H : 1V or flatter	10% or flatter	250 feet

Maintenance Standards

- Remove sediment from the pond when it reaches 1 foot in depth.
- Repair any damage to the pond embankments or slopes.

BMP C250: Construction Stormwater Chemical Treatment

Purpose

This BMP applies when using chemicals to treat turbidity in stormwater by either batch or flow-through chemical treatment.

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. BMP C241: Sediment Pond (Temporary) is effective at removing larger particulate matter by gravity settling, but is ineffective at removing smaller particulates such as clay and fine silt. Traditional Construction Stormwater BMPs may not be adequate to ensure compliance with the water quality standards for turbidity in the receiving water.

Chemical treatment can reliably provide exceptional reductions of turbidity and associated pollutants. Chemical treatment may be required to meet turbidity stormwater discharge requirements, especially when construction proceeds through the wet season.

Conditions of Use

Formal written approval from Ecology is required for the use of chemical treatment, regardless of site size. See https://fortress.wa.gov/ecy/publications/SummaryPages/ecy070258.html for a copy of the Request for Chemical Treatment form. The Local Permitting Authority may also require review and approval. When authorized, the chemical treatment systems must be included in the Construction Stormwater Pollution Prevention Plan (SWPPP).

Chemically treated stormwater discharged from construction sites must be nontoxic to aquatic organisms. The Chemical Technology Assessment Protocol - Ecology (CTAPE) must be used to evaluate chemicals proposed for stormwater treatment. Only chemicals approved by Ecology under the CTAPE may be used for stormwater treatment. The approved chemicals, their allowable application techniques (batch treatment or flow-through treatment), allowable application rates, and conditions of use can be found at the Department of Ecology Emerging Technologies website:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Background on Chemical Treatment Systems

Coagulation and flocculation have been used for over a century to treat water. The use of coagulation and flocculation to treat stormwater is a very recent application. Experience with the treatment of water and wastewater has resulted in a basic understanding of the process, in particular factors

that affect performance. This experience can provide insights as to how to most effectively design and operate similar systems in the treatment of stormwater.

Fine particles suspended in water give it a milky appearance, measured as *turbidity*. Their small size, often much less than 1 µm in diameter, give them a very large surface area relative to their volume. These fine particles typically carry a negative surface charge. Largely because of these two factors (small size and negative charge), these particles tend to stay in suspension for extended periods of time. Thus, removal is not practical by gravity settling. These are called stable suspensions. Chemicals like polymers, as well as inorganic chemicals such as alum, speed the settling process. The added chemical destabilizes the suspension and causes the smaller particles to flocculate. The process consists of three primary steps: *coagulation*, *flocculation*, and settling or *clarification*. Ecology requires a fourth step, *filtration*, on all stormwater chemical treatment systems to reduce floc discharge and to provide monitoring prior to discharge.

General Design and Installation Specifications

- Chemicals approved for use in Washington State are listed on Ecology's TAPE website, http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html, under the "Construction" tab.
- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. Stormwater that has been chemically treated must be filtered through BMP C251: Construction Stormwater Filtration for filtration and monitoring prior to discharge.
- System discharge rates must take into account downstream conveyance integrity.
- The following equipment should be located on site in a lockable shed:
    - The chemical injector.
    - Secondary containment for acid, caustic, buffering compound, and treatment chemical.
    - Emergency shower and eyewash.
    - Monitoring equipment which consists of a pH meter and a turbidimeter.
- There are two types of systems for applying the chemical treatment process to stormwater: the batch chemical treatment system and the flow-through chemical treatment system. See below for further details for both types of systems.

Batch Chemical Treatment Systems

A batch chemical treatment system consists of four steps: *coagulation*, *flocculation*, *clarification*, and polishing and monitoring via *filtration*.

Step 1: Coagulation

Coagulation is the process by which negative charges on the fine particles are disrupted. By disrupting the negative charges, the fine particles are able to flocculate. Chemical addition is one method of destabilizing the suspension, and polymers are one class of chemicals that are generally effective. Chemicals that are used for this purpose are called coagulants. Coagulation is complete

when the suspension is destabilized by the neutralization of the negative charges. Coagulants perform best when they are thoroughly and evenly dispersed under relatively intense mixing. This rapid mixing involves adding the coagulant in a manner that promotes rapid dispersion, followed by a short time period for destabilization of the particle suspension. The particles are still very small and are not readily separated by clarification until flocculation occurs.

Step 2: Flocculation

Flocculation is the process by which fine particles that have been destabilized bind together to form larger particles that settle rapidly. Flocculation begins naturally following coagulation, but is enhanced by gentle mixing of the destabilized suspension. Gentle mixing helps to bring particles in contact with one another such that they bind and continually grow to form "flocs." As the size of the flocs increase, they become heavier and settle.

Step 3: Clarification

The final step is the settling of the particles, or clarification. Particle density, size and shape are important during settling. Dense, compact flocs settle more readily than less dense, fluffy flocs. Because of this, flocculation to form dense, compact flocs is particularly important during chemical treatment. Water temperature is important during settling. Both the density and viscosity of water are affected by temperature; these in turn affect settling. Cold temperatures increase viscosity and density, thus slowing down the rate at which the particles settle.

The conditions under which clarification is achieved can affect performance. Currents can affect settling. Currents can be produced by wind, by differences between the temperature of the incoming water and the water in the clarifier, and by flow conditions near the inlets and outlets. Quiescent water, such as that which occurs during batch clarification, provides a good environment for settling. One source of currents in batch chemical treatment systems is movement of the water leaving the clarifier unit. Because flocs are relatively small and light, the velocity of the water must be as low as possible. Settled flocs can be resuspended and removed by fairly modest currents.

Step 4: Filtration

After clarification, Ecology requires stormwater that has been chemically treated to be filtered and monitored prior to discharge. The sand filtration system continually monitors the stormwater effluent for turbidity and pH. If the discharge water is ever out of an acceptable range for turbidity or pH, the water is returned to the untreated stormwater pond where it will begin the treatment process again.

Design and Installation of Batch Chemical Treatment Systems

A batch chemical treatment system consists of a stormwater collection system (either a temporary diversion or the permanent site drainage system), an untreated stormwater storage pond, pumps, a chemical feed system, treatment cells, a filtering and monitoring system, and interconnecting piping.

The batch treatment system uses a storage pond for untreated stormwater, followed by a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of chemically treated water in one cell, while other cells are being filled or emptied. Treatment cells may be ponds or tanks. Ponds with constructed earthen embankments greater than six feet high or which impound more than 10 acre-feet are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC).

See BMP D.1: Detention Ponds for more information regarding dam safety considerations for ponds.

Stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area. The stormwater is stored until treatment occurs. It is important that the storage pond is large enough to provide adequate storage.

The first step in the treatment sequence is to check the pH of the stormwater in the untreated stormwater storage pond. The pH is adjusted by the application of carbon dioxide or a base until the stormwater in the untreated storage pond is within the desired pH range, 6.5 to 8.5. When used, carbon dioxide is added immediately downstream of the transfer pump. Typically sodium bicarbonate (baking soda) is used as a base, although other bases may be used. When needed, base is added directly to the untreated stormwater storage pond. The stormwater is recirculated with the treatment pump to provide mixing in the storage pond. Initial pH adjustments should be based on daily bench tests. Further pH adjustments can be made at any point in the process. See BMP C252: Treating and Disposing of High pH Water for more information on pH adjustments as a part of chemical treatment.

Once the stormwater is within the desired pH range (which is dependant on the coagulant being used), the stormwater is pumped from the untreated stormwater storage pond to a lined treatment cell as a coagulant is added. The coagulant is added upstream of the pump to facilitate rapid mixing.

The water is kept in the lined treatment cell for clarification. In a batch mode process, clarification typically takes from 30 minutes to several hours. Prior to discharge, samples are withdrawn for analysis of pH, coagulant concentration, and turbidity. If these levels are acceptable, the treated water is withdrawn, filtered, and discharged.

Several configurations have been developed to withdraw treated water from the treatment cell. The original configuration is a device that withdraws the treated water from just beneath the water surface using a float with adjustable struts that prevent the float from settling on the cell bottom. This reduces the possibility of picking up floc from the bottom of the cell. The struts are usually set at a minimum clearance of about 12 inches; that is, the float will come within 12 inches of the bottom of the cell. Other systems have used vertical guides or cables which constrain the float, allowing it to drift up and down with the water level. More recent designs have an H-shaped array of pipes, set on the horizontal.This scheme provides for withdrawal from four points rather than one. This configuration reduces the likelihood of sucking settled solids from the bottom. It also reduces the tendency for a vortex to form. Inlet diffusers, a long floating or fixed pipe with many small holes in it, are also an option.

Safety is a primary concern. Design should consider the hazards associated with operations, such as sampling. Facilities should be designed to reduce slip hazards and drowning. Tanks and ponds should have life rings, ladders, or steps extending from the bottom to the top.

Sizing Batch Chemical Treatment Systems

Chemical treatment systems must be designed to control the velocity and peak volumetric flow rate that is discharged from the system and consequently the project site. See Element 3: Control Flow Rates for further details on this requirement.

The total volume of the untreated stormwater storage pond and treatment cells must be large enough to treat stormwater that is produced during multiple day storm events. It is recommended that at a minimum the untreated stormwater storage pond be sized to hold 1.5 times the volume of runoff generated from the site during the 10-year, 24-hour storm event. Bypass should be provided around the chemical treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in III-2.3 Single Event Hydrograph Method. Worst-case land cover conditions (i.e., producing the most runoff) should be used for analyses (in most cases, this would be the land cover conditions just prior to final landscaping).

Primary settling should be encouraged in the untreated stormwater storage pond. A forebay with access for maintenance may be beneficial.

There are two opposing considerations in sizing the treatment cells. A larger cell is able to treat a larger volume of water each time a batch is processed. However, the larger the cell, the longer the time required to empty the cell. A larger cell may also be less effective at flocculation and therefore require a longer settling time. The simplest approach to sizing the treatment cell is to multiply the allowable discharge flow rate (as determined by the guidance in Element 3: Control Flow Rates) times the desired drawdown time. A 4-hour drawdown time allows one batch per cell per 8-hour work period, given 1 hour of flocculation followed by two hours of settling.

See BMP C251: Construction Stormwater Filtration for details on sizing the filtration system at the end of the batch chemical treatment system.

If the chemical treatment system design does not allow you to discharge at the rates as required by Element 3: Control Flow Rates, and if the site has a permanent Flow Control BMP that will serve the planned development, the discharge from the chemical treatment system may be directed to the permanent Flow Control BMP to comply with Element 3: Control Flow Rates. In this case, all discharge (including water passing through the treatment system and stormwater bypassing the treatment system) will be directed into the permanent Flow Control BMP. If site constraints make locating the untreated stormwater storage pond difficult, the permanent Flow Control BMP may be divided to serve as the untreated stormwater storage pond and the post-treatment temporary flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The designer must document in the Construction SWPPP how the permanent Flow Control BMP is able to attenuate the discharge from the site to meet the requirements of Element 3: Control Flow Rates. If the design of the permanent Flow Control BMP was modified for temporary construction flow control purposes, the construction of the permanent Flow Control BMP must be finalized, as designed for its permanent function, at project completion.

Flow-Through Chemical Treatment Systems

Background on Flow-Through Chemical Treatment Systems

A flow-through chemical treatment system adds a sand filtration component to the batch chemical treatment system's treatment train following flocculation. The coagulant is added to the stormwater upstream of the sand filter so that the coagulation and flocculation step occur immediately prior to the filter. The advantage of a flow-through chemical treatment system is the time saved by immediately filtering the water, as opposed to waiting for the clarification process necessary in a batch chemical

treatment system. See BMP C251: Construction Stormwater Filtration for more information on filtration.

Design and Installation of Flow-Through Chemical Treatment Systems

At a minimum, a flow-through chemical treatment system consists of a stormwater collection system (either a temporary diversion or the permanent site drainage system), an untreated stormwater storage pond, and a chemically enhanced sand filtration system.

As with a batch treatment system, stormwater is collected at interception point(s) on the site and is diverted by gravity or by pumping to an untreated stormwater storage pond or other untreated stormwater holding area. The stormwater is stored until treatment occurs. It is important that the holding pond be large enough to provide adequate storage.

Stormwater is then pumped from the untreated stormwater storage pond to the chemically enhanced sand filtration system where a coagulant is added. Adjustments to pH may be necessary before coagulant addition. The sand filtration system continually monitors the stormwater effluent for turbidity and pH. If the discharge water is ever out of an acceptable range for turbidity or pH, the water is returned to the untreated stormwater pond where it will begin the treatment process again.

Sizing Flow-Through Chemical Treatment Systems

Refer to BMP C251: Construction Stormwater Filtration for sizing requirements of flow-through chemical treatment systems.

Factors Affecting the Chemical Treatment Process

Coagulants

Cationic polymers can be used as coagulants to destabilize negatively charged turbidity particles present in natural waters, wastewater and stormwater. Polymers are large organic molecules that are made up of subunits linked together in a chain-like structure. Attached to these chain-like structures are other groups that carry positive or negative charges, or have no charge. Polymers that carry groups with positive charges are called cationic, those with negative charges are called anionic, and those with no charge (neutral) are called nonionic. In practice, the only way to determine whether a polymer is effective for a specific application is to perform preliminary or on-site testing.

Aluminum sulfate (alum) can also be used as a coagulant, as this chemical becomes positively charged when dispersed in water.

Polymers are available as powders, concentrated liquids, and emulsions (which appear as milky liquids). The latter are petroleum based, which are not allowed for construction stormwater treatment. Polymer effectiveness can degrade with time and also from other influences. Thus, manufacturers' recommendations for storage should be followed. Manufacturer’s recommendations usually do not provide assurance of water quality protection or safety to aquatic organisms. Consideration of water quality protection is necessary in the selection and use of all polymers.

Application

Application of coagulants at the appropriate concentration or dosage rate for optimum turbidity removal is important for management of chemical cost, for effective performance, and to avoid aquatic toxicity. The optimum dose in a given application depends on several site-specific features. Turbidity of untreated water can be important with turbidities greater than 5,000 NTU. The surface charge of particles to be removed is also important. Environmental factors that can influence dosage rate are water temperature, pH, and the presence of constituents that consume or otherwise affect coagulant effectiveness. Laboratory experiments indicate that mixing previously settled sediment (floc sludge) with the untreated stormwater significantly improves clarification, therefore reducing the effective dosage rate. Preparation of working solutions and thorough dispersal of coagulants in water to be treated is also important to establish the appropriate dosage rate.

For a given water sample, there is generally an optimum dosage rate that yields the lowest residual turbidity after settling. When dosage rates below this optimum value (underdosing) are applied, there is an insufficient quantity of coagulant to react with, and therefore destabilize, all of the turbidity present. The result is residual turbidity (after flocculation and settling) that is higher than with the optimum dose. Overdosing, application of dosage rates greater than the optimum value, can also negatively impact performance. Like underdosing, the result of overdosing is higher residual turbidity than that with the optimum dose.

Mixing

The G-value, or just "G", is often used as a measure of the mixing intensity applied during coagulation and flocculation. The symbol G stands for “velocity gradient”, which is related in part to the degree of turbulence generated during mixing. High G-values mean high turbulence, and vice versa.

High G-values provide the best conditions for coagulant addition. With high G's, turbulence is high and coagulants are rapidly dispersed to their appropriate concentrations for effective destabilization of particle suspensions.

Low G-values provide the best conditions for flocculation. Here, the goal is to promote formation of dense, compact flocs that will settle readily. Low G's provide low turbulence to promote particle collisions so that flocs can form. Low G's generate sufficient turbulence such that collisions are effective in floc formation, but do not break up flocs that have already formed.

pH Adjustment

The pH must be in the proper range for the coagulants to be effective, which is typically 6.5 to 8.5. As polymers tend to lower the pH, it is important that the stormwater have sufficient buffering capacity. Buffering capacity is a function of alkalinity. Without sufficient alkalinity, the application of the polymer may lower the pH to below 6.5. A pH below 6.5 not only reduces the effectiveness of the polymer as a coagulant, but it may also create a toxic condition for aquatic organisms. Stormwater may not be discharged without readjustment of the pH to above 6.5. The target pH should be within 0.2 standard units of the receiving water's pH.

Experience gained at several projects in the City of Redmond has shown that the alkalinity needs to be at least 50 mg/L to prevent a drop in pH to below 6.5 when the polymer is added.

Maintenance Standards

Monitoring

At a minimum, the following monitoring shall be conducted. Test results shall be recorded on a daily log kept on site. Additional testing may be required by the NPDES permit based on site conditions.

- Operational Monitoring
    - Total volume treated and discharged.
    - Flow must be continuously monitored and recorded at not greater than 15-minute intervals.
    - Type and amount of chemical used for pH adjustment.
    - Type and amount of coagulant used for treatment.
    - Settling time.
- Compliance Monitoring
    - Influent and effluent pH, flocculent chemical concentration, and turbidity must be continuously monitored and recorded at not greater than 15-minute intervals.
    - pH and turbidity of the receiving water.
- Biomonitoring
    - Treated stormwater must be non-toxic to aquatic organisms. Treated stormwater must be tested for aquatic toxicity or residual chemicals. Frequency of biomonitoring will be determined by Ecology.
    - Residual chemical tests must be approved by Ecology prior to their use.
    - If testing treated stormwater for aquatic toxicity, you must test for acute (lethal) toxicity. Bioassays shall be conducted by a laboratory accredited by Ecology, unless otherwise approved by Ecology. Acute toxicity tests shall be conducted per the CTAPE protocol and Appendix G of *Whole Effluent Toxicity Testing Guidance and Test Review Criteria* (Marshall, 2016).

Discharge Compliance

Prior to discharge, treated stormwater must be sampled and tested for compliance with pH, flocculent chemical concentration, and turbidity limits. These limits may be established by the Construction Stormwater General Permit or a site-specific discharge permit. Sampling and testing for other pollutants may also be necessary at some sites. pH must be within the range of 6.5 to 8.5 standard units and not cause a change in the pH of the receiving water by more than 0.2 standard units. Treated stormwater samples and measurements shall be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water shall not be taken from the

treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

Operator Training

Each project site using chemical treatment must have a trained operator who is certified for operation of an Enhanced Chemical Treatment system. The operator must be trained and certified by an organization approved by Ecology. Organizations approved for operator training are found at the following website:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Contaminated-water-on-construction-sites

Sediment Removal and Disposal

- Sediment shall be removed from the untreated stormwater storage pond and treatment cells as necessary. Typically, sediment removal is required at least once during a wet season and at the decommissioning of the chemical treatment system. Sediment remaining in the cells between batches may enhance the settling process and reduce the required chemical dosage.
- Sediment that is known to be non-toxic may be incorporated into the site away from drainages.

BMP C251: Construction Stormwater Filtration

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Conditions of Use

Traditional Construction Stormwater BMPs used to control soil erosion and sediment loss from construction sites may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 µm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with BMP C250: Construction Stormwater Chemical Treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from Ecology must be obtained at each site where chemical use is proposed prior to use. See https://-fortress.wa.gov/ecy/publications/SummaryPages/ecy070258.html for a copy of the Request for Chemical Treatment form.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow.

Rapid filtration systems are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids.

Slow filtration systems have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow filtration systems have generally been used as post construction BMPs to treat stormwater (see V-6 Filtration BMPs). Slow filtration is mechanically simple in comparison to rapid filtration, but requires a much larger filter area.

Filter Types and Efficiencies

Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process and Description

Stormwater is collected at interception point(s) on the site and diverted to an untreated stormwater sediment pond or tank for removal of large sediment, and storage of the stormwater before it is treated by the filtration system. In a rapid filtration system, the untreated stormwater is pumped from the pond or tank through the filtration media. Slow filtration systems are designed using gravity to convey water from the pond or tank to and through the filtration media.

Sizing

Filtration treatment systems must be designed to control the velocity and peak volumetric flow rate that is discharged from the system and consequently the project site. See Element 3: Control Flow Rates for further details on this requirement.

The untreated stormwater storage pond or tank should be sized to hold 1.5 times the volume of runoff generated from the site during the 10-year, 24-hour storm event, minus the filtration treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the filtration treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft^2. Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the filtration treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in III-2.3 Single Event Hydrograph Method. Worst-case land cover conditions (i.e., producing the most runoff) should be used for analyses (in most cases, this would be the land cover conditions just prior to final landscaping).

If the filtration treatment system design does not allow you to discharge at the rates as required by Element 3: Control Flow Rates, and if the site has a permanent Flow Control BMP that will serve the planned development, the discharge from the filtration treatment system may be directed to the permanent Flow Control BMP to comply with Element 3: Control Flow Rates. In this case, all discharge (including water passing through the treatment system and stormwater bypassing the treatment

system) will be directed into the permanent Flow Control BMP. If site constraints make locating the untreated stormwater storage pond difficult, the permanent Flow Control BMP may be divided to serve as the untreated stormwater storage pond and the post-treatment temporary flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The designer must document in the Construction SWPPP how the permanent Flow Control BMP is able to attenuate the discharge from the site to meet the requirements of Element 3: Control Flow Rates. If the design of the permanent Flow Control BMP was modified for temporary construction flow control purposes, the construction of the permanent Flow Control BMP must be finalized, as designed for its permanent function, at project completion.

Maintenance Standards

- Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the untreated stormwater pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.
- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.
- Disposal of filtration equipment must comply with applicable local, state, and federal regulations.

BMP C252: Treating and Disposing of High pH Water

Purpose

When pH levels in stormwater rise above 8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to surface or ground water. A pH level range of 6.5 to 8.5 is typical for most natural watercourses, and this neutral pH range is required for the survival of aquatic organisms. Should the pH rise or drop out of this range, fish and other aquatic organisms may become stressed and may die.

Conditions of Use

- The water quality standard for pH in Washington State is in the range of 6.5 to 8.5. Stormwater with pH levels exceeding water quality standards may be either neutralized on site or disposed of to a sanitary sewer or concrete batch plant with pH neutralization capabilities.
- Neutralized stormwater may be discharged to surface waters under the Construction Stormwater General permit.
- Neutralized process water such as concrete truck wash-out, hydro-demolition, or saw-cutting slurry must be managed to prevent discharge to surface waters. Any stormwater

Appendix C
Correspondence

Site is less than 1 acre, so a Construction Stormwater General Permit is not required

Appendix D
Site Inspection Form

Construction Stormwater Site Inspection Form

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

_____

_____

_____

_____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: _____

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

Construction Stormwater Site Inspection Form

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) _____ (Signature) _____ Date: _____

Title/Qualification of Inspector: _____

Appendix E Construction Stormwater General Permit

Site is less than 1 acre, so a Construction Stormwater General Permit is not required

Appendix F 303(d) and TMDL Waterbodies Information

Listing ID: 10862

Main Listing Information

Listing ID: 10862
Waterbody Name: PUYALLUP RIVER
Medium: Water
Parameter: Temperature
WQI Project: None Assigned
Designated Use: None Assigned

2014 Category: 5
2012 Category: 3
2008 Category: 3
2004 Category: 1
On 1998 303(d) List?: N
On 1996 303(d) List?: N

Assessment Unit

Assessment Unit ID: 17110014000028

Location Identification

Counties: Pierce
WRIA: 10 - Puyallup-White
Waterbody ID (WBID): None Assigned
Waterbody Class: RA
Town/Range/Section (Legacy): 20N-4E-18

Basis

Location ID: 10A050 -- In 2003, between 7/25/2003 and 9/24/2003, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 39 of 62 da (63%); The maximum exceedance during this period was 18.4°C for the 7-day period centere 7/29/2003;

Location ID: 10A050 -- In 2002, between 7/18/2002 and 9/25/2002, the 7-day mean of daily maximum values (7DADmax) exceeded the criterion for this waterbody (16°C) on 19 of 70 da (27%); The maximum exceedance during this period was 17.46°C for the 7-day period cente on 8/11/2002;

Puyallup Tribe of Indians unpublished data at RM 10.3 (submitted by Char Naylor on 3 Marc 2003) show a 7-day mean of maximum daily temperature of 17.48 degrees C for the week e 15 August 2002, with a maximum daily maximum temperature of 18.18 degrees C collected August 2002.

Ebbert, 2002. Shows no excursions beyond the criterion from measurements collected in 20 and 2001.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 10A070 (PUYALLUP RIVER AT MERIDIAN ST) shows 0 excursions beyond the criterion out of 62 samples collected betwee 1993 - 2001.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 10A050 (Puyallup R @ Puyallup (USGS)) shows 0 excursions beyond the criterion out of 6 samples collected between 1993 - 2001.

Remarks

Remark	Modified By	Modified On	Visib

Combined Listing: Listing IDs 36172, 10871 were rolled into this listing	Chad Brown	9/24/2015	Public
As a result of merging of three stream reaches into a single assessment unit in 2014, this record was merged with the records formerly associated with Listing IDs 10871 and 36172.	Patrick Lizon	10/29/2014	Public
The Category 5 impairment determination is based on the application of the current temperature criterion to data from the years 2003 and 2003.	Patrick Lizon	10/29/2014	Public
Data for 2002 and 2003 does not cover the core critical season for temperature. Maximum temperatures may be higher than observed data;	Nicholas Groebner	4/24/2014	Public

EIM

User Study ID:	User Location ID:
AMS001E	10A070
AMS004	10A050

Print

Listing ID: 10874

Main Listing Information

Listing ID: 10874
Waterbody Name: PUYALLUP RIVER
Medium: Water
Parameter: Mercury
WQI Project: None Assigned
Designated Use: None Assigned

2014 Category: 5
2012 Category: 5
2008 Category: 5
2004 Category: 2
On 1998 303(d) List?: N
On 1996 303(d) List?: N

Assessment Unit

Assessment Unit ID: 17110014000028

Location Identification

Counties: Pierce
WRIA: 10 - Puyallup-White
Waterbody ID (WBID): None Assigned
Waterbody Class: RA
Town/Range/Section (Legacy): 20N-4E-22

Basis

Location ID(s) [10A070] -- In 2006, 1 of 3 sample event(s) exceeded Washington's Aquatic Life Chronic criterion.
Location ID(s) [10A070] -- In 2005, 2 of 2 sample event(s) did not exceed Washington's Aquatic Life Chronic criterion.
Location ID(s) [10A050] -- In 2003, 1 of 4 sample event(s) exceeded Washington's Aquatic Life Chronic criterion.
Location ID(s) [10A050] -- In 2002, 2 of 2 sample event(s) did not exceed Washington's Aquatic Life Chronic criterion.

Puyallup Tribe of Indians unpublished data (submitted by Char Naylor on 3 March 2003) show 1 excursion beyond the chronic criterion from 3 samples collected in 2002 at RM 5.8 and no excursions beyond the chronic criterion from 2 samples collected in 2002 at RM 10.3.

Hallock (2001) Dept. of Ecology Ambient Monitoring Station 10A070 (PUYALLUP RIVER AT MERIDIAN ST) shows 1 excursions beyond the criterion out of 11 samples collected between 1993 - 2001.

Location ID(s) [10A070] -- A sample collected on 09/28/1994 exceeded the chronic criterion: 0.017 ug/L.

Remarks

Remark	Modified By	Modified On	Visibility
Combined Listing: Listing IDs 45375, 35421, 35332 were rolled into this listing	Chad Brown	9/24/2015	Public
Two or more samples collected in a three-year period exceeded the Aquatic Life criterion; therefore the Assessment Unit meets the requirements for a Category 5 determination.	Brandee Era-Miller	12/15/2014	Public
Samples obtained after 1996 must be collected using EPA Method 1669 for sampling and EPA Method 1631 for analysis of the sample. As a result, this listing is moved from Category 5 to Category 3 - insufficient data.	Jessica Archer	10/27/2014	Private

EIM	
User Study ID:	**User Location ID:**
AMS001	10A070
AMS001	10A070
AMS001E	10A070

Print

Appendix G Contaminated Site Information

To our knowledge, there is no onsite soil or groundwater contamination.

Appendix H Engineering Calculations

None, no sediment trap is proposed.

Appendix B
Geotechnical Report

April 9, 2024

Cliff Rapp
Logistics Maintenance Manager
Puyallup Fred Meyer Distribution Center
2200 North Meridian
Puyallup, Washington 98371

RE: Geotechnical Exploration and Recommendation
Puyallup Fred Meyer Distribution Center – Truck Entrance
2200 North Meridian
Puyallup, Washington 98371
RGI Project No. 2017-206-2

Dear Mr. Rapp:

As requested, The Riley Group, Inc. (RGI) has performed a geotechnical exploration at the site. This report summarizes our findings and recommendations for the proposed truck entrance with related guard house.

Site Observations

On March 27, 2024, RGI observed the site condition and performed a subsurface exploration by observing excavation of two test pits excavated to a maximum depth of 12.5 feet below ground surface (bgs) in the proposed truck entrance and guard house in the northwest corner of the site. The test pit locations are shown on the site plan. The following presents our findings of the soil conditions and recommendations for the proposed project.

Subsurface Soil and Groundwater

Test pits TP-1 and TP-2 located near the east edge of the existing entrance driveway encountered 5 to 10 feet of fill consisting of medium dense to very dense gravelly sand with varying amounts of silt over native soils including loose to medium dense silty sand, medium stiff sandy silt, and soft organic silt. Light ground water seepage was encountered at 1.5 feet below the ground surface (bgs) at TP-2 that appears to be perched over dense soils.

Static ground water was not encountered during our exploration to a maximum depth of 12.5 feet bgs. RGI expects that the static ground water should be deeper.

More detailed descriptions of the subsurface conditions encountered are presented in the attached logs.

Summary and Recommendations

Based on the explorations, the site is underlain by compressible soil below the upper 5 to 10 feet. If the proposed guard building foundation is supported on shallow footings, it will experience a significant amount of post-construction settlement due to consolidation. To avoid the potential damages due to settlements, building is typically supported on a deep foundation system bearing on competent native soil. Due to the building is lightweighted, if it

can be designed to tolerate some differential settlement (or 1.5 inch every 20 feet), the foundation and floor slab can be supported on 36 inches of reinforced structural fill.

RGI recommends that the pavement section be supported on 18 inches of structural fill. The onsite fill is expected to be suitable for being reused as structural fill if the construction occurs in dry season. If the construction occurs in winter season and the onsite fill cannot be properly compacted, import structural fill should be considered. Alternatively, cement treatment of onsite fill can be considered.

Detailed recommendations regarding the above issues and other geotechnical design considerations are provided in the following sections. These recommendations should be incorporated into the final design drawings and construction specifications.

RGI expects that site grading will consist of shallow cuts and fills to achieve building and pavement grades and excavation for utilities including storm, water, sanitary sewer, and other utilities.

Seismic Considerations

Liquefaction is a phenomenon where there is a reduction or complete loss of soil strength due to an increase in water pressure induced by vibrations from a seismic event. Liquefaction mainly affects geologically recent deposits of fine-grained sands that are below the groundwater table. Soils of this nature derive their strength from intergranular friction. The generated water pressure or pore pressure essentially separates the soil grains and eliminates this intergranular friction, thus reducing or eliminating the soil's strength.

Review of the Liquefaction Susceptibility Map of Pierce County, Washington by Stephen P. Palmer, etc. (2004) indicates the site is mapped as having a high susceptibility to liquefaction.

Since the site has the potential for soil liquefaction during seismic event, it is should be classified as site class F. Per ASCE 7-16, Section 20.3, buildings that have fundamental periods of less than 0.5 second, site response analysis is not required.

Based on the International Building Code (IBC), RGI recommends the follow seismic parameters for design.

Table 1 IBC Seismic Parameters

2021 IBC Parameter	Value
Site Soil Class[1]	E[2]
Site Latitude	47.210217 N
Site Longitude	-122.2940066 W
Maximum considered earthquake spectral response acceleration parameters (g)	S_s =1.277, S_1 =0.439
Spectral response acceleration parameters adjusted for site class (g)	S_{ms} =1.534, S_{m1} =1.02[3]
Design spectral response acceleration parameters (g)	S_{ds} =1.021, S_{d1} =0.68[3]

. Note: In general accordance with Chapter 20 of ASCE 7-10. The Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile.

2. Note: The 2021 IBC and ASCE 7-16 require a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope of our services does not include the required 100 foot soil profile determination. Test pit explorations extended to a maximum depth of 12.5 feet, and this seismic site class definition considers that similar soil continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

3. Note: In accordance with ASCE 11.4.8, a ground motion hazard analysis is not required for the following cases:

- Structures on Site Class E sites with S_S greater than or equal to 1.0, provided the site coefficient Fa is taken as equal to that of Site Class C.
- Structures on Site Class D sites with S_1 greater than or equal to 0.2, provided that the value of the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for $T_L \geq T > 1.5T_s$ or Eq. 12.8-4 for $T > TL$.
- Structures on Site Class E sites with S_1 greater than or equal to 0.2, provided that T is less than or equal to T_s and the equivalent static force procedure is used for design.

The above exceptions do not apply to seismically isolated structures, structures with damping systems or structures designed using the response history procedures of Chapter 16.

Erosion and Sediment Control

Potential sources or causes of erosion and sedimentation depend on construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. The impacts on erosion-prone areas can be reduced by implementing an erosion and sedimentation control plan. The plan should be designed in accordance with applicable city and/or county standards.

RGI recommends the following erosion control Best Management Practices (BMPs):

- Scheduling site preparation and grading for the drier summer and early fall months and undertaking activities that expose soil during periods of little or no rainfall
- Establishing a quarry spall construction entrance
- Installing siltation control fencing or anchored straw or coir wattles on the downhill side of work areas
- Covering soil stockpiles with anchored plastic sheeting

- Revegetating or mulching exposed soils with a minimum 3-inch thickness of straw if surfaces will be left undisturbed for more than one day during wet weather or one week in dry weather
- Directing runoff away from exposed soils and slopes
- Decreasing runoff velocities with check dams, straw bales or coir wattles
- Confining sediment to the project site
- Inspecting and maintaining erosion and sediment control measures frequently (The contractor should be aware that inspection and maintenance of erosion control BMPs is critical toward their satisfactory performance. Repair and/or replacement of dysfunctional erosion control elements should be anticipated.)

Permanent erosion protection should be provided by reestablishing vegetation using hydroseeding and/or landscape planting. Until the permanent erosion protection is established, site monitoring should be performed by qualified personnel to evaluate the effectiveness of the erosion control measures. Provisions for modifications to the erosion control system based on monitoring observations should be included in the erosion and sedimentation control plan.

Excavation

All temporary cut slopes associated with the site and utility excavations should be adequately inclined to prevent sloughing and collapse. The site soils consisted of medium dense to very dense fill comprised of gravelly sand with varying amounts of silt over native soils including loose to medium dense silty sand, medium stiff sandy silt, and soft organic silt.

Accordingly, for excavations more than 4 feet but less than 20 feet in depth, the temporary side slopes should be laid back with a minimum slope inclination of 1.5:1 (Horizontal:Vertical) in upper loose soil and 3H:4H in native glacial till. If there is insufficient room to complete the excavations in this manner, or excavations greater than 20 feet in depth are planned, using temporary shoring to support the excavations should be considered. For open cuts at the site, RGI recommends:

- No traffic, construction equipment, stockpiles or building supplies are allowed at the top of cut slopes within a distance of at least 5 feet from the top of the cut.
- Exposed soil along the slope is protected from surface erosion using waterproof tarps and/or plastic sheeting.
- Construction activities are scheduled so that the length of time the temporary cut is left open is minimized.
- Surface water is diverted away from the excavation.
- The general condition of slopes should be observed periodically by a geotechnical engineer to confirm adequate stability and erosion control measures.

In all cases, however, appropriate inclinations will depend on the actual soil and groundwater conditions encountered during earthwork. Ultimately, the site contractor must be responsible for maintaining safe excavation slopes that comply with applicable OSHA or WISHA guidelines.

Stripping and Site Preparation

Stripping efforts should include removal of pavements, vegetation, organic materials, and deleterious debris from areas slated for pavement and utility construction.

RGI anticipates that some areas of loose soil may be present on the site after stripping operations are complete. Prior to placement of structural fill, RGI recommends proofrolling building and pavement subgrades and areas to receive structural fill. These areas should be proofrolled under the observation of RGI and compacted to a firm and unyielding condition in order to achieve a minimum compaction level of 95 percent of the modified proctor maximum dry density as determined by the American Society of Testing and Materials D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557).

Proofrolling and adequate subgrade compaction can only be achieved when the soils are within approximately ± 2 percent moisture content of the optimum moisture content. Soils may be proofrolled with a heavy compactor, loaded double-axle dump truck, or other heavy equipment under the observation of a RGI representative. This observer will assess the subgrade conditions prior to filling.

Subgrade soils that become disturbed due to elevated moisture conditions should be overexcavated to reveal firm, non-yielding, non-organic soils and backfilled with compacted structural fill. In order to maximize utilization of site soils as structural fill, RGI recommends that the earthwork portion of this project be completed during extended periods of warm and dry weather, if possible. If earthwork is completed during the wet season (typically November through May) it will be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork will require additional mitigative measures beyond what would be expected during the drier summer and fall months.

Structural Fill

Once site preparation is complete, cuts and fills can be made to establish desired pavement grades. Prior to placing fill, RGI recommends proof-rolling as described above. RGI recommends fill below the foundation and floor slab, behind retaining walls, and below pavement and hardscape surfaces be placed in accordance with the following recommendations for structural fill.

The suitability of excavated site soils and import soils for compacted structural fill use will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (that portion passing the U.S. No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult or impossible to achieve. Soils containing more than about 5 percent fines cannot be consistently compacted to a dense, non-yielding condition when the moisture content is more

than 2 percent above or below optimum. Optimum moisture content is the moisture that results in the greatest compacted dry density with a specified compactive effort.

The onsite fill may be suitable for use as structural fill if the moisture can be properly controlled at the time of compaction if the construction occurs in dry weather. If the construction occurs in winter or extended to wet season, it may be necessary to import clean, granular soils to complete site work that meets the grading requirements listed in Table 2.

Table 2 Structural Fill Gradation

U.S. Sieve Size	Percent Passing
4 inches	100
¾ inch	70 minimum
No. 4	35 to 60
No. 200	0 to 5*

*Based on minus 3/4 inch fraction.

Prior to use, a RGI representative should observe and test all materials imported to the site for use as structural fill. Structural fill materials should be placed in uniform loose layers not exceeding 12 inches and compacted as specified in Table 3. The soil's maximum density and optimum moisture should be determined by ASTM D1557.

Table 3 Structural Fill Compaction ASTM D1557

Location	Material Type	Minimum Compaction Percentage	Moisture Content Range	
General Fill (non-structural areas)	On-site granular or approved imported fill soils	90	+3	-2
Pavement, Subgrade and Base Course	On-site granular or approved imported fill soils	95	+2	-2

Placement and compaction of structural fill should be observed by RGI. A representative number of in-place density tests should be performed as the fill is being placed to confirm that the recommended level of compaction is achieved.

Guard House

The proposed guard house foundations may be supported on at least 36 inches of reinforced structural fill. The reinforcing should consist of TenCate Mirafi® BXG12 Biaxial Geogrid or equivalent every 12 inches vertically with the first layer placed on the native soil or structural fill surface. The reinforced structural fill should extend a minimum distance of three feet beyond the foundations and should be installed and compacted following the recommendations above.

Typically, a reinforced concrete slab foundation with thickened edge is able to spread the building load and reduce the amount of settlement. The reinforced slab will carry the building load and transfer it to the bearing soil below it. With site preparation and structural fill completed as described above, suitable support for slab-on-grade construction should be provided.

Perimeter thickened edge foundations exposed to the weather should be at a minimum depth of 18 inches below final exterior grades. RGI recommends designing reinforced slab for a net allowable bearing capacity of 1,000 pounds per square foot (psf) on structural fill. For short-term loads, such as wind and seismic, a 1/3 increase in this allowable capacity can be used. For thickness design of the slab subjected to point loading, RGI recommends using a subgrade modulus (K_S) of 150 pounds per square inch per inch of deflection.

For designing foundations to resist lateral loads, a base friction coefficient of 0.25 can be used for compacted structural fill. Passive earth pressures acting on the side of the thickened edge can also be considered for resisting lateral loads. RGI recommends calculating this lateral resistance using an equivalent fluid weight of 250 pounds per cubic foot (pcf). At perimeter locations, RGI recommends not including the upper 12 inches of soil in this computation because it can be affected by weather or disturbed by future grading activity. This value assumes the foundation will be constructed neat against competent fill soil or backfilled with structural fill as described above. The recommended friction coefficient and passive resistance value includes a safety factor of 1.5.

The purpose of this option is to develop a firm base below the building to reduce the damages caused by differential settlements due to consolidation settlement and during a seismic event. It will not avoid or reduce the total settlement across the entire site. RGI recommends that the building be designed to tolerate differential settlement of 1.5 inches every 20 feet along the building length.

Slab-on-Grade

As described above, the slab-on-grade supported on shallow soil will be subject to a significant amount of consolidation and liquefaction induced settlement during a seismic event. RGI recommends that the slab be supported 3 feet reinforced structural fill.

Immediately below the floor slab, RGI recommends placing a 4-inch-thick capillary break layer of clean, free-draining pea gravel, washed rock, or crushed rock that has less than 5 percent passing the U.S. No. 200 sieve. This material will reduce the potential for upward capillary movement of water through the underlying soil and subsequent wetting of the floor slab. Where moisture by vapor transmission is undesirable, an 8- to 10-mil thick plastic membrane should be placed on the 4-inch-thick layer of clean gravel or rock.

Drainage

Final exterior grades should promote free and positive drainage away from the building area. Water must not be allowed to pond or collect adjacent to foundations or within the immediate building area. For non-pavement locations, RGI recommends providing a minimum

drainage gradient of 3 percent for a minimum distance of 10 feet from the building perimeter. In paved locations, a minimum gradient of 1 percent should be provided unless provisions are included for collection and disposal of surface water adjacent to the structure.

Perimeter foundation drains shown on Figure 3 are typically installed around the perimeter of the buildings. The foundation drains and roof downspouts should be tightlined separately to an approved discharge facility. Subsurface drains must be laid with a gradient sufficient to promote positive flow to a controlled point of approved discharge.

Pavement

Regardless of the relative compaction achieved, the subgrade must be firm and relatively unyielding before paving. This condition should be verified by proofrolling with heavy construction equipment or hand probe by inspector.

With the pavement subgrade prepared as described above, RGI recommends the following new pavement sections for truck entrance paved with flexible asphalt concrete surfacing.

- **For heavy truck traffic areas**: 4 inches of Hot Mix Asphalt (HMA) over 8 inches of crushed rock base (CRB) over 18 inches of structural fill over a woven fabric

The asphalt paving materials used should conform to the Washington State Department of Transportation (WSDOT) specifications for Hot Mix Asphalt Class 1/2 inch and CRB surfacing.

RGI understands that concrete pavement is being considered by the design team. If concrete pavement is used, RGI recommends the following new pavement section.

- **For heavy truck traffic areas**: 5 inches of concrete over 4 inches of CRB over 18 inches structural fill over a woven fabric

Long-term pavement performance will depend on surface drainage. A poorly-drained pavement section will be subject to premature failure as a result of surface water infiltrating into the subgrade soils and reducing their supporting capability.

For optimum pavement performance, surface drainage gradients of no less than two percent are recommended. Also, some degree of longitudinal and transverse cracking of the pavement surface should be expected over time. Regular maintenance should be planned to seal cracks when they occur.

Cement Treatment

As discussed above, if the onsite fill cannot be properly compacted, import structural fill needs to be used below the pavement section. As an alternative, cement treatment can be considered for pavement subgrade support. If cement treatment will be used, the mix shall consist of onsite fill Portland cement, and water (if necessary) uniformly mixed, graded, compacted, finished, and compacted in accordance with these recommendations.

Portland Cement: Portland cement shall be Type II and shall be provided in accordance with Section 9-01 of the 2012 Washington State Department of Transportation (WSDOT) Standard

Specifications. Cement may be stored on site for use during the treatment process in a closed container

Water: Water shall be provided by the contractor and shall be free from substances deleterious to the hardening of the soil-cement.

Soil Material: Soil material shall consist of native subgrade material, of selected excavation material, or of a combination of these materials. The soil shall not contain roots, topsoil, or any material deleterious to its reaction with cement.

Equipment: Mixing shall be accomplished by equipment that will produce soil-cement mixing meeting the requirements for soil pulverization, cement and water application, mixing, transporting, placing, compacting, finishing, and curing as recommended herein. Agricultural disks or motor graders shall not be acceptable mixing equipment. The equipment shall have the ability to supply metered water and have the ability to adjust the supply of water to the material during the mixing procedure. While moving, the water supply shall deliver water evenly across the full width of the machine, if water is necessary to be added. If, in the opinion of the Engineer, the equipment is not equal to the above, the Contractor shall remove said equipment from the jobsite and replace it with equipment meeting the requirements above.

Cement Spreading and Mixing: Mixing of the soil material, cement, and water shall be accomplished by the mixed-in-place method. Cement shall be 3 to 6 percent by weight and may vary depending on the moisture content of the soil.

No cement shall be spread more than 500 feet beyond the mixing operation, unless approved by the Engineer. The mixing operation shall not exceed more than 500 feet beyond the grading, shaping, and compaction operation. The operation of cement application, mixing, spreading, compacting and finishing shall be continuous and completed within 4 hours from the start of mixing. Any soil-cement mixture that has not been compacted shall not be left undisturbed for longer than 30 minutes.

The operations of cement spreading, water application, and mixing shall be continuous and completed in daylight. No cement spreading shall be allowed during high winds. No cement shall be spread or soil-cement mixture mixed when the soil or subgrade is frozen.

Cement Spreading and Mixing Methods: Mixing shall be continued until the mixture is uniform in color and at the required moisture content throughout. Operations of cement spreading, water application, mixing, and grading mixed material shall result in a uniform soil, cement, and water mixture for the full depth and width.

The cement shall be uniformly distributed and mixed with the pulverized material and any existing underlying material or imported material as specified. The mixing operation may be accomplished by using either the same machine used for the pulverizing operation or a separate machine designed for in-place continuous mixing as approved by the Engineer. Regardless of which method is used, a control system capable of metering or measuring the cement application rate to an accuracy of plus/minus one pound per square yard shall be

used. The equipment used to spread the cement shall have weighing scales, a foot per minute gauge, and a RPM vane feeder in order to provide control of the cement distribution process.

Compaction: The cement-stabilized base will be uniformly compacted to a minimum of 95 percent of maximum density based on a moving average of five consecutive tests with no individual test below 92 percent. Field density of compacted soil-cement shall be determined by the nuclear method in the direct transmission mode (American Society for Testing and Materials D6938-10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) (ASTM D6938).

The specified optimum moisture content and maximum density shall be determined prior to the start of construction and also in the field by a moisture-density test, (ASTM D1557), on representative samples of soil-cement mixture obtained from the area being processed at the time compaction begins. The soil-cement shall be compacted by a vibratory roller to the specified density.

Finishing: When initial compaction is nearing completion at subgrade elevations, the surface of the soil cement will be shaped to the required lines, grades, and cross section. The moisture content of the surface material shall be maintained at or not less than 2 percent below or above the specified optimum moisture content during finishing operation. Compaction and finishing shall be done in such a manner as to produce, in not longer than 2 hours, a smooth, dense surface free of compaction planes, cracks, ridges, or loose material.

With the pavement subgrade prepared following the above procedure, RGI recommends the following alternative pavement sections for heavy truck traffic paved with flexible asphalt and concrete surfacing.

- Flexible Asphalt: 4 inches of HMA over 4 inches of CRB over 18 inches of treated soil subgrade
- Concrete Surface: 5 inches of concrete over 4 inches of CRB over 18 inches of treated soil subgrade

If you have any questions or require additional information, please contact us.

Respectfully submitted,

THE RILEY GROUP, INC.

State of Washington 2698 Licensed Geologist 4/9/2024

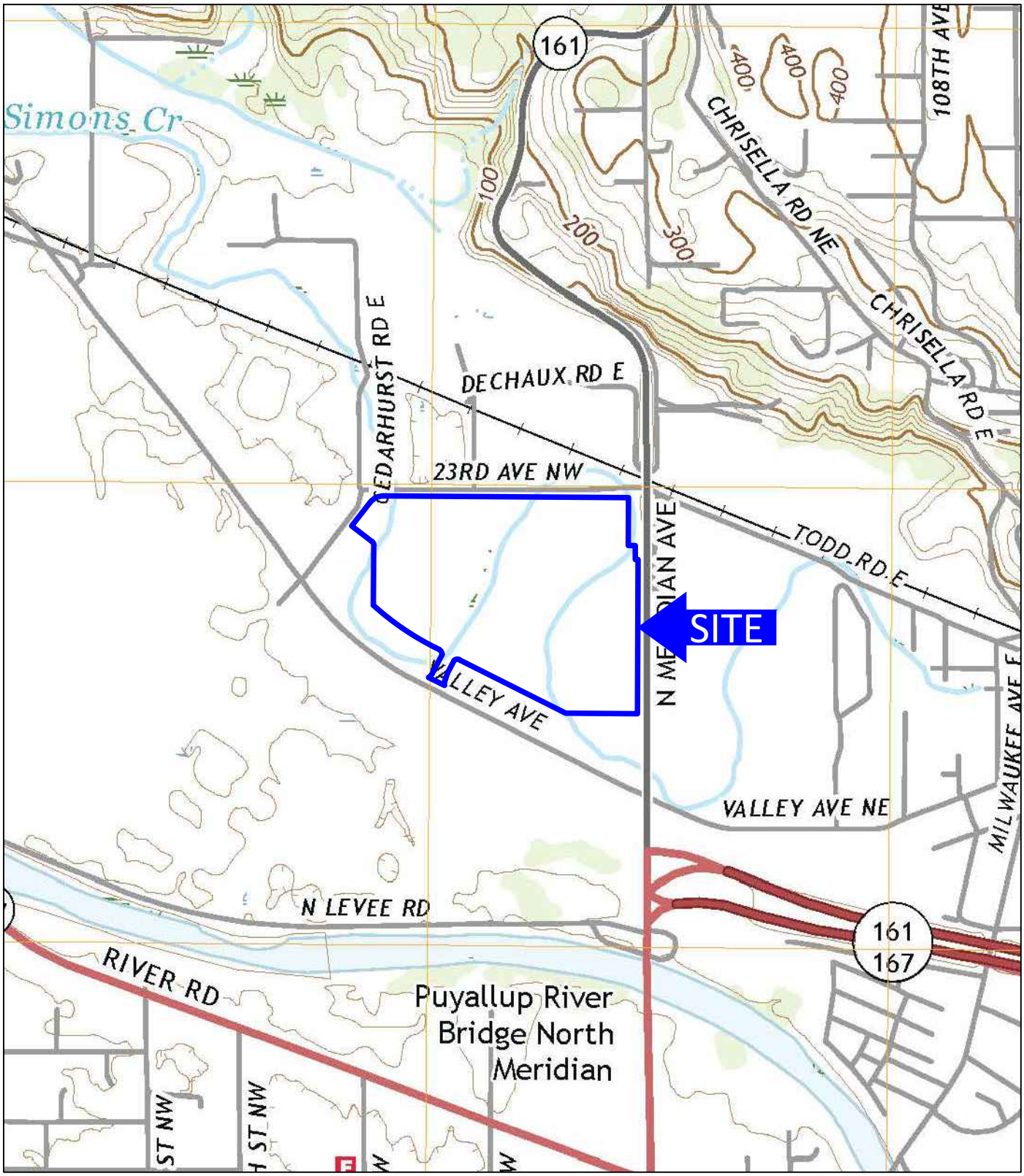
Eric L. Woods, LG
Senior Project Geologist

ERIC L. WOODS

RICKY RUNQI WANG STATE OF WASHINGTON 35013 REGISTERED PROFESSIONAL ENGINEER 4/9/2024

Ricky R. Wang, PhD, PE
Principal Engineer

Attachments: Figure 1. Site Vicinity Map
Figure 2. Geotechnical Exploration Plan
Figure 3. Typical Footing Drain Detail
Test Pit Logs



USGS, 2020, Puyallup, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
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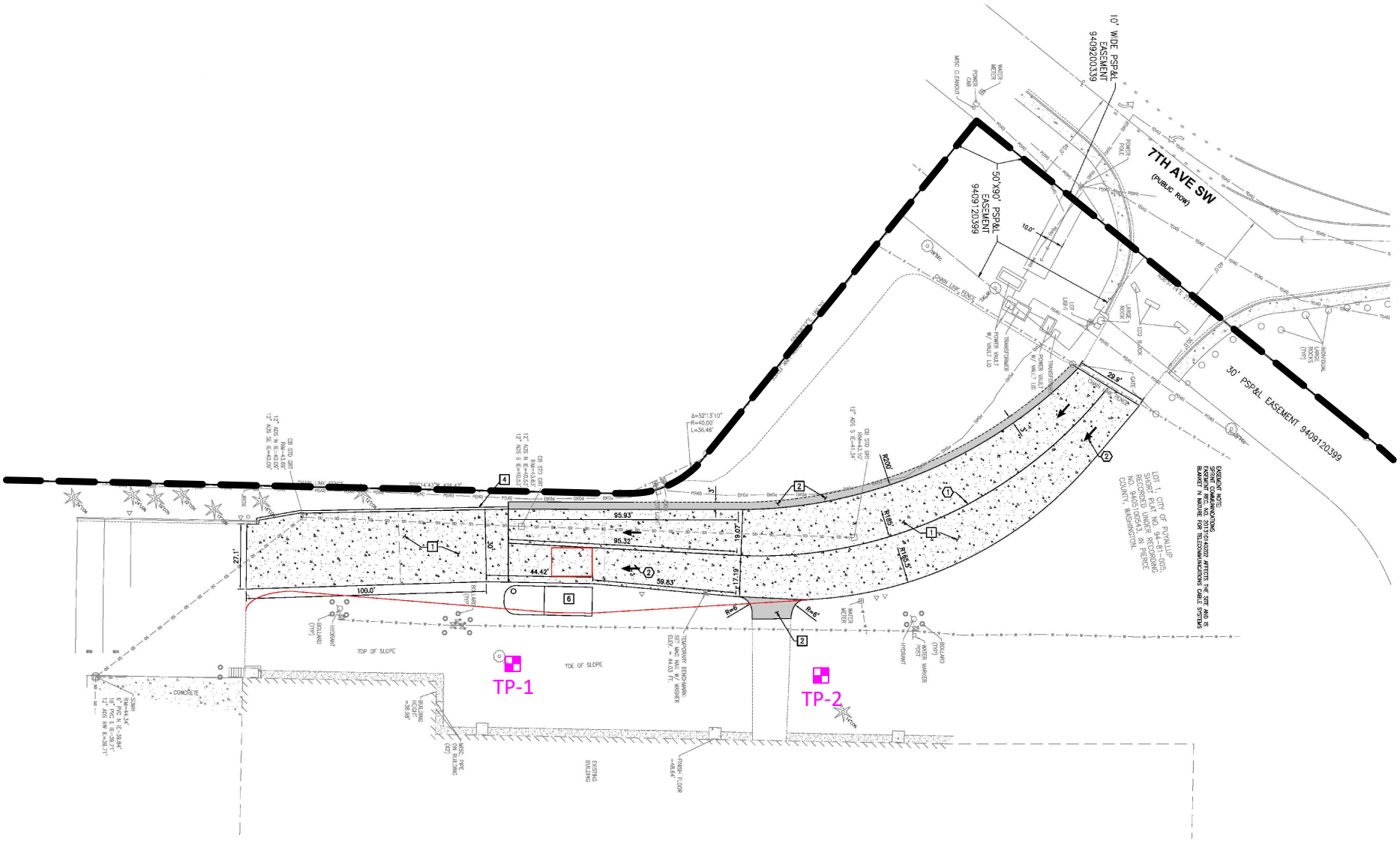
Fax: 425.415.0311

Fred Meyer Distribution Center - Truck Entrance		Figure 1
RGI Project Number 2017-206-2	Site Vicinity Map	Date Drawn: 04/2024
Address: 2200 North Meridian, Puyallup, Washington 98371		



Approximate Scale: 1" = 60'

0 30 60 120

N

= Test pit locations by RGI, 03/27/2024

= Site boundary

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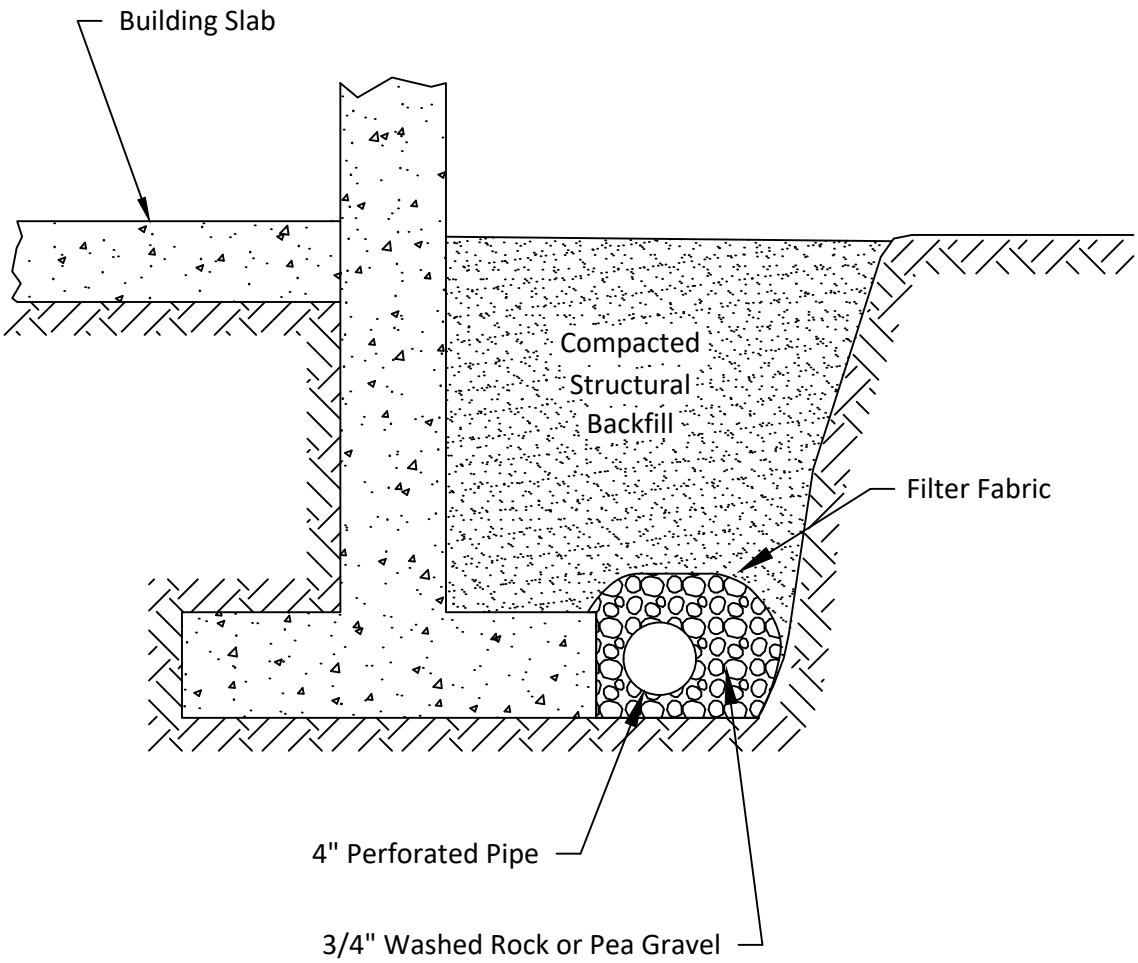
Fred Meyer Distribution Center - Truck Entrance		Figure 2
RGI Project Number 2017-206-2	Geotechnical Exploration Plan	Date Drawn: 04/2024
Address: 2200 North Meridian, Puyallup, Washington 98371		



Not to Scale

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Bothell, Washington 98011
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Fax: 425.415.0311

Fred Meyer Distribution Center - Truck Entrance		Figure 3
RGI Project Number 2017-206-2	Typical Footing Drain Detail	Date Drawn: 04/2024
Address: 2200 North Meridian, Puyallup, Washington 98371		

Project Name: **Fred Meyer Distribution Center - Truck Entrance**
Project Number: **2017-206-2**
Client: **The Kroger Co.**

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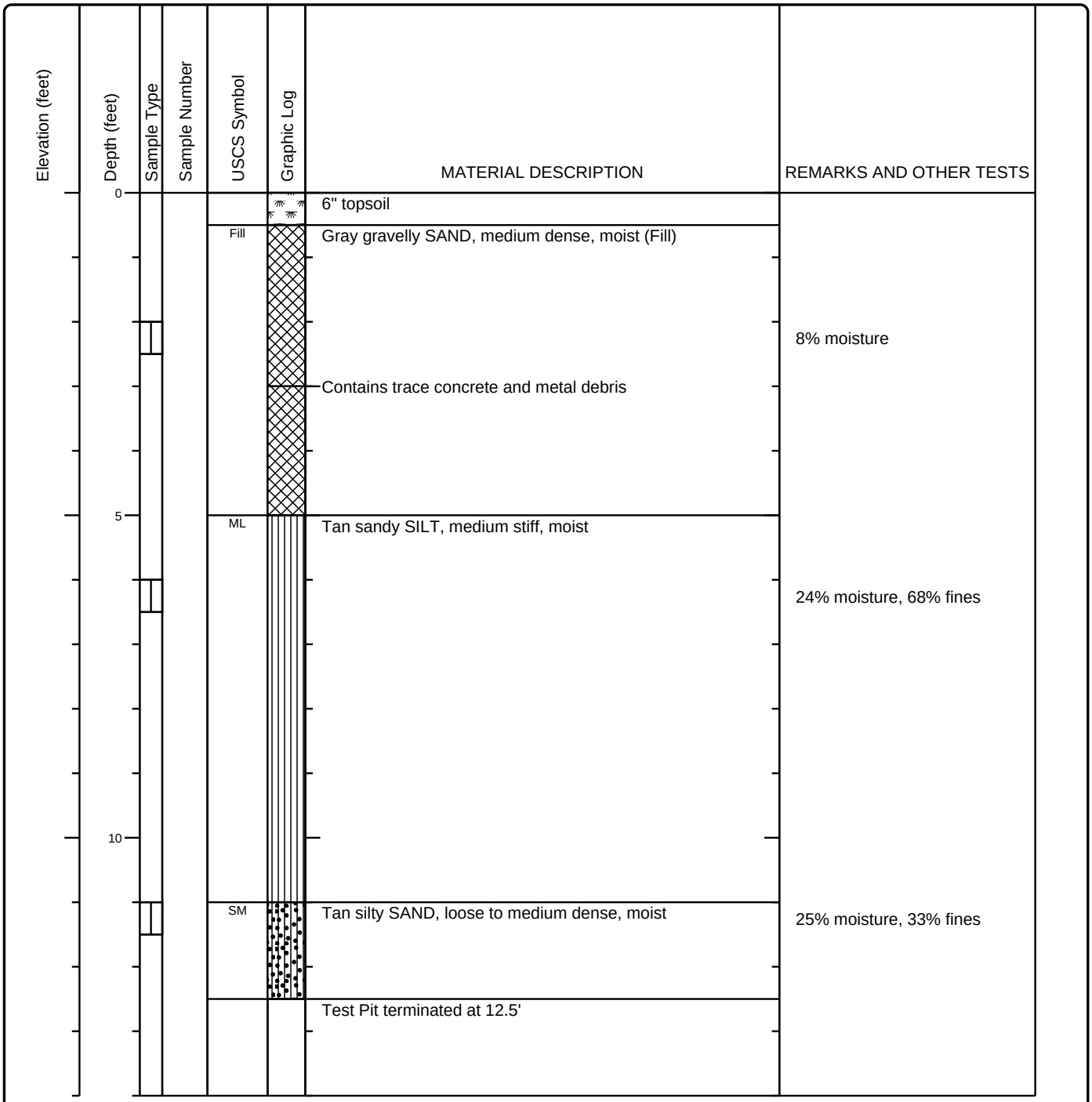
Test Pit No.: TP-1

Date(s) Excavated: **3/27/2024**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **12.5 feet bgs**
Excavator Type: **Mini Excavator**	Excavating Contractor: **Chavira Associates**	Approximate Surface Elevation **N/A**
Groundwater Level: **Not Encountered**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **2200 North Meridian, Puyallup, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Fred Meyer Distribution Center - Truck Entrance**
Project Number: **2017-206-2**
Client: **The Kroger Co.**

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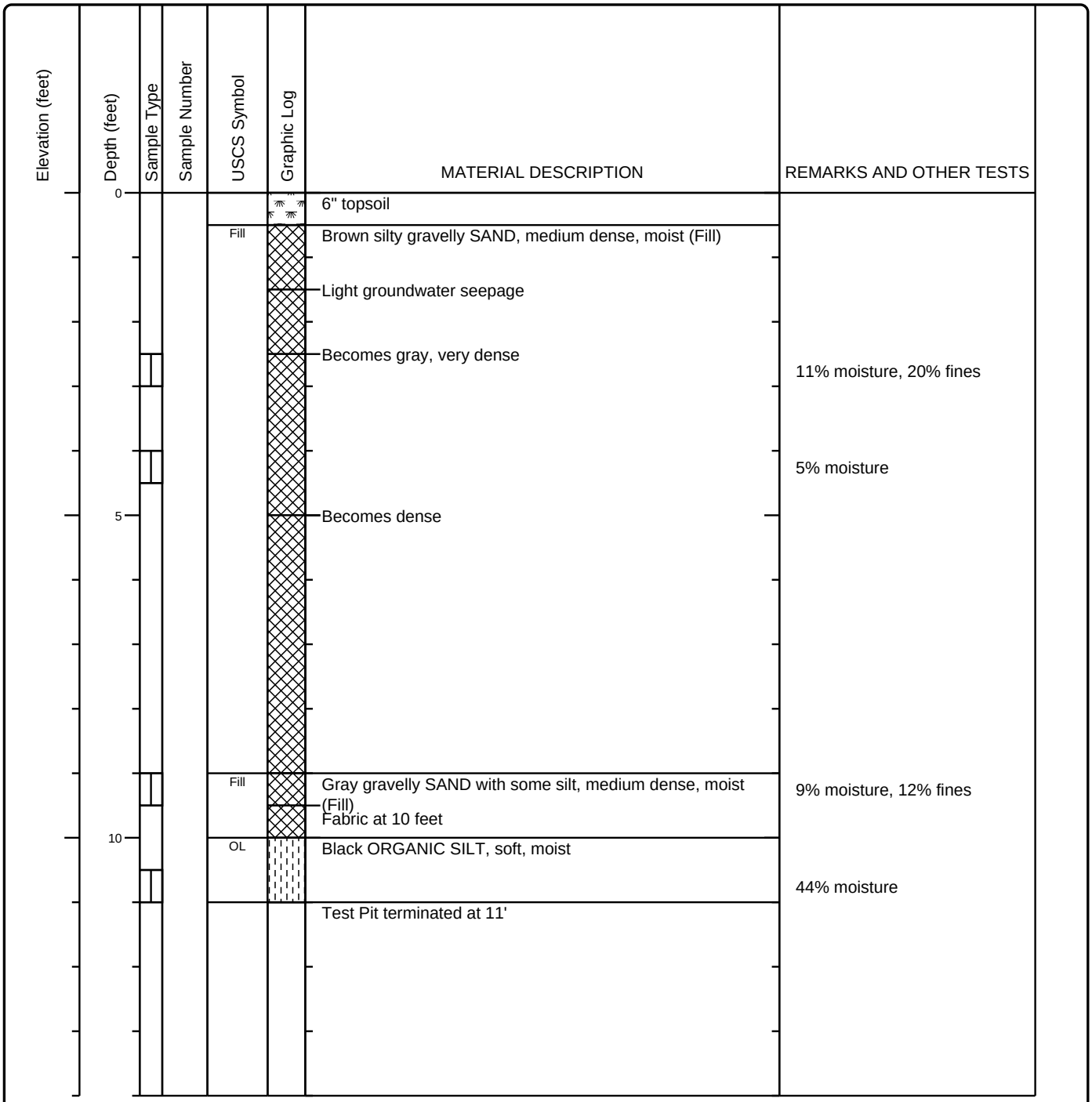
Test Pit No.: TP-2

Date(s) Excavated: **3/27/2024**	Logged By **ELW**	Surface Conditions: **Grass**
Excavation Method: **Test Pit**	Bucket Size: **N/A**	Total Depth of Excavation: **11 feet bgs**
Excavator Type: **Mini Excavator**	Excavating Contractor: **Chavira Associates**	Approximate Surface Elevation **N/A**
Groundwater Level: **Seepage at 1.5'**	Sampling Method(s) **Grab**	Compaction Method **Bucket**
Test Pit Backfill: **Cuttings**	Location **2200 North Meridian, Puyallup, Washington**	



The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Fred Meyer Distribution Center - Truck Entrance**
Project Number: **2017-206-2**
Client: **The Kroger Co.**

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Key to Logs

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. USCS Symbol: USCS symbol of the subsurface material.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

AF
SILT, SILT w/SAND, SANDY SILT (ML)
Low plasticity PEAT (OL)
Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting, AW)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Fred Meyer Distribution Center - Truck Entrance		**Exploration Type**	TP-1	
PROJECT NO.	2017-206-2		**Depth**	6'	
TECH/TEST DATE	EW/PL	3/27/2024	**Date Received**	3/27/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	595.1
Wt Dry Soil & Tare (gm)	(w2)	505.3
Weight of Tare (gm)	(w3)	134.9
Weight of Water (gm)	(w4=w1-w2)	89.8
Weight of Dry Soil (gm)	(w5=w2-w3)	370.4
Moisture Content (%)	(w4/w5)*100	24

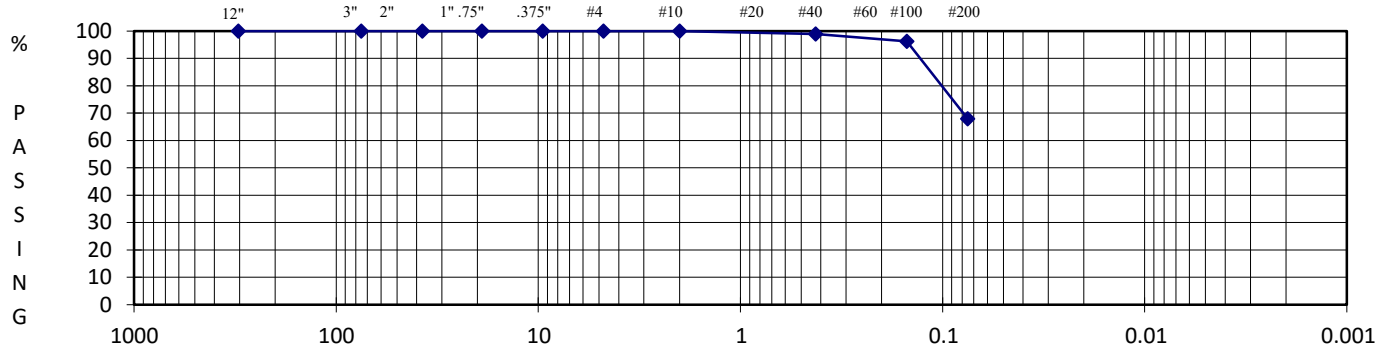
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		505.3
Tare Weight (gm)		134.9
Total Dry Weight (gm)	(W6)	370.4

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**0.0**
% C SAND	**0.1**
% M SAND	**1.0**
% F SAND	**31.0**
% FINES	**67.9**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.9	0.00	0.00	100.00	cobbles
3.0"	134.9	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	134.9	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	134.9	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	134.9	0.00	0.00	100.00	fine gravel
#4	134.9	0.00	0.00	100.00	coarse sand
#10	135.1	0.20	0.05	99.95	medium sand
#20					medium sand
#40	138.9	4.00	1.08	98.92	fine sand
#60					fine sand
#100	148.7	13.80	3.73	96.27	fine sand
#200	253.8	118.90	32.10	67.90	fines
PAN	505.3	370.40	100.00	0.00	silt/clay



DESCRIPTION	Sandy SILT
USCS	ML

Prepared For:
PanGEO, Inc.

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
17522 Bothell Way NE
Bothell, WA 98011

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Fred Meyer Distribution Center - Truck Entrance		**Exploration Type**	TP-1	
PROJECT NO.	2017-206-2		**Depth**	11'	
TECH/TEST DATE	EW/PL	3/27/2024	**Date Received**	3/27/2024	

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	540.0
Wt Dry Soil & Tare (gm)	(w2)	458.3
Weight of Tare (gm)	(w3)	126.5
Weight of Water (gm)	(w4=w1-w2)	81.7
Weight of Dry Soil (gm)	(w5=w2-w3)	331.8
Moisture Content (%)	(w4/w5)*100	25

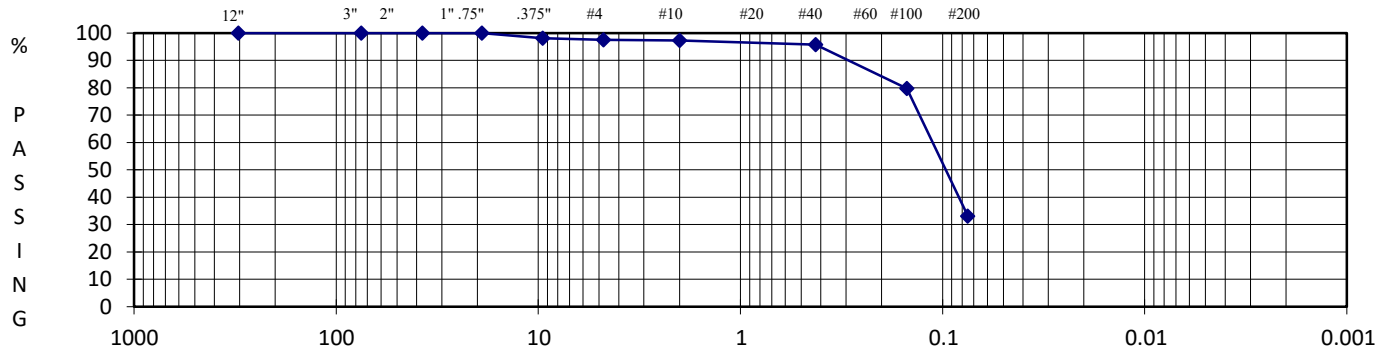
Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

Weight Of Sample (gm)		458.3
Tare Weight (gm)		126.5
(W6) Total Dry Weight (gm)		331.8

% COBBLES	**0.0**
% C GRAVEL	**0.0**
% F GRAVEL	**2.5**
% C SAND	**0.2**
% M SAND	**1.4**
% F SAND	**62.7**
% FINES	**33.2**
% TOTAL	**100.0**
D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	126.5	0.00	0.00	100.00	cobbles
3.0"	126.5	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	126.5	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	126.5	0.00	0.00	100.00	fine gravel
0.50"					fine gravel
0.375"	132.9	6.40	1.93	98.07	fine gravel
#4	134.7	8.20	2.47	97.53	coarse sand
#10	135.5	9.00	2.71	97.29	medium sand
#20					medium sand
#40	140.3	13.80	4.16	95.84	fine sand
#60					fine sand
#100	193.8	67.30	20.28	79.72	fine sand
#200	348.3	221.80	66.85	33.15	fines
PAN	458.3	331.80	100.00	0.00	silt/clay



DESCRIPTION	Silty SAND
USCS	SM

Prepared For:
PanGEO, Inc.

Reviewed By:
ELW

RILEYGROUP

THE RILEY GROUP, INC.
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Bothell, WA 98011

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Fred Meyer Distribution Center - Truck Entrance		**Exploration Type**	TP-2
PROJECT NO.	2017-206-2		**Depth**	2.5'
TECH/TEST DATE	EW/PL	3/27/2024	**Date Received**	3/27/2024

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	717.2
Wt Dry Soil & Tare (gm)	(w2)	657.2
Weight of Tare (gm)	(w3)	134.0
Weight of Water (gm)	(w4=w1-w2)	60.0
Weight of Dry Soil (gm)	(w5=w2-w3)	523.2
Moisture Content (%)	(w4/w5)*100	11

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

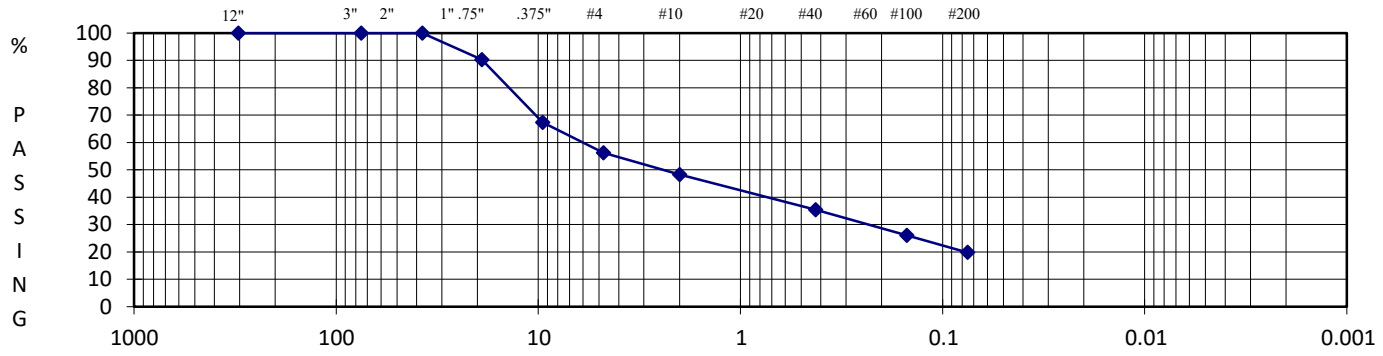
Weight Of Sample (gm)		657.2
Tare Weight (gm)		134.0
Total Dry Weight (gm)	(W6)	523.2

% COBBLES	**0.0**
% C GRAVEL	**9.7**
% F GRAVEL	**34.0**
% C SAND	**7.9**
% M SAND	**12.9**
% F SAND	**15.6**
% FINES	**19.9**
% TOTAL	**100.0**

D10 (mm)	
D30 (mm)	
D60 (mm)	
Cu	
Cc	

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.0	0.00	0.00	100.00	cobbles
3.0"	134.0	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	134.0	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	185.0	51.00	9.75	90.25	fine gravel
0.50"					fine gravel
0.375"	305.0	171.00	32.68	67.32	fine gravel
#4	362.9	228.90	43.75	56.25	coarse sand
#10	404.3	270.30	51.66	48.34	medium sand
#20					medium sand
#40	471.7	337.70	64.55	35.45	fine sand
#60					fine sand
#100	520.6	386.60	73.89	26.11	fine sand
#200	553.3	419.30	80.14	19.86	fines
PAN	657.2	523.20	100.00	0.00	silt/clay



DESCRIPTION	Silty gravelly SAND
USCS	SM

Prepared For:
PanGEO, Inc.

Reviewed By:
ELW

RILEYGROUP

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GRAIN SIZE ANALYSIS
ASTM D421, D422, D1140, D2487, D6913

PROJECT TITLE	Fred Meyer Distribution Center - Truck Entrance		**Exploration Type**	TP-2
PROJECT NO.	2017-206-2		**Depth**	9'
TECH/TEST DATE	EW/PL	3/27/2024	**Date Received**	3/27/2024

WATER CONTENT (Delivered Moisture)

Wt Wet Soil & Tare (gm)	(w1)	688.8
Wt Dry Soil & Tare (gm)	(w2)	644.2
Weight of Tare (gm)	(w3)	134.4
Weight of Water (gm)	(w4=w1-w2)	44.6
Weight of Dry Soil (gm)	(w5=w2-w3)	509.8
Moisture Content (%)	(w4/w5)*100	9

Total Weight Of Sample Used For Sieve Corrected For Hygroscopic Moisture

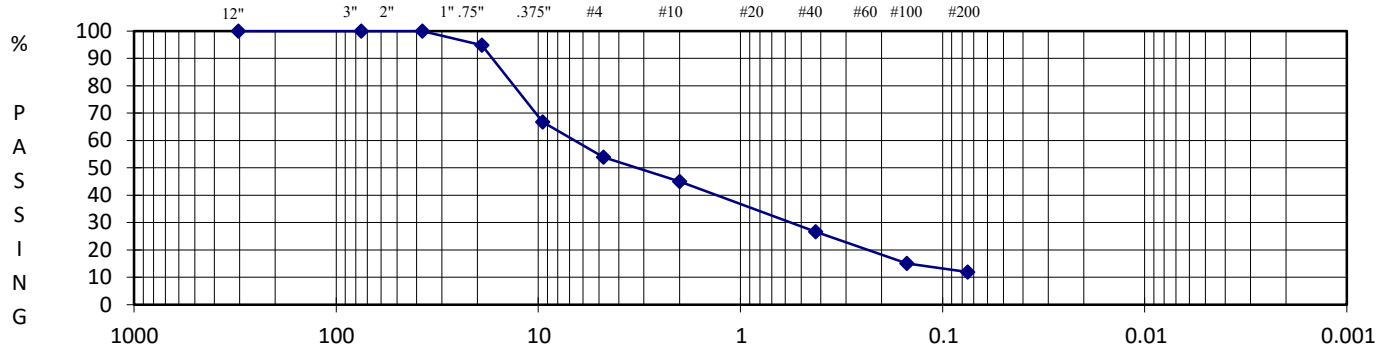
Weight Of Sample (gm)		644.2
Tare Weight (gm)		134.4
Total Dry Weight (gm)	(W6)	509.8

% COBBLES	**0.0**
% C GRAVEL	**5.1**
% F GRAVEL	**41.0**
% C SAND	**8.9**
% M SAND	**18.3**
% F SAND	**14.7**
% FINES	**11.9**
% TOTAL	**100.0**

D10 (mm)	0.075
D30 (mm)	0.54
D60 (mm)	6.8
Cu	90.7
Cc	0.6

SIEVE ANALYSIS

	Wt Ret +Tare	(Wt-Tare)	Cumulative (%Retained) {(wt ret/w6)*100}	% PASS (100-%ret)	
12.0"	134.4	0.00	0.00	100.00	cobbles
3.0"	134.4	0.00	0.00	100.00	coarse gravel
2.5"					coarse gravel
2.0"					coarse gravel
1.5"	134.4	0.00	0.00	100.00	coarse gravel
1.0"					coarse gravel
0.75"	160.5	26.10	5.12	94.88	fine gravel
0.50"					fine gravel
0.375"	303.6	169.20	33.19	66.81	fine gravel
#4	369.5	235.10	46.12	53.88	coarse sand
#10	414.8	280.40	55.00	45.00	medium sand
#20					medium sand
#40	508.2	373.80	73.32	26.68	fine sand
#60					fine sand
#100	567.3	432.90	84.92	15.08	fine sand
#200	583.3	448.90	88.05	11.95	fines
PAN	644.2	509.80	100.00	0.00	silt/clay



DESCRIPTION	Gravelly SAND with some silt
USCS	SP-SM

Prepared For:
PanGEO, Inc.

Reviewed By:
ELW

RILEYGROUP

January 6, 2025

Cliff Rapp
Logistics Maintenance Manager
Puyallup Fred Meyer Distribution Center
2200 North Meridian
Puyallup, Washington 98371

RE: Geotechnical Response Letter
Puyallup Fred Meyer Distribution Center – Truck Entrance
2200 North Meridian
Puyallup, Washington 98371
RGI Project No. 2017-206-2

Reference: The Riley Group, Inc, Geotechnical Exploration and Recommendation, Puyallup Fred Meyer Distribution Center – Truck Entrance, Puyallup, Washington dated April 9, 2024

The Riley Group, Inc, Stormwater Infiltration Assessment, Fred Meyer Distribution Center, Puyallup, Washington dated October 26, 2017

Dear Cliff Rapp:

The Riley Group, Inc. (RGI) is pleased to provide this letter addressing the Geotechnical comments prepared by City of Puyallup Engineering Division dated December 11, 2024. RGI previously prepared the referenced Geotechnical Exploration and Recommendation letter and the Stormwater Infiltration Assessment for the property.

City of Puyallup Comment: -Infeasibility criteria claim soils are not suitable for infiltration. The provided geotechnical report from Riley Group dated April 19, 2024 does not appear to discuss infiltration. Either provide further infiltration data and geotechnical recommendation around infiltration, or other infeasibility criteria, or incorporate BMPs into design.

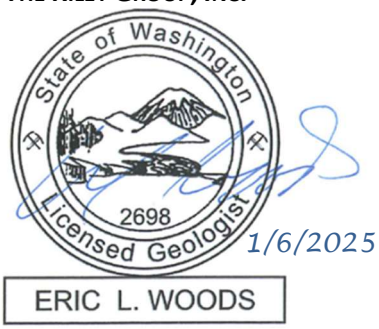
RGI Responses: RGI completed two test pits in the proposed truck entrance area. Fill soils were encountered in both test pits. Approximately 5 feet of fill soils were observed in test pit TP-1 from grade to a depth of 5 feet. Fill soils in test pit TP-2 contained concrete and metal debris. The fill soils in test pit TP-1 were underlain by silt. Ten feet of fill soils were observed in test pit TP-2 from grade to a depth of 10 feet. A layer of filter fabric was observed at the base of the fill. The fill soils in test pit TP-2 were underlain by silt.

Per the Washington State Department of Ecology Stormwater Management Manual for Western Washington, infiltration facilities can be placed in fill material if the fill is placed and compacted under the direct supervision of a geotechnical engineer. The presence of concrete and metal debris indicates the fill was not placed and compacted under the supervision of a geotechnical engineer, as concrete and metal debris would not be allowed in structural fill placement observed by a geotechnical engineer and does not meet the requirement for infiltration in fill soils.

Please call us at (425) 415-0551 if you have any questions or need additional information.

Respectfully submitted,

THE RILEY GROUP, INC.



Eric L. Woods, LG
Senior Project Geologist

Kristina M. Weller, PE
Principal Geotechnical Engineer

Appendix C
AMENDMENT TO STORMWATER MANAGEMENT REPORT, JUNE 4, 1998

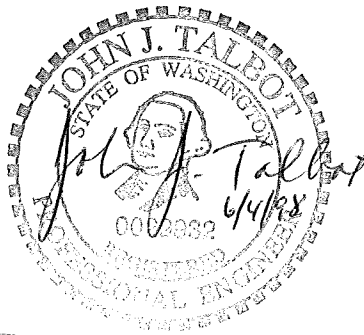
AMENDMENT TO STORMWATER MANAGEMENT REPORT

FOR THE

FRED MEYER
NORTHERN DISTRIBUTION CENTER

PUYALLUP, WASHINGTON

MAY 5, 1998
RE-ISSUED JUNE 4, 1998



7/27/98

PREPARED BY:

A.EPSTEIN AND SONS INTERNATIONAL, INC.
600 WEST FULTON STREET
CHICAGO, ILLINOIS 60661-1199
(312) 454-9100

The stormwater management report submitted in February 1994 for the Fred Meyer distribution center remains applicable to the expansion of the facility being undertaken at this time. The drainage design of the original facility addressed the expansion program. Storm sewers and bio-filtration swales were sized for an expanded facility.

The additional pavement area for docks and trailer parking in front of the dry grocery expansion at the west side of the existing facility was designed as part of the original facility and was submitted for approval. This pavement was not constructed as part of the original facility and will be placed now. The expansion of the employee parking area remains within the area originally projected. 430 spaces have been planned, only a maximum of 355 are being provided. The additional building area was also included in the original drainage design.

One alteration to the original design is being undertaken. Bioswale "G" near the employee entrance from Meridian Street is proposed to be altered to accommodate the building expansion. The desired building footprint requires an alteration of the employee entrance drive which requires that the bioswale be shortened by 30 feet. In accordance with the King County design procedures the bioswale is to be widened by approximately 5 feet to compensate for the reduced length. The design of Bioswale "G" was for a 200 foot long swale. The top of water width for the 5-year storm was 26.11 feet. The design procedure for bioswales less than 200 feet in length is to determine the swale width based upon a 200 foot length and the widen the swale to keep the top of water area the same. In this case 200 x 26.11 = 5222 square feet. The reduced length would require a top of water area of 5222 / 170 = 30.7 feet. The bioswale is proposed to be widened by this additional 4.6 feet.

The drainage area to Bioswale "G" provides for a expanded employee parking area. An expanded employee parking area is included as part of the expansion program. The size of the expanded employee parking area is not as large as the area assumed in the original design of Bioswale "G". approximately 30,000 square feet less parking area is being provided. The expansion program represents the full build-out of the facility. As such no additional employee parking is anticipated.

The reduction in length of Bioswale "G", 30 feet, is 15% of the original 200 foot length. An evaluation of Bioswale "G", using the King County procedures, with 30,000 square feet less impervious area indicates that the depth of flow, and hence the top width which is used in determining the width of a bioswale, is not significantly reduced. Hence an argument cannot be made that the reduced impervious area would allow a reduction in the length of the bioswale without also widening the bioswale.

The drawings for the expansion program indicate the widening of Bioswale "G" based on the calculations shown herein. The entire bioswale will be reworked to change its width. Consideration of the impact of having to entirely regrade the existing bioswale to accommodate this additional width could be given by the City of Puyallup. If the city should feel the impact of a complete reworking of the bioswale is a greater negative than a reduced length bioswale, not altering the bioswale would certainly be desirable.

Diversion of roof drainage to Wapato Creek is incorporated into the design of the expansion

program. At an existing drainage structure at the northwest corner of the dry grocery portion of the existing facility, labeled J4 on the drawings, a 12 inch diameter pipe is to be placed crossing 23rd Avenue NW. This pipe will provide the diversion of up to 2 cfs of runoff from the site to Wapato Creek.

The roof drains from the north half of the dry grocery addition are collected and routed to this structure. At this structure the invert of the 12 inch sewer to the north will be placed lower than the invert of the 12 inch sewer which continues east, collecting roof drainage from the existing facility, to the existing pump station. By placing the invert of the 12" sewer crossing 23rd Avenue NW to the north, lower than the sewer continuing to the east, the roof drainage from the dry grocery addition will normally be routed to Wapato Creek.

Discussions with the tribe resulted in agreement to route a maximum of 2 cfs to Wapato Creek so as not to exacerbate flooding problems in the wet season. To limit the discharge to Wapato Creek to 2 cfs, an orifice plate is to be placed on the 12" pipe to Wapato Creek. The orifice opening is sized assuming a head of 6.5 feet which is approximately from the centerline of the pipe to the rim elevation of the structure. This condition is not likely to ever occur since the sewer continuing east always provides for overflow but since the agreement is 2 cfs maximum this will provide a more certain limit.

Using the orifice equation $Q=Ca(2gh)^{0.5}$, where:

Q = 2 cfs
a = to be determined
g = 32.2 feet per second per second
h = 6.5 feet
C = 0.6

a = 0.1669

a for a circular opening = Pi r^2.

r = 0.23 feet
= 2.8"
diameter = 5.6 inches.

STORMWATER MANAGEMENT REPORT

FOR THE

ROUNDUP COMPANY'S

FRED MEYER
NORTHERN DISTRIBUTION CENTER

PUYALLUP, WASHINGTON

FEBRUARY 4, 1994

PREPARED BY:

A. EPSTEIN AND SONS INTERNATIONAL, INC.
600 WEST FULTON STREET
CHICAGO, ILLINOIS 60661-1199
(312) 454-9100

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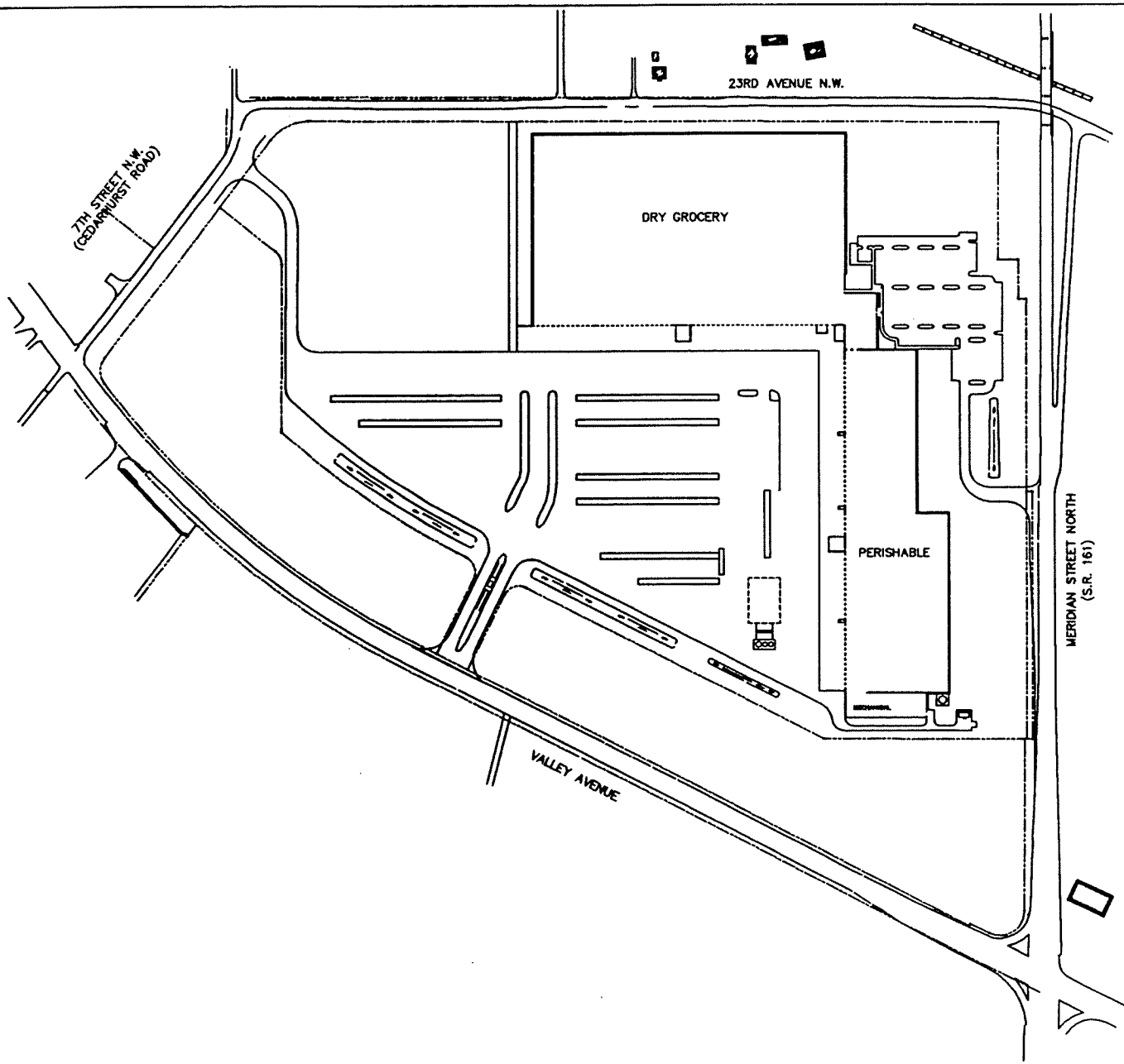
EXISTING CONDITIONS

The site is part of Parcel 1 of The Park in Puyallup being a portion of Government lots 1, 10, 11 and 12, and that portion of the Adam Benston D.L.C. No. 46 all lying within Section 21, Township 20 North, Range 4 East of the W.M., in Pierce County, Washington. The site consists of approximately 57 acres and is bordered by Meridian Street North (State Route 161) on the east, by Valley Avenue on the south, by 7th Street N.W. (Cedarhurst Road) on the west and by 23rd Avenue N.W. on the North (See Figure 1). The site is zoned "General Commercial", a large portion of which is currently being used as agricultural land. The existing ground cover consists of row crops, light grass, weeds and brush with sporadic trees. Based on the soil survey prepared by the USDA/SCS for Pierce County, the native soils present on the site consist of Pilchuck fine sand, Puyallup fine sandy loam, and Sultan silt loam having 0 to 3 percent slopes. The highest elevation on the site is approximately 45.5 located at the southeast corner; the lowest elevation is approximately 36.5 located along the north property line near 23rd Avenue N.W. The groundwater depth ranges from 8 - 10 feet during the dry months to a seasonal high of 4 - 5 feet during the wettest months.

The site is basically divided into two (2) drainage sheds. The first shed consists of the westerly portion of the site and a narrow strip along the north property line all of which drain northward across 23rd Avenue N.W. into an existing storm sewer system. This storm sewer discharges into a ditch which conveys the water west and north and eventually into the Wapato Creek. The second shed consists of the easterly portion of the site which drains into an existing ditch. This ditch is part of the interim drainage plan for the filled-in Wapato Slough/Wapato Creek Diversion Project. The ditch flows to a storm sewer which ties into the Wapato Creek Diversion Line located at the intersection of Valley Avenue and Meridian Street. The flow in this line is then routed south to the Puyallup River.



Fred Meyer, Inc.

NORTHERN FOOD
DISTRIBUTION CENTER
Puyallup, Washington

OVERALL SITE PLAN

EPSTEIN

A. EPSTEIN AND SONS INTERNATIONAL, INC.

G. KOLCHIN	5139	SHEET NUMBER
T. SHILES	7-27-88	FIGURE 1
B. HILTY		OF SHEETS

PROPOSED CONDITIONS

The site will be developed as a Fred Meyer Food Distribution Facility. The building will be approximately 600,000 square feet with a future expansion of approximately 270,000 square feet. The proposed ground cover (not including future expansion), will consist of 25% building area, 38% bituminous and concrete pavement, and 37% grassed areas. Based on the Concommitant Agreement in the Manual for the Park in Puyallup and due to the construction of the Wapato Diversion Line, no stormwater detention will be required for this facility. The Wapato Diversion Line was sized to take all runoff from the Park in Puyallup at full development. All stormwater runoff from this site will be directed to this line as shown in Figure 2 and as described below:

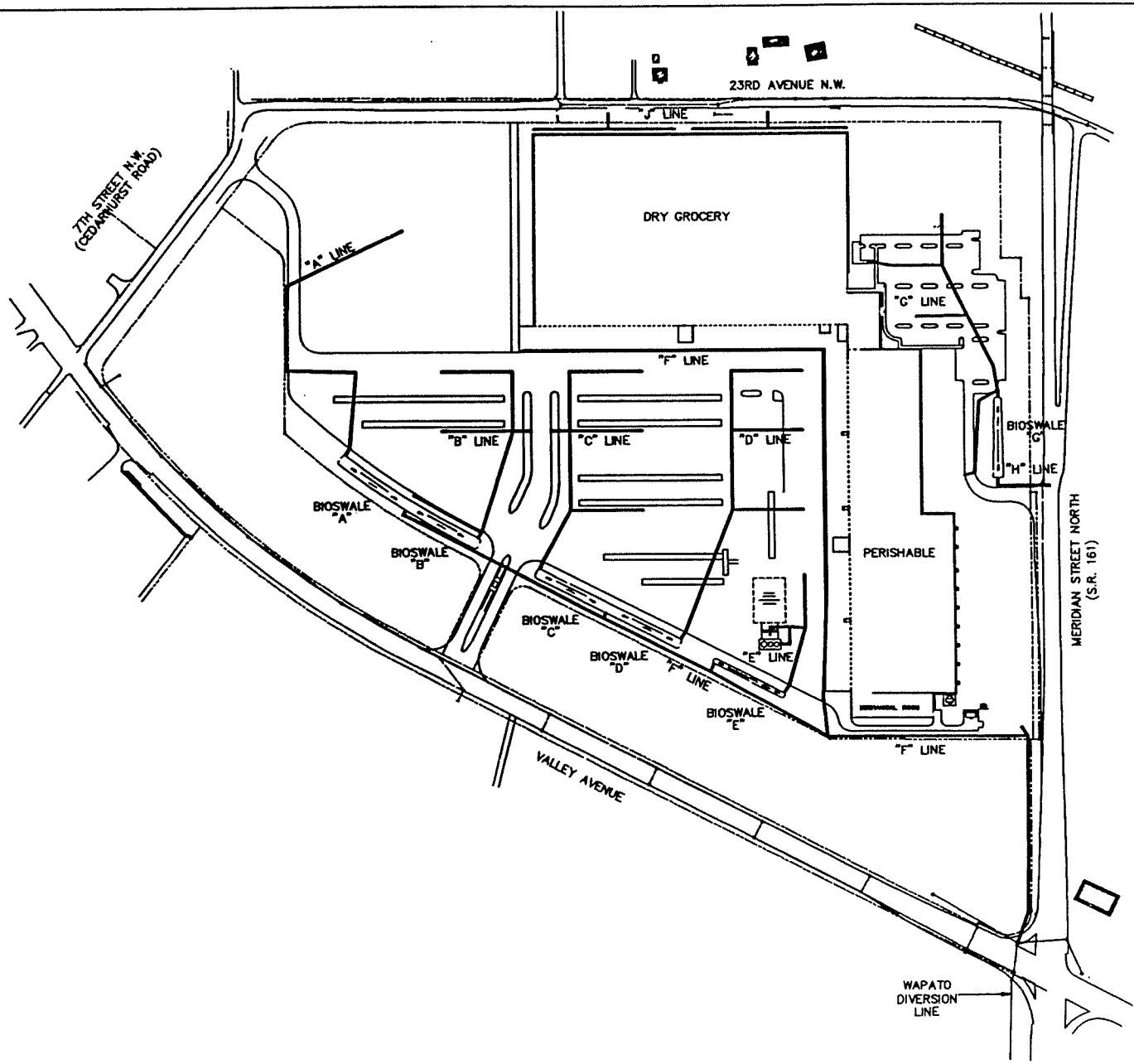
1. The drainage from the northern half of the Dry Grocery section of the building and the 30 foot strip of land along the north right-of-way line will be directed into the proposed off-site storm sewer located in 23rd Avenue N.W.. This storm sewer (design and location to be determined by others) will route the flow to the Wapato Diversion Line located at the intersection of Valley Avenue and Meridian Street North.

2. The drainage from the car parking area at the northeast corner of the site will be collected by a series of inlets and routed through a storm sewer southward to a vegetated biofiltration swale located north of the employee entrance adjacent to the west right-of-way of Meridian Street. At the last structure prior to entering the swale the stormwater will pass through a spill-control oil/water separator. (See City Standard Detail No. 205 in the Appendix). After traveling through the swale the flow will be picked up by a storm sewer located just north of the employee entrance driveway which will direct the water eastward into the proposed off-site gravity sewer located in Meridian Street North which will route the flow to the Wapato Diversion Line located at the intersection of Valley Avenue and Meridian Street North.

3. The drainage from the paved truck parking, maneuvering, and dock areas will be collected by a series of inlets and routed through various storm lines southward to vegetated biofiltration swales located along the south property line of the site. At the last structure of each line and prior to entering the swale, the stormwater will pass through a spill-control oil/water separator. (See City Standard Detail No. 205 in the Appendix). Once the stormwater has flowed through the swale, it is picked up by a gravity sewer which will direct the flow eastward and eventually into the proposed of-site storm sewer located along Meridian Street North.

4. The roof drainage, excluding the northern half of the Dry Grocery and the eastern 80 feet of the Perishable section of the building, will flow into a gravity sewer located along the dock area south and west of the building. Flow in this line will be directed southward and connect into the proposed storm sewer which also drains the previously mentioned biofiltration swales.

5. The roof drainage from the eastern 80 feet of the Perishable section of the building will discharge at grade. This runoff and the runoff from the grass area between this portion of the building and westerly right-of-way line of Meridian Street North will flow overland southward to the proposed storm sewer located at the south property line. All flow in this line will then be routed to the proposed off-site stormsewer located along Meridian Street North. As was mentioned previously, the proposed storm sewer in Meridian Street North will flow southward and connect into the Wapato Diversion Line.



Fred Meyer, Inc.

NORTHERN FOOD DISTRIBUTION CENTER
Puyallup, Washington

OVERALL DRAINAGE PLAN

EPSTEIN

A. EPSTEIN AND SONS INTERNATIONAL INC.
300 WEST FALTON STREET CHICAGO, ILLINOIS 60661-1198
CHICAGO NEW YORK LONDON SHANGHAI TEL AVIV

PROJECT MANAGER: B. KELCHNER	JOB NUMBER: 6139	SHEET NUMBER: FIGURE 2
DESIGNED BY: T. SMILES	DATE: 7-27-95	OF SHEETS
DRAWN BY: B. HILTY	CHECKED BY:	

STORM PIPE DESIGN CRITERIA

The storm sewer material will be polyvinylchloride for pipe sizes up to 27" and reinforced concrete pipe for pipe sizes 30" and larger. All on-site storm pipe is designed for a 25-year storm. For those lines discharging into a biofiltration swale the backwater analysis method is used; all other lines are designed using the rational method for uniform gravity flow. Pipe inverts are matched at all structures unless otherwise indicated on the plans. The minimum pipe size is 12" for the main lines and 6" for building laterals. The minimum design velocity is three feet per second except in the first segment of a pipe run where the low flows and resulting steep pipe slopes would not make it practical. The minimum pipe slope is 0.003 feet per foot.

Backwater Analysis Method - In this method a Manning's "n" of 0.009 for polyvinylchloride pipe is used. For the 25-year design storm a minimum of 0.5 feet of freeboard is provided between the headwater surface elevation and the top of any structure.

Uniform Flow Analysis Method - In this method a Manning's "n" of 0.014 for concrete pipe and 0.009 for polyvinylchloride pipe is used. For a 25-year design storm the pipes are designed to be full or partially full.

BIOFILTRATION SWALE DESIGN CRITERIA

The biofiltration swales are designed to provide water quality for the 5-year storm and to provide conveyance of the 100-year storm. All swales are trapezoidal with a maximum side slope of 4H:1V. The swales are a minimum of 200 feet long with the longitudinal slope of 0.5%. A Manning's "n" of 0.07 is used for all calculations. For water quality design using the 5-year storm, the maximum depth of flow is 5" and the design velocity does not exceed 1.5 feet per second. The 5" design depth has been approved by the City of Puyallup as long as coarse vegetation is planted in the swale bottom. For capacity design using the 100-year storm, more than 1 foot of freeboard has been provided between the maximum headwater elevation and top of the swale.

COMPUTATIONS

COMPOSITE RUNOFF COEFFICIENT CALCULATION

COMPOSITE RUNOFF COEFFICIENT CALCULATION

SUBBASIN NUMBER	LAND COVER	RUNOFF COEFF. (C)	AREA (AC)	(CxA)	TOTAL (CxA)	TOTAL (A)	COMPOSITE RUNOFF COEFF.
A2	Pavement	0.90	0.76	0.68	0.68	0.76	0.90
A3	Pavement	0.90	0.80	0.72	0.72	0.80	0.90
	Lawn	0.25	0.04	0.01			
A5	Pavement	0.90	0.21	0.19	0.20	0.25	0.80
	Lawn	0.25	0.25	0.06			
A7	Pavement	0.90	0.15	0.14	0.20	0.40	0.49
A8	Lawn	0.25	6.20	1.55	1.55	6.20	0.25
	Lawn	0.25	0.07	0.02			
B3	Pavement	0.90	0.72	0.65	0.67	0.79	0.84
B5	Pavement	0.90	0.53	0.48	0.48	0.53	0.90
	Lawn	0.25	0.05	0.01			
B6	Pavement	0.90	0.45	0.41	0.42	0.50	0.84
	Lawn	0.25	0.05	0.01			
B7	Pavement	0.90	0.11	0.10	0.11	0.16	0.70
B8	Pavement	0.90	0.85	0.77	0.77	0.85	0.90
B9	Pavement	0.90	0.55	0.50	0.50	0.55	0.90
B10	Pavement	0.90	0.83	0.75	0.75	0.83	0.90
	Lawn	0.25	0.07	0.02			
C2	Pavement	0.90	1.29	1.16	1.18	1.36	0.87
C4	Pavement	0.90	1.00	0.90	0.90	1.00	0.90
	Lawn	0.25	0.05	0.01			
C5	Pavement	0.90	0.45	0.41	0.42	0.50	0.84
	Lawn	0.25	0.05	0.01			
C6	Pavement	0.90	0.11	0.10	0.11	0.16	0.70
C7	Pavement	0.90	1.00	0.90	0.90	1.00	0.90
C8	Pavement	0.90	0.55	0.50	0.50	0.55	0.90
C9	Pavement	0.90	0.83	0.75	0.75	0.83	0.90

COMPOSITE RUNOFF COEFFICIENT CALCULATION

SUBBASIN NUMBER	LAND COVER	RUNOFF COEFF. (C)	AREA (AC)	(CxA)	TOTAL (CxA)	TOTAL (A)	COMPOSITE RUNOFF COEFF.
D2	Pavement	0.90	1.50	1.35	1.35	1.50	0.90
D4	Pavement	0.90	1.35	1.22	1.22	1.35	0.90
D5	Pavement	0.90	0.75	0.68	0.68	0.75	0.90
D6	Pavement	0.90	1.12	1.01	1.01	1.12	0.90
D7	Pavement	0.90	0.65	0.59	0.59	0.65	0.90
D8	Pavement	0.90	0.84	0.76	0.76	0.84	0.90
D9	Pavement	0.90	0.76	0.68	0.68	0.76	0.90
E2	Pavement	0.90	0.52	0.47	0.47	0.52	0.90
E3	Pavement	0.90	0.56	0.50	0.50	0.56	0.90
E4	Pavement	0.90	0.52	0.47	0.47	0.52	0.90
E7	Pavement	0.90	0.02	0.02	0.02	0.02	0.90
E8	Pavement	0.90	0.02	0.02	0.02	0.02	0.90
E9	Pavement	0.90	0.02	0.02	0.02	0.02	0.90
F2	Lawn Roof	0.25 0.90	2.50 0.83	0.63 0.75	1.37	3.33	0.41
F4	Roof	0.90	1.46	1.31	1.31	1.46	0.90
F6	Lawn	0.25	0.66	0.17	0.17	0.66	0.25
F8	Lawn	0.25	0.82	0.21	0.21	0.82	0.25

COMPOSITE RUNOFF COEFFICIENT CALCULATION

SUBBASIN NUMBER	LAND COVER	RUNOFF COEFF. (C)	AREA (AC)	(CxA)	TOTAL (CxA)	TOTAL (A)	COMPOSITE RUNOFF COEFF.
F11	Lawn	0.25	0.32	0.08	0.08	0.32	0.25
F12	Roof	0.90	1.24	1.12	1.41	1.57	0.90
F13	Roof	0.90	1.84	1.66	1.66	1.84	0.90
F14	Roof	0.90	2.23	2.01	2.01	2.23	0.90
F15	Roof	0.90	1.93	1.74	1.74	1.93	0.90
F16	Future Roof	0.90	2.50	2.25	2.25	2.50	0.90
G3	Lawn	0.25	0.36	0.09	0.38	0.68	0.56
	Pavement	0.90	0.32	0.29			
G4	Lawn	0.25	0.07	0.02	0.48	0.58	0.82
	Pavement	0.90	0.51	0.46			
G5	Lawn	0.25	0.07	0.02	0.49	0.59	0.82
	Pavement	0.90	0.52	0.47			
G6	Lawn	0.25	0.03	0.01	0.35	0.41	0.85
	Pavement	0.90	0.38	0.34			
G7	Lawn	0.25	0.04	0.01	0.31	0.37	0.83
	Pavement	0.90	0.33	0.30			
G8	Lawn	0.25	0.05	0.01	0.05	0.09	0.54
	Pavement	0.90	0.04	0.04			
G9	Lawn	0.25	0.05	0.01	0.36	0.44	0.83
	Pavement	0.90	0.39	0.35			
Future G10	Lawn	0.25	0.14	0.04	0.45	0.60	0.75
	Pavement	0.90	0.46	0.41			
Future G11	Lawn	0.25	0.14	0.04	0.44	0.59	0.75
	Pavement	0.90	0.45	0.41			
Future G12	Lawn	0.25	0.21	0.05	0.46	0.66	0.69
	Pavement	0.90	0.45	0.41			
G14	Lawn	0.25	0.10	0.03	0.12	0.20	0.58
	Pavement	0.90	0.10	0.09			
G15	Lawn	0.25	0.10	0.03	0.73	0.88	0.83
	Pavement	0.90	0.78	0.70			

COMPOSITE RUNOFF COEFFICIENT CALCULATION

SUBBASIN NUMBER	LAND COVER	RUNOFF COEFF. (C)	AREA (AC)	(CxA)	TOTAL (CxA)	TOTAL (A)	COMPOSITE RUNOFF COEFF.
H3	Lawn	0.25	0.50	0.13	0.13	0.50	0.25
J3	Roof	0.90	1.04	0.94	0.94	1.04	0.90
J4	Roof	0.90	1.04	0.94	0.94	1.04	0.90
J7	Roof	0.90	1.13	1.02	1.02	1.13	0.90
J8	Roof	0.90	1.13	1.02	1.02	1.13	0.90

TIME
OF
CONCENTRATION
CALCULATION

TIME OF CONCENTRATION CALCULATION

SUBBASIN NUMBER	LAND COVER	VELOCITY FACTOR (ft/sec)	SLOPE (ft/ft)	AVERAGE VELOCITY (ft/sec)	LENGTH (ft)	TRAVEL TIME (min)	TIME OF CONCENTRATION (min)
A2	Pavement	20.0	0.01	2.0	220	1.8	6.3 *
A3	Pavement	20.0	0.01	2.0	160	1.3	6.3 *
	Lawn	7.0	0.01	0.7	50	1.2	
A5	Pavement	20.0	0.01	2.0	80	0.7	6.3 *
	Lawn	7.0	0.01	0.7	60	1.4	
A7	Pavement	20.0	0.01	2.0	110	0.9	6.3 *
A8	Lawn	7.0	0.01	0.7	370	8.8	8.8
	Lawn	7.0	0.02	1.0	10	0.2	
B3	Pavement	20.0	0.01	2.0	200	1.7	6.3 *
B5	Pavement	20.0	0.01	2.0	190	1.6	6.3 *
	Lawn	7.0	0.02	1.0	10	0.2	
B6	Pavement	20.0	0.01	2.0	100	0.8	6.3 *
	Lawn	7.0	0.02	1.0	10	0.2	
B7	Pavement	20.0	0.01	2.0	100	0.8	6.3 *
B8	Pavement	20.0	0.01	2.0	150	1.3	6.3 *
B9	Pavement	20.0	0.01	2.0	135	1.1	6.3 *
B10	Pavement	20.0	0.01	2.0	160	1.3	6.3 *
	Lawn	7.0	0.02	1.0	10	0.2	
C2	Pavement	20.0	0.01	2.0	230	1.9	6.3 *
C4	Pavement	20.0	0.01	2.0	150	1.3	6.3 *
	Lawn	7.0	0.02	1.0	10	0.2	
C5	Pavement	20.0	0.01	2.0	100	0.8	6.3 *
	Lawn	7.0	0.02	1.0	10	0.2	
C6	Pavement	20.0	0.01	2.0	100	0.8	6.3 *
C7	Pavement	20.0	0.01	2.0	150	1.3	6.3 *
C8	Pavement	20.0	0.01	2.0	135	1.1	6.3 *
C9	Pavement	20.0	0.01	2.0	160	1.3	6.3 *

*6.3 minutes minimum Tc

TIME-C1.WK1

TIME OF CONCENTRATION CALCULATION

SUBBASIN NUMBER	LAND COVER	VELOCITY FACTOR (ft/sec)	SLOPE (ft/ft)	AVERAGE VELOCITY (ft/sec)	LENGTH (ft)	TRAVEL TIME (min)	TIME OF CONCENTRATION (min)
D2	Pavement	20.0	0.01	2.0	240	2.0	6.3 *
D4	Pavement	20.0	0.01	2.0	200	1.7	6.3 *
D5	Pavement	20.0	0.01	2.0	150	1.3	6.3 *
D6	Pavement	20.0	0.01	2.0	160	1.3	6.3 *
D7	Pavement	20.0	0.01	2.0	140	1.2	6.3 *
D8	Pavement	20.0	0.01	2.0	160	1.3	6.3 *
D9	Pavement	20.0	0.01	2.0	135	1.1	6.3 *
E2	Pavement	20.0	0.01	2.0	180	1.5	6.3 *
E3	Pavement	20.0	0.01	2.0	135	1.1	6.3 *
E4	Pavement	20.0	0.01	2.0	135	1.1	6.3 *
E7	Pavement	20.0	0.01	2.0	20	0.2	6.3 *
E8	Pavement	20.0	0.01	2.0	20	0.2	6.3 *
E9	Pavement	20.0	0.01	2.0	20	0.2	6.3 *
	Lawn	7.0	0.01	0.7	80	1.9	
F2	Roof	20.0	0.01	2.0	620	5.2	7.1
F4	Roof	20.0	0.01	2.0	180	1.5	6.3 *
		7.0	0.01	0.7	150	3.6	
F6	Lawn	7.0	0.005	0.5	200	6.7	10.3
		7.0	0.01	0.7	50	1.2	
F8	Lawn	7.0	0.005	0.5	200	6.7	7.9

*6.3 minutes minimum Tc

TIME-C2.WK1

TIME OF CONCENTRATION CALCULATION

SUBBASIN NUMBER	LAND COVER	VELOCITY FACTOR (ft/sec)	SLOPE (ft/ft)	AVERAGE VELOCITY (ft/sec)	LENGTH (ft)	TRAVEL TIME (min)	TIME OF CONCENTRATION (min)
	Lawn	7.0	0.03	1.2	180	2.5	
F11	Lawn	7.0	0.005	0.5	200	6.7	9.2
F12	Roof	20.0	0.01	2.0	180	1.5	6.3 *
F13	Roof	20.0	0.01	2.0	180	1.5	6.3 *
F14	Roof	20.0	0.01	2.0	240	2.0	6.3 *
F15	Roof	20.0	0.01	2.0	240	2.0	6.3 *
F16	Future Roof	20.0	0.01	2.0	240	2.0	6.3 *
	Lawn	7.0	0.01	0.7	110	2.6	
G3	Pavement	20.0	0.01	2.0	140	1.2	6.3 *
	Lawn	7.0	0.02	1.0	30	0.5	
G4	Pavement	20.0	0.01	2.0	120	1.0	6.3 *
	Lawn	7.0	0.02	1.0	50	0.8	
G5	Pavement	20.0	0.01	2.0	80	0.7	6.3 *
	Lawn	7.0	0.02	1.0	20	0.3	
G6	Pavement	20.0	0.01	2.0	110	0.9	6.3 *
	Lawn	7.0	0.02	1.0	30	0.5	
G7	Pavement	20.0	0.01	2.0	100	0.8	6.3 *
	Lawn	7.0	0.02	1.0	15	0.3	
G8	Pavement	20.0	0.01	2.0	60	0.5	6.3 *
	Lawn	7.0	0.02	1.0	20	0.3	
G9	Pavement	20.0	0.01	2.0	110	0.9	6.3 *
Future	Lawn	7.0	0.02	1.0	15	0.3	
G10	Pavement	20.0	0.01	2.0	110	0.9	6.3 *
Future	Lawn	7.0	0.02	1.0	20	0.3	
G11	Pavement	20.0	0.01	2.0	120	1.0	6.3 *
Future	Lawn	7.0	0.02	1.0	60	1.0	
G12	Pavement	20.0	0.01	2.0	80	0.7	6.3 *
	Lawn	7.0	0.01	0.7	15	0.4	
G14	Pavement	20.0	0.01	2.0	170	1.4	6.3 *
	Lawn	7.0	0.02	1.0	110	1.9	
G15	Pavement	20.0	0.01	2.0	180	1.5	6.3 *

*6.3 minutes minimum Tc

TIME-C3.WK1

TIME OF CONCENTRATION CALCULATION

SUBBASIN NUMBER	LAND COVER	VELOCITY FACTOR (ft/sec)	SLOPE (ft/ft)	AVERAGE VELOCITY (ft/sec)	LENGTH (ft)	TRAVEL TIME (min)	TIME OF CONCENTRATION (min)
	Lawn	7.0	0.02	1.0	30	0.5	
H3	Lawn	7.0	0.005	0.5	200	6.7	7.2
J3	Roof	20.0	0.01	2.0	240	2.0	6.3 *
J4	Roof	20.0	0.01	2.0	240	2.0	6.3 *
J7	Roof	20.0	0.01	2.0	240	2.0	6.3 *
J8	Roof	20.0	0.01	2.0	240	2.0	6.3 *

*6.3 minutes minimum Tc

TIME-C4.WK1

PEAK
RAINFALL
INTENSITY
CALCULATION

5-YEAR STORM

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
A2	5	2.45	6.3	2.33	0.63	0.73	1.79
A3	5	2.45	6.3	2.33	0.63	0.73	1.79
A5	5	2.45	6.3	2.33	0.63	0.73	1.79
A7	5	2.45	6.3	2.33	0.63	0.73	1.79
A8	5	2.45	8.8	2.33	0.63	0.59	1.45
B3	5	2.45	6.3	2.33	0.63	0.73	1.79
B5	5	2.45	6.3	2.33	0.63	0.73	1.79
B6	5	2.45	6.3	2.33	0.63	0.73	1.79
B7	5	2.45	6.3	2.33	0.63	0.73	1.79
B8	5	2.45	6.3	2.33	0.63	0.73	1.79
B9	5	2.45	6.3	2.33	0.63	0.73	1.79
B10	5	2.45	6.3	2.33	0.63	0.73	1.79
C2	5	2.45	6.3	2.33	0.63	0.73	1.79
C4	5	2.45	6.3	2.33	0.63	0.73	1.79
C5	5	2.45	6.3	2.33	0.63	0.73	1.79
C6	5	2.45	6.3	2.33	0.63	0.73	1.79
C7	5	2.45	6.3	2.33	0.63	0.73	1.79
C6	5	2.45	6.3	2.33	0.63	0.73	1.79
C7	5	2.45	6.3	2.33	0.63	0.73	1.79

RAIN-P1.WK1

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
D2	5	2.45	6.3	2.33	0.63	0.73	1.79
D4	5	2.45	6.3	2.33	0.63	0.73	1.79
D5	5	2.45	6.3	2.33	0.63	0.73	1.79
D6	5	2.45	6.3	2.33	0.63	0.73	1.79
D7	5	2.45	6.3	2.33	0.63	0.73	1.79
D8	5	2.45	6.3	2.33	0.63	0.73	1.79
D9	5	2.45	6.3	2.33	0.63	0.73	1.79
E2	5	2.45	6.3	2.33	0.63	0.73	1.79
E3	5	2.45	6.3	2.33	0.63	0.73	1.79
E4	5	2.45	6.3	2.33	0.63	0.73	1.79
E7	5	2.45	6.3	2.33	0.63	0.73	1.79
E8	5	2.45	6.3	2.33	0.63	0.73	1.79
E9	5	2.45	6.3	2.33	0.63	0.73	1.79
F2	5	2.45	7.1	2.33	0.63	0.68	1.66
F4	5	2.45	6.3	2.33	0.63	0.73	1.79
F6	5	2.45	10.3	2.33	0.63	0.54	1.31
F8	5	2.45	7.9	2.33	0.63	0.63	1.55

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
F11	5	2.45	9.2	2.33	0.63	0.58	1.41
F12	5	2.45	6.3	2.33	0.63	0.73	1.79
F13	5	2.45	6.3	2.33	0.63	0.73	1.79
F14	5	2.45	6.3	2.33	0.63	0.73	1.79
F15	5	2.45	6.3	2.33	0.63	0.73	1.79
F16	5	2.45	6.3	2.33	0.63	0.73	1.79
G3	5	2.45	6.3	2.33	0.63	0.73	1.79
G4	5	2.45	6.3	2.33	0.63	0.73	1.79
G5	5	2.45	6.3	2.33	0.63	0.73	1.79
G6	5	2.45	6.3	2.33	0.63	0.73	1.79
G7	5	2.45	6.3	2.33	0.63	0.73	1.79
G8	5	2.45	6.3	2.33	0.63	0.73	1.79
G9	5	2.45	6.3	2.33	0.63	0.73	1.79
Future G10	5	2.45	6.3	2.33	0.63	0.73	1.79
Future G11	5	2.45	6.3	2.33	0.63	0.73	1.79
Future G12	5	2.45	6.3	2.33	0.63	0.73	1.79
G14	5	2.45	6.3	2.33	0.63	0.73	1.79
G15	5	2.45	6.3	2.33	0.63	0.73	1.79

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
H3	5	2.45	7.2	2.33	0.63	0.67	1.65
J3	5	2.45	6.3	2.33	0.63	0.73	1.79
J4	5	2.45	6.3	2.33	0.63	0.73	1.79
J7	5	2.45	6.3	2.33	0.63	0.73	1.79
J8	5	2.45	6.3	2.33	0.63	0.73	1.79

RAIN-P4.WK1

PEAK RAINFALL INTENSITY CALCULATION

25-YEAR STORM

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
A2	25	3.40	6.3	2.66	0.65	0.80	2.73
A3	25	3.40	6.3	2.66	0.65	0.80	2.73
A5	25	3.40	6.3	2.66	0.65	0.80	2.73
A7	25	3.40	6.3	2.66	0.65	0.80	2.73
A8	25	3.40	8.8	2.66	0.65	0.65	2.20
B3	25	3.40	6.3	2.66	0.65	0.80	2.73
B5	25	3.40	6.3	2.66	0.65	0.80	2.73
B6	25	3.40	6.3	2.66	0.65	0.80	2.73
B7	25	3.40	6.3	2.66	0.65	0.80	2.73
B8	25	3.40	6.3	2.66	0.65	0.80	2.73
B9	25	3.40	6.3	2.66	0.65	0.80	2.73
B10	25	3.40	6.3	2.66	0.65	0.80	2.73
C2	25	3.40	6.3	2.66	0.65	0.80	2.73
C4	25	3.40	6.3	2.66	0.65	0.80	2.73
C5	25	3.40	6.3	2.66	0.65	0.80	2.73
C6	25	3.40	6.3	2.66	0.65	0.80	2.73
C7	25	3.40	6.3	2.66	0.65	0.80	2.73
C6	25	3.40	6.3	2.66	0.65	0.80	2.73
C7	25	3.40	6.3	2.66	0.65	0.80	2.73

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
D2	25	3.40	6.3	2.66	0.65	0.80	2.73
D4	25	3.40	6.3	2.66	0.65	0.80	2.73
D5	25	3.40	6.3	2.66	0.65	0.80	2.73
D6	25	3.40	6.3	2.66	0.65	0.80	2.73
D7	25	3.40	6.3	2.66	0.65	0.80	2.73
D8	25	3.40	6.3	2.66	0.65	0.80	2.73
D9	25	3.40	6.3	2.66	0.65	0.80	2.73
E2	25	3.40	6.3	2.66	0.65	0.80	2.73
E3	25	3.40	6.3	2.66	0.65	0.80	2.73
E4	25	3.40	6.3	2.66	0.65	0.80	2.73
E7	25	3.40	6.3	2.66	0.65	0.80	2.73
E8	25	3.40	6.3	2.66	0.65	0.80	2.73
E9	25	3.40	6.3	2.66	0.65	0.80	2.73
F2	25	3.40	7.1	2.66	0.65	0.74	2.53
F4	25	3.40	6.3	2.66	0.65	0.80	2.73
F6	25	3.40	10.3	2.66	0.65	0.58	1.99
F8	25	3.40	7.9	2.66	0.65	0.69	2.36

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
F11	25	3.40	9.2	2.66	0.65	0.63	2.14
F12	25	3.40	6.3	2.66	0.65	0.80	2.73
F13	25	3.40	6.3	2.66	0.65	0.80	2.73
F14	25	3.40	6.3	2.66	0.65	0.80	2.73
F15	25	3.40	6.3	2.66	0.65	0.80	2.73
F16	25	3.40	6.3	2.66	0.65	0.80	2.73
G3	25	3.40	6.3	2.66	0.65	0.80	2.73
G4	25	3.40	6.3	2.66	0.65	0.80	2.73
G5	25	3.40	6.3	2.66	0.65	0.80	2.73
G6	25	3.40	6.3	2.66	0.65	0.80	2.73
G7	25	3.40	6.3	2.66	0.65	0.80	2.73
G8	25	3.40	6.3	2.66	0.65	0.80	2.73
G9	25	3.40	6.3	2.66	0.65	0.80	2.73
Future G10	25	3.40	6.3	2.66	0.65	0.80	2.73
Future G11	25	3.40	6.3	2.66	0.65	0.80	2.73
Future G12	25	3.40	6.3	2.66	0.65	0.80	2.73
G14	25	3.40	6.3	2.66	0.65	0.80	2.73
G15	25	3.40	6.3	2.66	0.65	0.80	2.73

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
H3	25	3.40	7.2	2.66	0.65	0.74	2.51
J3	25	3.40	6.3	2.66	0.65	0.80	2.73
J4	25	3.40	6.3	2.66	0.65	0.80	2.73
J7	25	3.40	6.3	2.66	0.65	0.80	2.73
J8	25	3.40	6.3	2.66	0.65	0.80	2.73

RAIN-P4.WK1

PEAK RAINFALL INTENSITY CALCULATION

100-YEAR STORM

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
A2	100	3.95	6.3	2.61	0.63	0.82	3.23
A3	100	3.95	6.3	2.61	0.63	0.82	3.23
A5	100	3.95	6.3	2.61	0.63	0.82	3.23
A7	100	3.95	6.3	2.61	0.63	0.82	3.23
A8	100	3.95	8.8	2.61	0.63	0.66	2.62
B3	100	3.95	6.3	2.61	0.63	0.82	3.23
B5	100	3.95	6.3	2.61	0.63	0.82	3.23
B6	100	3.95	6.3	2.61	0.63	0.82	3.23
B7	100	3.95	6.3	2.61	0.63	0.82	3.23
B8	100	3.95	6.3	2.61	0.63	0.82	3.23
B9	100	3.95	6.3	2.61	0.63	0.82	3.23
B10	100	3.95	6.3	2.61	0.63	0.82	3.23
C2	100	3.95	6.3	2.61	0.63	0.82	3.23
C4	100	3.95	6.3	2.61	0.63	0.82	3.23
C5	100	3.95	6.3	2.61	0.63	0.82	3.23
C6	100	3.95	6.3	2.61	0.63	0.82	3.23
C7	100	3.95	6.3	2.61	0.63	0.82	3.23
C6	100	3.95	6.3	2.61	0.63	0.82	3.23
C7	100	3.95	6.3	2.61	0.63	0.82	3.23

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
D2	100	3.95	6.3	2.61	0.63	0.82	3.23
D4	100	3.95	6.3	2.61	0.63	0.82	3.23
D5	100	3.95	6.3	2.61	0.63	0.82	3.23
D6	100	3.95	6.3	2.61	0.63	0.82	3.23
D7	100	3.95	6.3	2.61	0.63	0.82	3.23
D8	100	3.95	6.3	2.61	0.63	0.82	3.23
D9	100	3.95	6.3	2.61	0.63	0.82	3.23
E2	100	3.95	6.3	2.61	0.63	0.82	3.23
E3	100	3.95	6.3	2.61	0.63	0.82	3.23
E4	100	3.95	6.3	2.61	0.63	0.82	3.23
E7	100	3.95	6.3	2.61	0.63	0.82	3.23
E8	100	3.95	6.3	2.61	0.63	0.82	3.23
E9	100	3.95	6.3	2.61	0.63	0.82	3.23
F2	100	3.95	7.1	2.61	0.63	0.76	3.00
F4	100	3.95	6.3	2.61	0.63	0.82	3.23
F6	100	3.95	10.3	2.61	0.63	0.60	2.37
F8	100	3.95	7.9	2.61	0.63	0.71	2.80

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
F11	100	3.95	9.2	2.61	0.63	0.64	2.55
F12	100	3.95	6.3	2.61	0.63	0.82	3.23
F13	100	3.95	6.3	2.61	0.63	0.82	3.23
F14	100	3.95	6.3	2.61	0.63	0.82	3.23
F15	100	3.95	6.3	2.61	0.63	0.82	3.23
F16	100	3.95	6.3	2.61	0.63	0.82	3.23
G3	100	3.95	6.3	2.61	0.63	0.82	3.23
G4	100	3.95	6.3	2.61	0.63	0.82	3.23
G5	100	3.95	6.3	2.61	0.63	0.82	3.23
G6	100	3.95	6.3	2.61	0.63	0.82	3.23
G7	100	3.95	6.3	2.61	0.63	0.82	3.23
G8	100	3.95	6.3	2.61	0.63	0.82	3.23
G9	100	3.95	6.3	2.61	0.63	0.82	3.23
Future G10	100	3.95	6.3	2.61	0.63	0.82	3.23
Future G11	100	3.95	6.3	2.61	0.63	0.82	3.23
Future G12	100	3.95	6.3	2.61	0.63	0.82	3.23
G14	100	3.95	6.3	2.61	0.63	0.82	3.23
G15	100	3.95	6.3	2.61	0.63	0.82	3.23

PEAK RAINFALL INTENSITY CALCULATION

SUBBASIN NUMBER	DESIGN STORM	24-HOUR PRECIP. (inches)	TIME OF CONCENTRATION (min)	ADJUSTMENT FACTOR		UNIT PEAK RAINFALL INTENSITY FACTOR	PEAK RAINFALL INTENSITY (in/hr)
				a	b		
H3	100	3.95	7.2	2.61	0.63	0.75	2.97
J3	100	3.95	6.3	2.61	0.63	0.82	3.23
J4	100	3.95	6.3	2.61	0.63	0.82	3.23
J7	100	3.95	6.3	2.61	0.63	0.82	3.23
J8	100	3.95	6.3	2.61	0.63	0.82	3.23

RAIN-P4.WK1

PEAK RUNOFF
TO EACH
SUBBASIN AREA
FOR THE
5, 25 & 100-YEAR STORMS

PEAK RUNOFF TO EACH SUBBASIN AREA

SUBBASIN NUMBER	RAINFALL INTENSITY (IN/HR) 5 YR	25 YR	100 YR	AREA (SF)	RUNOFF COEFFICIENT	PEAK RUNOFF (CFS) 5 YR	25 YR	100 YR
A2	1.79	2.73	3.23	0.76	0.90	1.22	1.87	2.21
A3	1.79	2.73	3.23	0.80	0.90	1.29	1.97	2.33
A5	1.79	2.73	3.23	0.25	0.80	0.36	0.55	0.65
A7	1.66	2.53	3.00	0.40	0.49	0.33	0.50	0.59
A8	1.45	2.20	2.62	1.55	0.25	0.56	0.85	1.02
					TOTAL	3.76	5.73	6.78
B3	1.79	2.73	3.23	0.79	0.84	1.19	1.81	2.14
B5	1.79	2.73	3.23	0.53	0.90	0.85	1.30	1.54
B6	1.79	2.73	3.23	0.50	0.84	0.75	1.15	1.36
B7	1.79	2.73	3.23	0.16	0.70	0.20	0.31	0.36
B8	1.79	2.73	3.23	0.85	0.90	1.37	2.09	2.47
B9	1.79	2.73	3.23	0.55	0.90	0.89	1.35	1.60
B10	1.79	2.73	3.23	0.83	0.90	1.34	2.04	2.41
					TOTAL	6.59	10.05	11.89

QPEAK1.WK1

PEAK RUNOFF TO EACH SUBBASIN AREA

SUBBASIN NUMBER	RAINFALL INTENSITY (IN/HR) 5 YR	25 YR	100 YR	AREA (SF)	RUNOFF COEFFICIENT	PEAK RUNOFF (CFS) 5 YR	25 YR	100 YR
C2	1.79	2.73	3.23	1.36	0.87	2.12	3.23	3.82
C4	1.79	2.73	3.23	1.00	0.90	1.61	2.46	2.91
C5	1.79	2.73	3.23	0.50	0.84	0.75	1.15	1.36
C6	1.79	2.73	3.23	0.16	0.70	0.20	0.31	0.36
C7	1.79	2.73	3.23	1.00	0.90	1.61	2.46	2.91
C8	1.79	2.73	3.23	0.55	0.90	0.89	1.35	1.60
C9	1.79	2.73	3.23	0.83	0.90	1.34	2.04	2.41
					TOTAL	8.52	12.99	15.37
D2	1.79	2.73	3.23	1.50	0.90	2.42	3.69	4.36
D4	1.79	2.73	3.23	1.35	0.90	2.17	3.32	3.92
D5	1.79	2.73	3.23	0.75	0.90	1.21	1.84	2.18
D6	1.79	2.73	3.23	1.12	0.90	1.80	2.75	3.26
D7	1.79	2.73	3.23	0.65	0.90	1.05	1.60	1.89
D8	1.79	2.73	3.23	0.84	0.90	1.35	2.06	2.44
D9	1.79	2.73	3.23	0.76	0.90	1.22	1.87	2.21
					TOTAL	11.23	17.13	20.26

QPEAK2.WK1

PEAK RUNOFF TO EACH SUBBASIN AREA

SUBBASIN NUMBER	RAINFALL INTENSITY (IN/HR) 5 YR	25 YR	100 YR	AREA (SF)	RUNOFF COEFFICIENT	PEAK RUNOFF (CFS) 5 YR	25 YR	100 YR
E2	1.79	2.73	3.23	0.52	0.90	0.84	1.28	1.51
E3	1.79	2.73	3.23	0.56	0.90	0.90	1.38	1.63
E4	1.79	2.73	3.23	0.52	0.90	0.84	1.28	1.51
E7	1.79	2.73	3.23	0.02	0.90	0.03	0.05	0.06
E8	1.79	2.73	3.23	0.02	0.90	0.03	0.05	0.06
E9	1.79	2.73	3.23	0.02	0.90	0.03	0.05	0.06
					TOTAL	2.67	4.08	4.83
F2	1.66	2.53	3.00	3.33	0.41	2.27	3.45	4.10
F4	1.79	2.73	3.23	1.46	0.90	2.35	3.59	4.24
F6	1.31	1.99	2.37	0.66	0.25	0.22	0.33	0.39
F8	1.55	2.14	2.80	0.82	0.25	0.32	0.44	0.57
F11	1.41	2.73	2.55	0.32	0.25	0.11	0.22	0.20
F12	1.79	2.73	3.23	1.57	0.90	2.53	3.86	4.56
F13	1.79	2.73	3.23	1.84	0.90	2.96	4.52	5.35
F14	1.79	2.73	3.23	2.23	0.90	3.59	5.48	6.48
F15	1.79	2.73	3.23	1.93	0.90	3.11	4.74	5.61
F16	1.79	2.73	3.23	2.50	0.90	4.03	6.14	7.27
					TOTAL	21.49	32.77	38.78

QPEAK3.WK1

PEAK RUNOFF TO EACH SUBBASIN AREA

SUBBASIN NUMBER	RAINFALL INTENSITY (IN/HR) 5 YR	25 YR	100 YR	AREA (SF)	RUNOFF COEFFICIENT	PEAK RUNOFF (CFS) 5 YR	25 YR	100 YR
G3	1.79	2.73	3.23	0.68	0.56	0.68	1.04	1.23
G4	1.79	2.73	3.23	0.58	0.82	0.85	1.30	1.54
G5	1.79	2.73	3.23	0.59	0.82	0.87	1.32	1.56
G6	1.79	2.73	3.23	0.41	0.85	0.62	0.95	1.13
G7	1.79	2.73	3.23	0.37	0.83	0.55	0.84	0.99
G8	1.79	2.73	3.23	0.09	0.54	0.09	0.13	0.16
G9	1.79	2.73	3.23	0.44	0.83	0.65	1.00	1.18
Future G10	1.79	2.73	3.23	0.60	0.75	0.81	1.23	1.45
Future G11	1.79	2.73	3.23	0.59	0.75	0.79	1.21	1.43
Future G12	1.79	2.73	3.23	0.66	0.69	0.82	1.24	1.47
G14	1.79	2.73	3.23	0.20	0.58	0.21	0.32	0.37
G15	1.79	2.73	3.23	0.88	0.83	1.31	1.99	2.36
					TOTAL	8.24	12.57	14.87
H3	1.65	2.51	2.97	0.50	0.25	0.21	0.31	0.37
					TOTAL	0.21	0.31	0.37
J3	1.79	2.73	3.23	1.04	0.90	1.68	2.56	3.02
J4	1.79	2.73	3.23	1.04	0.90	1.68	2.56	3.02
J7	1.79	2.73	3.23	1.13	0.90	1.82	2.78	3.28
J8	1.79	2.73	3.23	1.13	0.90	1.82	2.78	3.28
					TOTAL	6.99	10.66	12.62

QPEAK4.WK1

PIPE SYSTEM DESIGN USING THE BACKWATER ANALYSIS METHOD

A. EPSTEIN & SONS INTERNATIONAL, INC.

BY: D. Hilty PROJECT: Fred Meyer Northern D.C. SHEET NO.: ____ OF ____

DATE: January 12, 1994 LOCATION: Puyallup, Washington PROJECT NO.: 5126

BACKWATER CALCULATION SHEET

Pipe Segment CB to CB		(1) 25 Year Q (cfs)	(2) Length (ft)	(3) Pipe Size (in)	(4) "n" Value	(5) Outlet Elev (ft)	(6) Inlet Elev (ft)	(7) Barrel Area (sqft)	(8) Barrel Vel (fps)	(9) Barrel Vel Head (ft.)	(10) TW Elev (fps)	(11) Fric-tion Loss (ft)	(12) Entr HGL Elev (ft)	(13) Entr Head Loss (ft)	(14) Exit Head Loss (ft)	(15) Outlt Contr Elev (ft)	(16) Inlet Contr Elev (ft)	(17) Appr Vel Head (ft)	(18) Bend Head Loss (ft)	(19) Junc Head Loss (ft)	(20) HW Elev (ft)
A1	A2	5.73	20	18	0.009	35.00	35.06	1.77	3.2	0.16	35.00	0.03	35.03	0.08	0.16	35.27	34.46	-0.15	0.00	0.00	35.12
A2	A3	3.87	192	15	0.009	33.00	33.58	1.23	3.2	0.15	35.12	0.33	35.45	0.08	0.15	35.68	34.78	-0.09	0.12	0.00	35.71
A3	A4	1.90	178	12	0.009	33.58	34.11	0.79	2.4	0.09	35.71	0.24	35.95	0.05	0.09	36.08	34.99	-0.01	0.01	0.00	36.09
A4	A5	0.55	6	12	0.009	34.11	34.14	0.79	0.7	0.01	36.09	0.00	36.09	0.00	0.01	36.10	34.64	0.00	0.00	0.00	36.10
A4	A6	1.35	213	12	0.009	34.11	34.75	0.79	1.7	0.05	36.09	0.15	36.24	0.02	0.05	36.30	35.45	-0.01	0.01	0.01	36.31
A6	A7	0.50	6	12	0.009	34.75	34.78	0.79	0.6	0.01	36.31	0.00	36.31	0.00	0.01	36.32	35.28	0.00	0.00	0.00	36.32
A6	A8	0.85	330	12	0.009	34.75	35.74	0.79	1.1	0.02	36.31	0.09	36.40	0.01	0.02	36.43	36.60	0.00	0.00	0.00	36.60
B1	B2	10.05	15	24	0.009	35.00	35.05	3.14	3.2	0.16	35.00	0.01	35.01	0.08	0.16	35.25	35.75	-0.24	0.05	0.06	35.62
B2	B3	1.81	6	12	0.009	33.00	33.03	0.79	2.3	0.08	35.62	0.01	35.62	0.04	0.08	35.75	33.88	0.00	0.00	0.00	35.75
B2	B4	1.30	195	12	0.009	33.00	33.59	0.79	1.7	0.04	35.62	0.12	35.74	0.02	0.04	35.80	34.27	-0.04	0.06	0.00	35.82
B4	B5	1.30	5	12	0.009	33.59	33.61	0.79	1.7	0.04	35.82	0.00	35.82	0.02	0.04	35.88	34.30	0.00	0.00	0.00	35.88
B2	B6	6.94	270	18	0.009	33.00	33.81	1.77	3.9	0.24	35.62	0.56	36.18	0.12	0.24	36.54	35.41	-0.29	0.38	0.03	36.66
B6	B7	0.31	47	12	0.009	33.81	33.95	0.79	0.4	0.00	36.66	0.00	36.66	0.00	0.00	36.66	34.45	0.00	0.00	0.00	36.66
B6	B8	2.09	183	12	0.009	33.81	34.36	0.79	2.7	0.11	36.66	0.30	36.96	0.05	0.11	37.12	35.28	0.00	0.00	0.00	37.12
B6	B9	3.39	150	12	0.009	33.81	34.26	0.79	4.3	0.29	36.66	0.64	37.30	0.14	0.29	37.74	35.56	-0.10	0.14	0.00	37.77
B9	B10	2.04	183	12	0.009	34.26	34.81	0.79	2.6	0.10	37.77	0.28	38.06	0.05	0.10	38.21	35.70	0.00	0.00	0.00	38.21

BW1-5126.WK1

A. EPSTEIN & SONS INTERNATIONAL, INC.

BY: D. Hilty PROJECT: Fred Meyer Northern D.C. SHEET NO.: ____ OF ____

DATE: January 12, 1994 LOCATION: Puyallup, Washington PROJECT NO.: 5126

BACKWATER CALCULATION SHEET

Pipe Segment CB to CB		(1) 25 Year Q (cfs)	(2) Length (ft)	(3) Pipe Size (in)	(4) "n" Value	(5) Outlet Elev (ft)	(6) Inlet Elev (ft)	(7) Barrel Area (sqft)	(8) Barrel Vel (fps)	(9) Barrel Vel Head (ft.)	(10) TW Elev (fps)	(11) Fric-tion Loss (ft)	(12) Entr HGL Elev (ft)	(13) Entr Head Loss (ft)	(14) Exit Head Loss (ft)	(15) Outlt Contr Elev (ft)	(16) Inlet Contr Elev (ft)	(17) Appr Vel Head (ft)	(18) Bend Head Loss (ft)	(19) Junc Head Loss (ft)	(20) HW Elev (ft)
C1	C2	12.99	20	24	0.009	35.00	35.06	3.14	4.1	0.27	35.00	0.03	35.03	0.13	0.27	35.43	36.26	-0.15	0.00	0.00	36.11
C2	C3	9.77	148	24	0.009	33.00	33.44	3.14	3.1	0.15	36.11	0.13	36.24	0.08	0.15	36.47	35.08	-0.15	0.20	0.07	36.59
C3	C4	2.46	183	12	0.009	33.44	33.99	0.79	3.1	0.15	36.59	0.41	37.00	0.08	0.15	37.23	35.07	0.00	0.00	0.00	37.23
C3	C5	7.31	200	18	0.009	33.44	34.04	1.77	4.1	0.27	36.59	0.46	37.05	0.13	0.27	37.45	35.72	-0.15	0.00	0.02	37.31
C5	C6	0.31	47	12	0.009	34.04	34.19	0.79	0.4	0.00	37.31	0.00	37.31	0.00	0.00	37.32	34.69	0.00	0.00	0.00	37.32
C5	C7	2.46	183	12	0.009	34.04	34.59	0.79	3.1	0.15	37.31	0.41	37.72	0.08	0.15	37.95	35.66	0.00	0.00	0.00	37.95
C5	C8	3.39	150	12	0.009	34.04	34.49	0.79	4.3	0.29	37.31	0.64	37.95	0.14	0.29	38.39	35.79	-0.10	0.14	0.00	38.42
C8	C9	2.04	183	12	0.009	34.49	35.04	0.79	2.6	0.10	38.42	0.28	38.71	0.05	0.10	38.86	35.97	0.00	0.00	0.00	38.86
D1	D2	8.56	20	24	0.009	35.00	35.06	3.14	2.7	0.12	35.00	0.01	35.01	0.06	0.12	35.19	36.58	-0.28	0.00	0.00	36.30
D1	D2	8.56	20	24	0.009	35.00	35.06	3.14	2.7	0.12	35.00	0.01	35.01	0.06	0.12	35.19	36.58	-0.28	0.00	0.00	36.30
D2	D3	13.44	190	24	0.009	32.50	33.07	3.14	4.3	0.28	36.30	0.32	36.61	0.14	0.28	37.04	35.17	-0.28	0.00	0.00	36.76
D3	D4	13.44	142	24	0.009	33.07	33.50	3.14	4.3	0.28	36.76	0.24	37.00	0.14	0.28	37.42	35.60	-0.09	0.11	0.02	37.47
D4	D5	1.84	180	12	0.009	33.50	34.04	0.79	2.3	0.09	37.47	0.23	37.70	0.04	0.09	37.83	34.90	0.00	0.00	0.00	37.83
D4	D6	8.28	200	24	0.009	33.50	34.10	3.14	2.6	0.11	37.47	0.13	37.60	0.05	0.11	37.76	35.60	-0.06	0.09	0.04	37.82
D6	D7	1.60	180	12	0.009	34.10	34.64	0.79	2.0	0.06	37.82	0.17	37.99	0.03	0.06	38.09	35.42	0.00	0.00	0.00	38.09
D6	D8	3.93	150	15	0.009	34.10	34.55	1.23	3.2	0.16	37.82	0.26	38.08	0.08	0.16	38.32	35.78	-0.09	0.12	0.00	38.35
D8	D9	1.87	180	12	0.009	34.55	35.09	0.79	2.4	0.09	38.35	0.24	38.59	0.04	0.09	38.72	35.96	0.00	0.00	0.00	38.72

BW2-5126.WK1

A. EPSTEIN & SONS INTERNATIONAL, INC.

BY: D. Hilty PROJECT: Fred Meyer Northern D.C. SHEET NO.: ____ OF ____

DATE: January 12, 1994 LOCATION: Puyallup, Washington PROJECT NO.: 5126

BACKWATER CALCULATION SHEET

Pipe Segment CB to CB		(1) 25 Year Q (cfs)	(2) Length (ft)	(3) Pipe Size (in)	(4) "n" Value	(5) Outlet Elev (ft)	(6) Inlet Elev (ft)	(7) Barrel Area (sqft)	(8) Barrel Vel (fps)	(9) Barrel Vel Head (ft.)	(10) TW Elev (fps)	(11) Fric- tion Loss (ft)	(12) Entr HGL Elev (ft)	(13) Entr Head Loss (ft)	(14) Exit Head Loss (ft)	(15) Outlt Contr Elev (ft)	(16) Inlet Contr Elev (ft)	(17) Appr Vel Head (ft)	(18) Bend Head Loss (ft)	(19) Junc Head Loss (ft)	(20) HW Elev (ft)
E1	E2	4.08	25	15	0.009	35.00	35.13	1.23	3.3	0.17	35.00	0.05	35.05	0.09	0.17	35.30	36.38	-0.18	0.00	0.00	36.20
E2	E3	2.66	147	12	0.009	34.90	35.34	0.79	3.4	0.18	36.20	0.39	36.59	0.09	0.18	36.86	36.44	-0.04	0.05	0.01	36.88
E3	E4	1.28	134	12	0.009	35.34	35.74	0.79	1.6	0.04	36.88	0.08	36.96	0.02	0.04	37.02	36.42	0.00	0.00	0.00	37.02
E3	E5	0.15	25	12	0.009	35.34	35.59	0.79	0.2	0.00	36.88	0.00	36.88	0.00	0.00	36.88	36.10	-0.01	0.00	0.00	36.87
E5	E6	0.15	10	6	0.009	35.59	35.69	0.20	0.8	0.01	36.87	0.00	36.87	0.00	0.01	36.89	35.95	-0.00	0.01	0.00	36.89
E6	E7	0.10	50	6	0.009	35.69	36.19	0.20	0.5	0.00	36.89	0.01	36.90	0.00	0.00	36.91	36.53	-0.00	0.00	0.00	36.91
E7	E8	0.05	20	6	0.009	36.19	36.39	0.20	0.3	0.00	36.91	0.00	36.91	0.00	0.00	36.91	36.65	0.00	0.00	0.00	36.91
E6	E9	0.05	65	6	0.009	35.69	36.34	0.20	0.3	0.00	36.89	0.00	36.89	0.00	0.00	36.90	36.60	0.00	0.00	0.00	36.90
G1	G2	12.57	20	24	0.009	37.00	37.06	3.14	4.0	0.25	37.00	0.03	37.03	0.12	0.25	37.40	39.06	-0.17	0.00	0.03	38.93
G2	G3	10.26	63	24	0.009	36.00	36.19	3.14	3.3	0.17	38.93	0.06	38.99	0.08	0.17	39.24	38.95	-0.42	0.00	0.00	38.81
G3	G4	9.22	140	18	0.009	36.19	36.61	1.77	5.2	0.42	38.81	0.51	39.33	0.21	0.42	39.96	39.77	-0.04	0.06	0.01	39.99
G4	G5	1.32	127	12	0.009	36.61	36.99	0.79	1.7	0.04	39.99	0.08	40.07	0.02	0.04	40.14	38.75	0.00	0.00	0.00	40.14
G4	G6	6.60	142	18	0.009	36.61	37.04	1.77	3.7	0.22	39.99	0.27	40.25	0.11	0.22	40.58	39.60	-0.02	0.03	0.00	40.59
G6	G7	0.97	128	12	0.009	37.04	37.42	0.79	1.2	0.02	40.59	0.05	40.63	0.01	0.02	40.67	39.08	-0.00	0.00	0.00	40.67
G7	G8	0.13	58	12	0.009	37.42	37.71	0.79	0.2	0.00	40.67	0.00	40.67	0.00	0.00	40.67	39.37	0.00	0.00	0.00	40.67
G6	G9	4.68																			
G2	G13	2.31																			

BW3-5126.WK1

A. EPSTEIN & SONS INTERNATIONAL, INC.

BY: D. Hilty PROJECT: Fred Meyer Northern D.C. SHEET NO.: ____ OF ____

DATE: January 12, 1994 LOCATION: Puyallup, Washington PROJECT NO.: 5126

BACKWATER CALCULATION SHEET

Pipe Segment CB to CB		(1) 25 Year Q (cfs)	(2) Length (ft)	(3) Pipe Size (in)	(4) "n" Value	(5) Outlet Elev (ft)	(6) Inlet Elev (ft)	(7) Barrel Area (sqft)	(8) Barrel Vel (fps)	(9) Barrel Vel Head (ft.)	(10) TW Elev (fps)	(11) Fric-tion Loss (ft)	(12) Entr HGL Elev (ft)	(13) Entr Head Loss (ft)	(14) Exit Head Loss (ft)	(15) Outlt Contr Elev (ft)	(16) Inlet Contr Elev (ft)	(17) Appr Vel Head (ft)	(18) Bend Head Loss (ft)	(19) Junc Head Loss (ft)	(20) HW Elev (ft)
G6	G9	4.68	127	15	0.009	37.04	37.42	1.23	3.8	0.23	40.59	0.32	40.91	0.11	0.23	41.25	39.86	-0.04	0.05	0.01	41.27
G9	G10	1.23	127	12	0.009	37.42	37.80	0.79	1.6	0.04	41.27	0.07	41.34	0.02	0.04	41.40	39.54	0.00	0.00	0.00	41.40
G9	G11	2.45	127	12	0.009	37.42	37.80	0.79	3.1	0.15	41.27	0.28	41.55	0.08	0.15	41.78	39.86	-0.04	0.05	0.00	41.79
G11	G12	1.24	127	12	0.009	37.80	38.18	0.79	1.6	0.04	41.79	0.07	41.86	0.02	0.04	41.92	39.92	0.00	0.00	0.00	41.92
G2	G13	2.31	55	12	0.009	36.00	36.17	0.79	2.9	0.13	38.93	0.11	39.04	0.07	0.13	39.24	38.23	-0.13	0.18	0.00	39.28
G13	G14	2.31	179	12	0.009	36.17	36.70	0.79	2.9	0.13	39.28	0.36	39.64	0.07	0.13	39.84	38.77	-0.10	0.13	0.00	39.87
G14	G15	1.99	25	12	0.009	36.70	36.95	0.79	2.5	0.10	39.87	0.04	39.91	0.05	0.10	40.06	38.86	0.00	0.00	0.00	40.06

BW4-5126.WK1

PIPE SYSTEM DESIGN USING THE RATIONAL METHOD

CONVEYANCE SYSTEM ANALYSIS AND SIZING TABLE USING THE RATIONAL METHOD

LOCATION		SUBBASIN	AREA	C	CxA	SUM	Tc	I	I	Q	PIPE	n	SLOPE	Q	V	V	LENGTH	Tt
FROM	TO	NUMBER	(AC)			(CxA)	(min)			(cfs)	(in)		(ft/ft)	(full)	(full)	(design)	(ft)	(min)
F17	F16	FUTURE	2.50	0.90	2.25	2.25	6.3	0.80	2.73	6.15	18	0.009	0.0030	8.31	4.70	5.23	70	0.22
F16	F15	F16	0.00	0.90	0.00	2.25	6.5	0.79	2.67	6.01	18	0.009	0.0030	8.31	4.70	5.20	380	1.22
F15	F14	F15	1.93	0.90	1.74	3.99	7.7	0.70	2.39	9.53	24	0.009	0.0030	17.90	5.70	5.80	380	1.09
F14	F13	F14	2.23	0.90	2.01	5.99	8.8	0.65	2.19	13.16	24	0.009	0.0030	17.90	5.70	6.32	300	0.79
F13	F12	F13	1.84	0.90	1.66	7.65	9.6	0.61	2.08	15.88	24	0.009	0.0030	17.90	5.70	6.56	300	0.76
F12	F4	F12	1.57	0.90	1.41	9.06	10.4	0.58	1.98	17.90	24	0.009	0.0030	17.90	5.70	6.64	372	0.93
F11	F10	F11	FLOW FROM LINES "A" & "B" ADDED							16.00	24	0.009	0.0030	17.90	5.70	6.54	15	0.04
F10	F9		MANHOLE - NO EXTRA FLOW							16.00	24	0.009	0.0030	17.90	5.70	6.54	288	0.73
F9	F7		MANHOLE - NO EXTRA FLOW							16.00	24	0.009	0.0030	17.90	5.70	6.54	285	0.73
F7	F5		MANHOLE - FLOW FROM F8							46.56	42	0.014	0.0030	51.17	5.32	6.02	300	0.83
F5	F4		MANHOLE - FLOW FROM F6							50.97	42	0.014	0.0030	51.17	5.32	6.19	335	0.90
F4	F3	F4	FLOW FROM BUILDING ADDED							66.85	48	0.014	0.0030	73.06	5.81	6.73	248	0.61
F3	F1		MANHOLE - NO EXTRA FLOW							66.85	48	0.014	0.0030	73.06	5.81	6.73	258	0.64
F8	F7	F8	FLOW FROM LINES "C" & "D" ADDED							30.56	24	0.009	0.0100	32.68	10.40	12.04	15	0.02
F6	F5	F6	FLOW FROM LINE "E" ADDED							4.41	12	0.009	0.0100	5.15	6.55	7.47	25	0.06
F2	F1	F2	3.33	0.41	1.37	1.37	7.1	0.74	2.53	3.45	12	0.009	0.0100	5.15	6.55	7.13	30	0.07
F1	OFFSITE		MANHOLE - FLOW FROM F2 & F3							71.26	54	0.014	0.0030	100.02	6.29	6.97	520	1.24
J4	J2	J4	1.04	0.90	0.94	0.94	6.3	0.80	2.73	2.56	12	0.009	0.0200	7.28	9.27	8.34	167	0.33
J3	J2	J3	1.04	0.90	0.94	0.94	6.3	0.80	2.73	2.56	12	0.009	0.0050	3.64	4.63	5.09	187	0.61
J2	J1		0.00	0.90	0.00	1.87	6.9	0.76	2.57	4.82	15	0.009	0.0050	6.60	5.38	5.85	50	0.14
J8	J6	J8	1.13	0.90	1.02	1.02	6.3	0.80	2.73	2.78	12	0.009	0.0167	6.65	8.47	9.42	200	0.35
J7	J6	J7	1.13	0.90	1.02	1.02	6.3	0.80	2.73	2.78	12	0.009	0.0200	7.28	9.27	8.54	187	0.36
J6	J5		0.00	0.90	0.00	2.03	6.7	0.78	2.64	5.36	15	0.009	0.0050	6.60	5.38	5.90	50	0.14
				R=	25 YR	a=	2.66	b=	0.65	P=	3.4							

BIOFILTRATION SWALE DESIGN FOR WATER QUALITY USING A 5-YEAR STORM

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "A"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - 5" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Depth.....	0.42 ft
Discharge.....	3.76 cfs

Computed Results:

Bottom Width....	10.01 ft
Velocity.....	0.77 fps
Flow Area.....	4.91 sf
Flow Top Width...	13.37 ft
Wetted Perimeter.	13.47 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1348 ft/ft
Froude Number....	0.22 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "B"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - 5" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Depth.....	0.42 ft
Discharge.....	6.59 cfs

Computed Results:

Bottom Width....	18.06 ft
Velocity.....	0.79 fps
Flow Area.....	8.29 sf
Flow Top Width...	21.42 ft
Wetted Perimeter.	21.53 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1338 ft/ft
Froude Number....	0.23 (flow is Subcritical)

Open Channel Flow Module, Version 3.16 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "C"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - 5" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0080 ft/ft
Depth.....	0.42 ft
Discharge.....	8.52 cfs

Computed Results:

Bottom Width....	18.48 ft
Velocity.....	1.01 fps
Flow Area.....	8.47 sf
Flow Top Width...	21.84 ft
Wetted Perimeter.	21.94 ft
Critical Depth...	0.19 ft
Critical Slope...	0.1274 ft/ft
Froude Number....	0.28 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "D"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - 5" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0080 ft/ft
Depth.....	0.42 ft
Discharge.....	11.23 cfs

Computed Results:

Bottom Width....	24.55 ft
Velocity.....	1.02 fps
Flow Area.....	11.02 sf
Flow Top Width...	27.91 ft
Wetted Perimeter.	28.02 ft
Critical Depth...	0.18 ft
Critical Slope...	0.1270 ft/ft
Froude Number....	0.29 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "E"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - 5" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Depth.....	0.42 ft
Discharge.....	2.67 cfs

Computed Results:

Bottom Width....	6.89 ft
Velocity.....	0.74 fps
Flow Area.....	3.60 sf
Flow Top Width...	10.25 ft
Wetted Perimeter.	10.35 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1357 ft/ft
Froude Number....	0.22 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "G"

Comment: SWALE DESIGNED FOR 5-YEAR STORM - [illegible]" DEPTH

Solve For Bottom Width

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Depth.....	0.42 ft
Discharge.....	8.24 cfs

Computed Results:

Bottom Width....	22.75 ft
Velocity.....	0.80 fps
Flow Area.....	10.26 sf
Flow Top Width...	26.11 ft
Wetted Perimeter.	26.21 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1336 ft/ft
Froude Number....	0.23 (flow is Subcritical)

BIOFILTRATION SWALE DESIGN
FOR
CAPACITY
USING A 100-YEAR STORM

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "A"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	27.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	6.78 cfs

Computed Results:

Depth.....	0.34 ft
Velocity.....	0.71 fps
Flow Area.....	9.61 sf
Flow Top Width...	29.71 ft
Wetted Perimeter.	29.79 ft
Critical Depth...	0.12 ft
Critical Slope...	0.1442 ft/ft
Froude Number....	0.22 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "B"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	27.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	11.89 cfs

Computed Results:

Depth.....	0.47 ft
Velocity.....	0.87 fps
Flow Area.....	13.65 sf
Flow Top Width...	30.78 ft
Wetted Perimeter.	30.90 ft
Critical Depth...	0.18 ft
Critical Slope...	0.1278 ft/ft
Froude Number....	0.23 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "C"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	24.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	15.37 cfs

Computed Results:

Depth.....	0.59 ft
Velocity.....	0.99 fps
Flow Area.....	15.50 sf
Flow Top Width...	28.70 ft
Wetted Perimeter.	28.85 ft
Critical Depth...	0.23 ft
Critical Slope...	0.1183 ft/ft
Froude Number....	0.24 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "D"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	24.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	20.26 cfs

Computed Results:

Depth.....	0.69 ft
Velocity.....	1.09 fps
Flow Area.....	18.50 sf
Flow Top Width...	29.53 ft
Wetted Perimeter.	29.70 ft
Critical Depth...	0.28 ft
Critical Slope...	0.1117 ft/ft
Froude Number....	0.24 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "E"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	13.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	4.83 cfs

Computed Results:

Depth.....	0.42 ft
Velocity.....	0.78 fps
Flow Area.....	6.18 sf
Flow Top Width...	16.37 ft
Wetted Perimeter.	16.47 ft
Critical Depth...	0.16 ft
Critical Slope...	0.1342 ft/ft
Froude Number....	0.22 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BIOSWALE "G"

Comment: WATER DEPTH IN SWALE FOR 100-YEAR STORM

Solve For Depth

Given Input Data:

Bottom Width.....	23.00 ft
Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.070
Channel Slope....	0.0050 ft/ft
Discharge.....	14.87 cfs

Computed Results:

Depth.....	0.59 ft
Velocity.....	0.99 fps
Flow Area.....	14.98 sf
Flow Top Width...	27.73 ft
Wetted Perimeter.	27.87 ft
Critical Depth...	0.23 ft
Critical Slope...	0.1182 ft/ft
Froude Number....	0.24 (flow is Subcritical)

SEDIMENT BASIN
DESIGN CALCULATION

SEDIMENT BASIN DESIGN

BASIN #1

SEDIMENT STORAGE VOLUME CALCULATION

SOIL TYPE	RAINFALL EROSION INDEX (R)	SOIL ERODIBILITY FACTOR (K)	LENGTH SLOPE FACTOR (LS)	COVER FACTOR (CV)	EROSION CONTROL PRACTICE FACTOR (PR)	ANNUAL SEDIMENT YIELD TONS/AC *(A-SED)	EXPOSED AREA IN ACRES	ANNUAL SEDIMENT LOAD (L-SED)= (A-SED) x ACRES
PILCHUCK	10.20	0.10	0.14	1.00	1.30	0.19	1.00	0.19 TONS
PUYALLUP	10.20	0.28	0.16	1.00	1.30	0.59	4.10	2.44 TONS
SULTAN	10.20	0.37	0.16	1.00	1.30	0.78	8.60	6.75 TONS

* UNIVERSAL SOIL LOSS EQUATION

A-SED = R x K x LS x CV x PR

TOTAL ANNUAL SEDIMENT LOAD = 9.37 TONS

divided by

AVERAGE SEDIMENT DENSITY = 0.05 TONS/CF

SEDIMENT STORAGE VOLUME = 187 CF

SEDIMENT BASIN STORAGE CALCULATION

ELEVATION	SURFACE AREA (SF)	AVERAGE SURFACE AREA (SF)	STORAGE VOLUME (CF)	CUMULATIVE STORAGE VOLUME (CF)
34.00	0		0	0
34.18	2074	1037	187	187
35.00	11490	6782	5561	5748
36.00	15995	13743	13743	19304
37.00	20938	18467	18467	32209
38.00	26436	23687	23687	42154

SEDIMENT BASIN DESIGN

1" DEWATERING HOLE INVERT =	34.50
RISER PIPE CREST ELEVATION =	36.50
EMERGENCY OVERFLOW CREST =	37.50
TOP OF BASIN ELEVATION =	38.50

SEDIMENT BASIN DESIGN

BASIN #2

SEDIMENT STORAGE VOLUME CALCULATION

SOIL TYPE	RAINFALL EROSION INDEX (R)	SOIL ERODIBILITY FACTOR (K)	LENGTH SLOPE FACTOR (LS)	COVER FACTOR (CV)	EROSION CONTROL PRACTICE FACTOR (PR)	ANNUAL SEDIMENT YIELD TONS/AC *(A-SED)	EXPOSED AREA IN ACRES	ANNUAL SEDIMENT LOAD (L-SED)= (A-SED) x ACRES
PILCHUCK	10.20	0.10	0.16	1.00	1.30	0.21	6.10	1.29 TONS
PUYALLUP	10.20	0.28	0.15	1.00	1.30	0.56	5.00	2.78 TONS
SULTAN	10.20	0.37	0.15	1.00	1.30	0.74	7.90	5.81 TONS

* UNIVERSAL SOIL LOSS EQUATION

A-SED = R x K x LS x CV x PR

TOTAL ANNUAL SEDIMENT LOAD = 9.89 TONS

divided by

AVERAGE SEDIMENT DENSITY = 0.05 TONS/CF

SEDIMENT STORAGE VOLUME = 198 CF

SEDIMENT BASIN STORAGE CALCULATION

ELEVATION	SURFACE AREA (SF)	AVERAGE SURFACE AREA (SF)	STORAGE VOLUME (CF)	CUMULATIVE STORAGE VOLUME (CF)
34.00	0		0	0
34.20	1980	990	198	198
35.00	10078	6029	4823	5021
36.00	13526	11802	11802	16625
37.00	17075	15301	15301	27103
38.00	20724	18900	18900	34200

SEDIMENT BASIN DESIGN

1" DEWATERING HOLE INVERT =	34.50
RISER PIPE CREST ELEVATION =	36.50
EMERGENCY OVERFLOW CREST =	37.50
TOP OF BASIN ELEVATION =	38.50

SEDIMENT BASIN DESIGN

BASIN #3

SEDIMENT STORAGE VOLUME CALCULATION

SOIL TYPE	RAINFALL EROSION INDEX (R)	SOIL ERODIBILITY FACTOR (K)	LENGTH SLOPE FACTOR (LS)	COVER FACTOR (CV)	EROSION CONTROL PRACTICE FACTOR (PR)	ANNUAL SEDIMENT YIELD TONS/AC *(A-SED)	EXPOSED AREA IN ACRES	ANNUAL SEDIMENT LOAD (L-SED)= (A-SED) x ACRES
PILCHUCK	10.20	0.10	0.14	1.00	1.30	0.19	0.80	0.15 TONS
PUYALLUP	10.20	0.28	0.16	1.00	1.30	0.59	2.80	1.66 TONS
SULTAN	10.20	0.37	0.12	1.00	1.30	0.59	0.30	0.18 TONS

* UNIVERSAL SOIL LOSS EQUATION

A-SED = R x K x LS x CV x PR

TOTAL ANNUAL SEDIMENT LOAD = 1.99 TONS

divided by

AVERAGE SEDIMENT DENSITY = 0.05 TONS/CF

SEDIMENT STORAGE VOLUME = 40 CF

SEDIMENT BASIN STORAGE CALCULATION

ELEVATION	SURFACE AREA (SF)	AVERAGE SURFACE AREA (SF)	STORAGE VOLUME (CF)	CUMULATIVE STORAGE VOLUME (CF)
34.00	0		0	0
34.18	458	229	40	40
35.00	2578	1518	1290	1330
36.00	4298	3438	3438	4728
37.00	6118	5208	5208	8646
38.00	8040	7079	7079	12287

SEDIMENT BASIN DESIGN

1" DEWATERING HOLE INVERT =	34.50
RISER PIPE CREST ELEVATION =	36.50
EMERGENCY OVERFLOW CREST =	37.50
TOP OF BASIN ELEVATION =	38.50

SEDIMENT BASIN DESIGN

BASIN #4

SEDIMENT STORAGE VOLUME CALCULATION

SOIL TYPE	RAINFALL EROSION INDEX (R)	SOIL ERODIBILITY FACTOR (K)	LENGTH SLOPE FACTOR (LS)	COVER FACTOR (CV)	EROSION CONTROL PRACTICE FACTOR (PR)	ANNUAL SEDIMENT YIELD TONS/AC *(A-SED)	EXPOSED AREA IN ACRES	ANNUAL SEDIMENT LOAD (L-SED)= (A-SED) x ACRES
PILCHUCK	10.20	0.10	0.15	1.00	1.30	0.20	2.10	0.42 TONS
PUYALLUP	10.20	0.28	0.16	1.00	1.30	0.59	3.20	1.90 TONS
SULTAN	10.20	0.37	0.14	1.00	1.30	0.69	2.60	1.79 TONS

* UNIVERSAL SOIL LOSS EQUATION

A-SED = R x K x LS x CV x PR

TOTAL ANNUAL SEDIMENT LOAD = 4.10 TONS

divided by

AVERAGE SEDIMENT DENSITY = 0.05 TONS/CF

SEDIMENT STORAGE VOLUME = 82 CF

SEDIMENT BASIN STORAGE CALCULATION

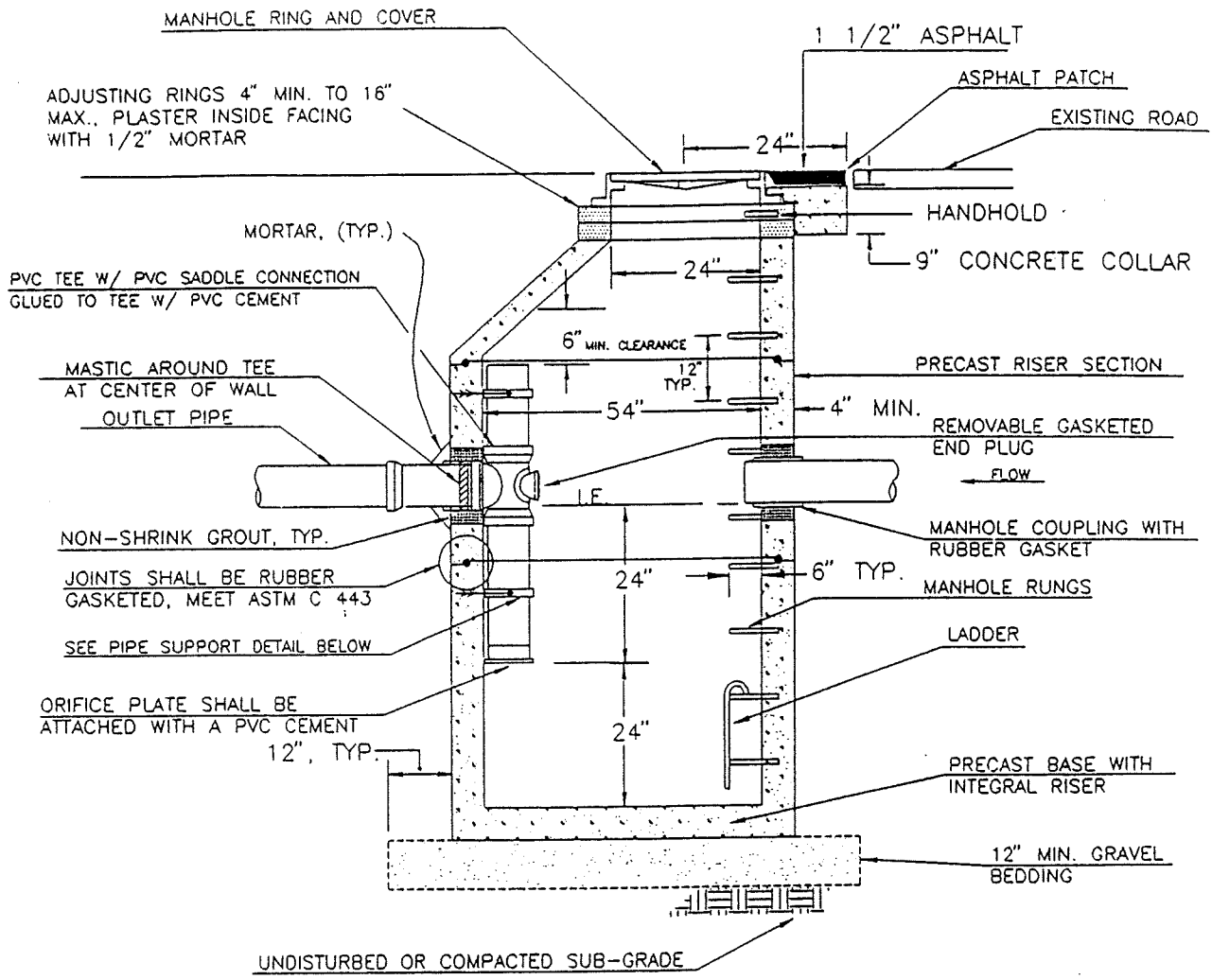
ELEVATION	SURFACE AREA (SF)	AVERAGE SURFACE AREA (SF)	STORAGE VOLUME (CF)	CUMULATIVE STORAGE VOLUME (CF)
36.00	0		0	0
36.19	850	425	82	82
37.00	4380	2615	2108	2190
38.00	6000	5190	5190	7298
39.00	7580	6790	6790	11980
40.00	9210	8395	8395	15185

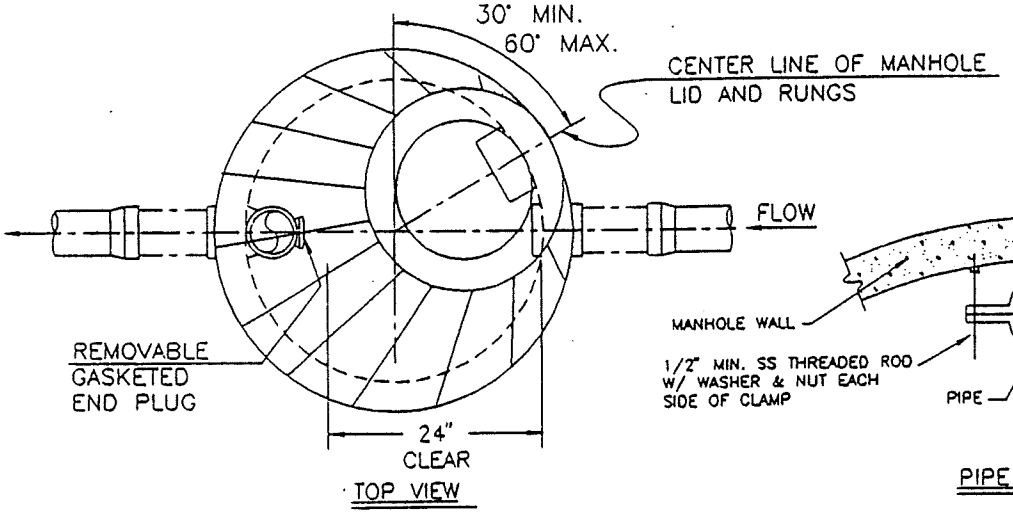
SEDIMENT BASIN DESIGN

1" DEWATERING HOLE INVERT =	36.50
RISER PIPE CREST ELEVATION =	38.50
EMERGENCY OVERFLOW CREST =	42.00
TOP OF BASIN ELEVATION =	43.00

APPENDIX

MANHOLE SHALL BE INSTALLED IN ACCORDANCE WITH CITY STANDARD NO. 201





TOP VIEW

PIPE SUPPORT

CITY OF PUYALLUP
PUBLIC WORKS DEPARTMENT

FLOW CONTROL MANHOLE WITH CONE SECTION

DRAWN	PLOTTING SCALE	DATE APPROVED	REVISED	CITY STANDARD
	NTS/ 1=1	9-92	9-92	NO. 205.1
FILE NAME \STORM\FCMHCONE.DWG		CHECKED BY G. STIDHAM		

Appendix D
Operations and Maintenance Manual

OPERATIONS AND MAINTENANCE MANUAL

Fred Meyer Distribution Center - Driveway

2200 North Meridian
Puyallup, WA 98371

Prepared for:
The Kroger Co.
P.O. Box 42121
Portland, OR 97242

April 21, 2025
Our Job No. 18510

BARGHAUSEN CONSULTING ENGINEERS, INC.

18215 72ND AVENUE SOUTH KENT, WA 98032 (425) 251-6222 (425) 251-8782 FAX
BRANCH OFFICES ♦ TUMWATER, WA ♦ LONG BEACH, CA ♦ ROSEVILLE, CA ♦ SAN DIEGO, CA
www.barghausen.com

TABLE OF CONTENTS

1.0 INTRODUCTION/GENERAL INFORMATION

Catch basins are located on the Fred Meyer Distribution site that collect runoff from the truck docks and parking lots and route that runoff through conveyance piping to vegetated bioswales and then to the conveyance system in Meridian.

Because this site discharges directly to the Puyallup River, flow control is not required.

The paved surfaces onsite are sent to vegetated bioswales for treatment prior to runoff leaving the site. These facilities were intended to meet the City of Puyallup's requirement for water quality treatment when the site was constructed in 1993-1994. These bioswales will not be used for treatment of the proposed project. Instead, a Contech Stormfilter is proposed to provide basic treatment for the area. Runoff from the building roofs drains directly to the conveyance system, bypassing the treatment facilities.

This manual is a working document and should be updated with specific maintenance procedures based on the proposed activities onsite. At a minimum, good housekeeping measures need to be employed to keep the site free of trash and debris, cover and secure hazardous materials and clean up spills promptly. These activities shall be ongoing and not based on a bi-annual inspection schedule.

2.0 STORM DRAINAGE FACILITIES

Contech Stormfilter

Stormfilters use media-filled cartridges to trap particulates and absorb pollutants from runoff. The stormfilter will be in use during all storm events so it is important to inspect the stormfilter for damage or clogging after rainfalls of greater than 0.5 inches.

Catch Basins and Conveyance Pipes

Catch basin inlets should be kept free of trash and debris, and their sumps should be cleaned regularly.

All facilities on the project site should be maintained on a regular basis of at least twice a year at an interval of every six months.

3.0 PLAN GOAL

The specific purpose of the storm water facilities is to minimize pollution that is typically associated with modern development. Stormwater runoff contains pollutants harmful to humans, animals and aquatic life. The majority of pollution is generated by the operation of motor vehicles and lawn / landscape maintenance. Attached to this narrative is a maintenance manual that offers guidelines to the project's owner for stormwater facility maintenance.

4.0 MAINTENANCE AND OPERATIONAL RESPONSIBILITIES

Owners and/or tenants have three major Operations and Maintenance responsibilities, which include:

- The Contech Stormfilter
- The onsite catch basins and pipe system that convey runoff throughout the site

- The general site and landscaping

5.0 INSPECTION

A representative of the owner shall inspect the drainage systems twice per year, in the spring (March - May) and fall (September-October). One inspection should be during the month of September to identify and correct any problems prior to the winter rainy season. The owner shall keep records of these inspections and make them available upon request to the City. Additional inspections are required after seasonal storms, of one inch of rain or more in a 24- hour period.

- Events such as major storms (more than 1 inch of rain in a 24-hour period) or heavy winds will require immediate inspections for damage to any of the essential parts of the drainage system.

The owner, tenants and anyone doing landscaping on the property must be careful to avoid introducing landscape fertilizer or other pollutants to receiving waters or groundwater. The owner will be responsible for monitoring and controlling this activity.

Use photocopies of the attached Inspection/Maintenance Checklist and maintenance standards for drainage facilities to provide a list of the problems you should look for during an inspection. Copies of the included construction plan sheets would be useful during field inspections to identify areas that need maintenance and to make sure all structures and conveyance pipes are inspected. Add comments in the Inspection Results field and note the actions taken. Keep these check sheets in your files. The maintenance records must be kept on file to be reviewed by the City of Puyallup personnel at their discretion. Please refer to the attached Inspection/Maintenance Checklist example for typical inspection requirements.

6.0 WATER QUALITY STANDARDS AND REQUIREMENTS

No water quality testing is required on this site unless required by the City. Then annual (or more frequent) testing will be required.

7.0 PERSON OF RESPONSIBILITY

(Owner of Parcel)
The Kroger Co.
P.O. Box 42121
Portland, OR 97242
Dennis Hicks (253) 770-6825

8.0 DESIGN ENGINEER

Barghausen Consulting Engineers, Inc.
18215 – 72nd Avenue South
Kent, WA 98032
(425) 251-6222

9.0 PLAN AND / OR INFORMATION UPDATES

The City of Puyallup shall review and approve any changes to this stormwater maintenance plan prior to changes in its implementation. Additionally, any changes in the ownership/person of responsibility of the Fred Meyer Distribution shall be reported to the City of Puyallup.

If the City of Puyallup determines that maintenance or repair work is required to be done to the private storm drainage facilities, the City will give adequate notice of the specific maintenance and/or repair needed. The City will set a reasonable time in which such work is be completed by the property owner. If the required maintenance and/or repair work is not completed within the time set by the City, the City will assess financial sanctions and/or initiate enforcement proceedings in accordance with City Code.

If at any time the City determines that the existing systems create any imminent threat to public health or welfare, the City may take immediate measures to remedy said threat. No notice to the owner shall be required. All costs incurred by the city for maintaining or repairing the private storm drainage facilities shall be forwarded to, and paid by, the property owner.

Appendix A
Site Maps

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

SITE IMPROVEMENT PLANS
CIVIL COVER SHEET

CONSTRUCTION SEQUENCE:

1. HOLD A PRECONSTRUCTION MEETING WITH THE CITY AND OBTAIN REQUIRED PERMITS.
2. INSTALL CATCH BASIN INLET PROTECTION AND OTHER EROSION CONTROL DEVICES AS SHOWN.
3. INSTALL TEMPORARY TREE PROTECTION FENCING.
4. SCHEDULE AN EROSION CONTROL INSPECTION WITH THE CITY.
5. NO UNCONTROLLED SURFACE WATER SHALL BE ALLOWED TO LEAVE THE SITE OR BE DISCHARGED TO A CRITICAL AREA AT ANY TIME DURING THE GRADING OPERATIONS.
6. GRADE SITE AND INSTALL UTILITIES PER PLANS.
7. INSTALL PAVING.
8. INSPECT AND MAINTAIN ALL BMP'S UNTIL SITE IS STABILIZED.

SURVEY DATA:

HORIZONTAL DATUM:
WASHINGTON STATE PLANE COORDINATE SYSTEM, NORTH ZONE NAD 83/91

BASIS OF BEARINGS:
NORTH 51°55'28" WEST, AS MEASURED BETWEEN WSDOT MONUMENTS ID 3194 (GP27167-76) AND 3193 (GP27167-75).

VERTICAL DATUM:
NAVD88

VERTICAL BENCHMARK:
WSDOT MONUMENT ID 3194 (GP27167-76), BEING THE TOP OF A FOUND 3" BRASSIE IN CONCRETE, APPROXIMATELY 14' WEST OF THE WEST EDGE OF FREEEMAN ROAD AT SW QUADRANT OF INTERSECTION WITH RAILROAD ELEV.=30.17 US FEET

ADDRESS:
2200 N MERIDIAN, PUYALLUP, WA 98371

TAX PARCEL NUMBER:
0420215004

REFERENCE SURVEYS:
R.O.S. REC. NO. 200709255006
R.O.S., REC. NO. 9906075005
CITY OF PUYALLUP SP 94-81-005, REC. NO. 9405100543

DATE OF SURVEY:
THIS SURVEY REPRESENTS VISIBLE PHYSICAL IMPROVEMENT CONDITIONS EXISTING ON JANUARY 8, 2023. ALL SURVEY CONTROL INDICATED AS "FOUND" WAS RECOVERED FOR THIS PROJECT IN JANUARY OF 2023.

HORIZONTAL CONTROL / SURVEY NOTE:

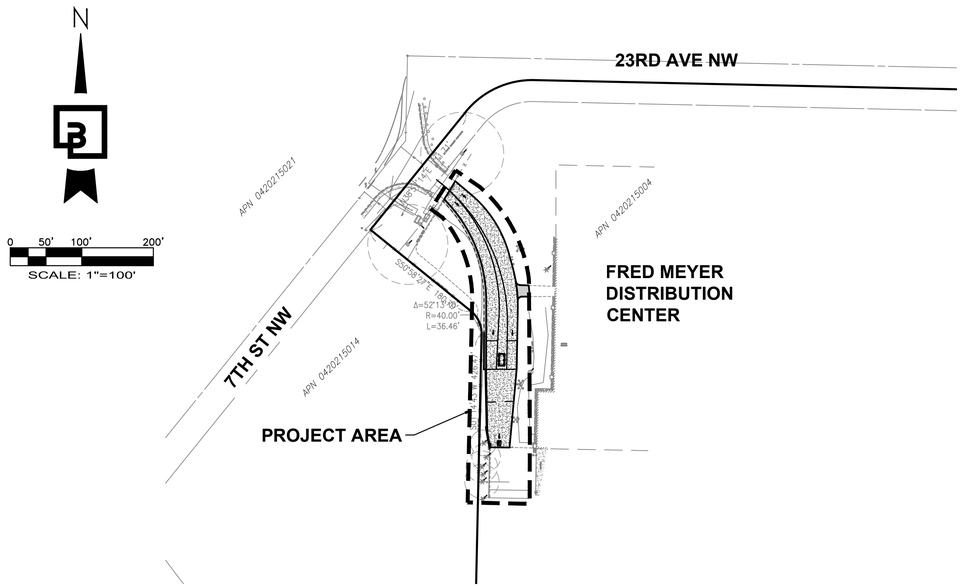
1. CONTRACTOR SHALL OBTAIN SERVICES OF A LICENSED LAND SURVEYOR TO STAKE HORIZONTAL AND VERTICAL CONTROL FOR ALL NEW IMPROVEMENTS. CONTRACTOR SHALL CONTACT BARGHAUSEN CONSULTING ENGINEERS, INC. TO OBTAIN ELECTRONIC CAD FILES FOR STAKING PURPOSES.
2. UNDERGROUND UTILITIES AND FEATURES DEPICTED HERON ARE BASED ON FIELD OBSERVATION, MARKINGS, DEVELOPMENT PLANS, AND/OR BEST AVALIBLE RECORD DOCUMENTS ONLY. CONTRACTOR SHALL FIELD VERIFY SIZE AND TYPE OF EXISTING UTILITIES PRIOR TO CONSTRUCTION. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF BARGHAUSEN CONSULTING ENGINEERS, INC. PRIOR TO WORK.

SOILS REPORT NOTES

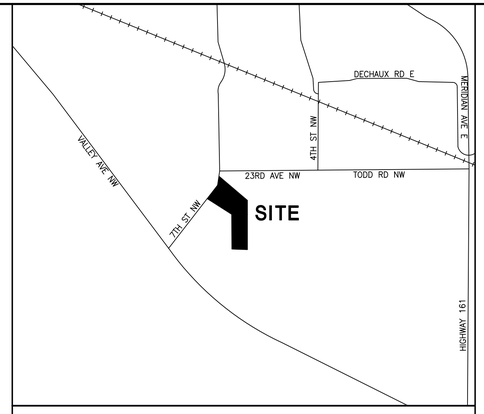
1. THE FOLLOWING SOILS REPORTS/ASSESSMENTS WERE PREPARED FOR THE SITE:
   A. GEOTECHNICAL EXPLORATION AND RECOMMENDATION, REPORT NO. 2017-206-2
   FRED MEYER DISTRIBUTION CENTER
   2200 NORTH MERIDIAN
   PUYALLUP, WASHINGTON

   PREPARED BY:
   THE RILEY GROUP
   17522 BOTHELL WAY NORTHEAST
   BOTHELL, WASHINGTON 98011
   PH: 425.415.0551
   DATED APRIL 9, 2024
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL PROVISIONS OF THE SOILS REPORT FOR THE SITE BE OBSERVED AND COMPLIED WITH DURING ALL PHASES OF THE SITE PREPARATION, GRADING OPERATIONS, AND PAVING CONSTRUCTION.
3. ANY PROVISIONS OF THE SOILS REPORT WHICH CONFLICT WITH INFORMATION SHOWN ELSEWHERE ON THESE DRAWINGS, OR WHICH REQUIRE FURTHER CLARIFICATION, SHALL BE BROUGHT TO THE ATTENTION OF BARGHAUSEN ENGINEERS.
4. A REPRESENTATIVE FOR THE SOILS ENGINEER SHALL OBSERVE AND APPROVE THE EARTHWORK OPERATIONS AND TO VERIFY FIELD CONDITIONS AS WORK PROCEEDS. THE SOILS ENGINEER SHALL SUBMIT FIELD REPORTS CERTIFYING THAT THE METHODS AND MATERIALS OF THE EARTHWORK OPERATIONS WERE IN ACCORDANCE WITH THE RECOMMENDATION OF THE SOILS INVESTIGATION AND THAT THE WORK WAS PERFORMED TO THE SATISFACTION OF THE ENGINEER. THE CONTRACTOR SHALL MAKE ALL PROVISIONS FOR SOILS INSPECTIONS AS RECOMMENDED WITHIN SOILS REPORT. AS A MINIMUM, THIS INCLUDES THE OBSERVATION OF THE FOLLOWING BY A SOILS ENGINEER:

   a. EXCAVATION TO REMOVE THE SILT AND FILL FROM THE PROPOSED PAVING LIMITS.
   b. SUBGRADE PREPARATION OF PAVEMENT SECTION,
   d. SUITABLE REUSE OF EXISTING ONSITE SOILS.
5. THE CONTRACTOR SHALL QUALIFY ANY LIMITATIONS TO SOILS INSPECTIONS WITHIN BID PROPOSAL.



SITE MAP
1"=100'



VICINITY MAP PUYALLUP,WASHINGTON

UTILITY CONFLICT NOTE:

CAUTION:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION, AND DEPTH OF ALL EXISTING UTILITIES WHETHER SHOWN ON THESE PLANS OR NOT BY POTHOLING THE UTILITIES AND SURVEYING THE HORIZONTAL AND VERTICAL LOCATION PRIOR TO CONSTRUCTION. THIS SHALL INCLUDE CALLING UTILITY LOCATE @ 811 AND THEN POTHOLING ALL OF THE EXISTING UTILITIES AT LOCATIONS OF NEW UTILITY CROSSINGS TO PHYSICALLY VERIFY WHETHER OR NOT CONFLICTS EXIST. LOCATIONS OF SAID UTILITIES AS SHOWN ON THESE PLANS ARE BASED UPON THE UNVERIFIED PUBLIC INFORMATION AND ARE SUBJECT TO VARIATION. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.

CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR OBTAINING PERMITS FROM THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES FOR REMOVING AND REPLACING ALL SURVEY MONUMENTATION THAT MAY BE AFFECTED BY CONSTRUCTION ACTIVITY, PURSUANT TO WAC 332-120. APPLICATIONS MUST BE COMPLETED BY A REGISTERED LAND SURVEYOR. APPLICATIONS FOR PERMITS TO REMOVE MONUMENTS MAY BE OBTAINED FROM THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES, OR BY CONTACTING THEIR OFFICE BY TELEPHONE AT (360) 902-1190.

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
PUBLIC LAND SURVEY OFFICE
801 88th AVE S.E.
OLYMPIA, WASHINGTON 98501-7019

UPON COMPLETION OF CONSTRUCTION, ALL MONUMENTS DISPLACED, REMOVED, OR DESTROYED SHALL BE REPLACED BY A REGISTERED LAND SURVEYOR, AT THE COST AND AT THE DIRECTION OF THE CONTRACTOR, PURSUANT TO THESE REGULATIONS. THE APPROPRIATE FORMS FOR REPLACEMENT OF SAID MONUMENTATION SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR.

SITE ADDRESS

2200 N MERIDIAN
PUYALLUP, WA 98837

INDEX OF SHEETS:

TAX PARCEL NUMBER

0420215004

ZONING

ML – LIMITED MANUFACTURING

OWNER/APPLICANT

DOUG HARDY
WEST REGION ENGINEER – KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

CIVIL ENGINEER:

BARGHAUSEN CONSULTING ENGINEERS
18215 72ND AVENUE SOUTH
KENT, WA. 98032
(425) 251-6222
JASON HUBBELL
EMAIL: jhubbell@barghausen.com

GEOTECHNICAL ENGINEER:

THE RILEY GROUP, LLC.
17522 BOTHELL WAY NE
BOTHELL, WA. 98011
(425) 415-0551
ERIC L. WOODS, LG
EMAIL: ewoods@riley-group.com

SITE SURVEYOR:

BARGHAUSEN CONSULTING ENGINEERS
18215 72ND AVENUE SOUTH
KENT, WA. 98032
(425) 251-6222
RYAN LEE
EMAIL: rlee@barghausen.com

PROJECT INFO:

TOTAL SITE AREA= 346,555 SF
TOTAL IMPERVIOUS AREA= 289,069 SF (83.4%)
TOTAL PERVIOUS AREA= 57,486 SF (16.6%)

UTILITIES/SERVICES

STORM/SEWER/WATER:
CITY OF PUYALLUP WATER DIVISION
1100 39TH AVE. SE
PUYALLUP, WA 98374
(253) 841-5505

POWER:
PUGET SOUND ENERGY
8001 SOUTH 212TH STREET
KENT, WA 98032
(253) 395-7065

GAS:
PUGET SOUND ENERGY
8001 SOUTH 212TH STREET
KENT, WA 98032
(253) 395-7065

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

ESTIMATED EARTHWORK VOLUMES:

(FOR PERMITTING ONLY. NOT FOR BID PURPOSES)

CUT/EXPORT	=800 CY
FILL/IMPORT	= 800 CY
TOTAL EARTHWORK	= 1600 CY

IMPERVIOUS SURFACE CALCULATIONS:

DISTURBED AREA	= 16,000 SF
EXISTING AND NEW IMPERVIOUS AREA	= 16,000 SF
PERVIOUS AREA REMOVED/ CONVERTED TO IMPERVIOUS AREA	= 2,035 SF

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: SITE IMPROVEMENT PLANS
CIVIL COVER SHEET

FRED MEYER - DISTRIBUTION CENTER

For: DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=100' Vertical N/A

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C1 of 7

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PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

NOTES AND LEGEND

STORMWATER NOTES:

1. ALL WORK IN CITY RIGHT-OF-WAY REQUIRES A PERMIT FROM THE CITY OF PUYALLUP. PRIOR TO ANY WORK COMMENCING, THE GENERAL CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING AT THE DEVELOPMENT SERVICES CENTER TO BE ATTENDED BY ALL CONTRACTORS THAT WILL PERFORM WORK SHOWN ON THE ENGINEERING PLANS, REPRESENTATIVES FROM ALL APPLICABLE UTILITY COMPANIES, THE PROJECT OWNER AND APPROPRIATE CITY STAFF. CONTACT ENGINEERING SERVICES TO SCHEDULE THE MEETING (253) 841-5568. THE CONTRACTOR IS RESPONSIBLE TO HAVE THEIR OWN APPROVED SET OF PLANS AT THE MEETING.
2. AFTER COMPLETION OF ALL ITEMS SHOWN ON THESE PLANS AND BEFORE ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBTAIN A "PUNCH LIST" PREPARED BY THE CITY'S INSPECTOR DETAILING REMAINING ITEMS OF WORK TO BE COMPLETED. ALL ITEMS OF WORK SHOWN ON THESE PLANS SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY PRIOR TO ACCEPTANCE OF THE WATER SYSTEM AND PROVISION OF SANITARY SEWER SERVICE.
3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS"), WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND AMERICAN PUBLIC WORKS ASSOCIATION, WASHINGTON STATE CHAPTER, LATEST EDITION, UNLESS SUPERSEDED OR AMENDED BY THE CITY OF PUYALLUP CITY STANDARDS FOR PUBLIC WORKS ENGINEERING AND CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "CITY STANDARDS").
4. A COPY OF THESE APPROVED PLANS AND APPLICABLE CITY DEVELOPER SPECIFICATIONS AND DETAILS SHALL BE ON SITE DURING CONSTRUCTION.
5. ANY REVISIONS MADE TO THESE PLANS MUST BE REVIEWED AND APPROVED BY THE DEVELOPER'S ENGINEER AND THE ENGINEERING SERVICES STAFF PRIOR TO ANY IMPLEMENTATION IN THE FIELD. THE CITY SHALL NOT BE RESPONSIBLE FOR ANY ERRORS AND/OR OMISSIONS ON THESE PLANS.
6. THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL (811) AT LEAST TWO WORKING DAYS IN ADVANCE. THE OWNER AND HIS/HER ENGINEER SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT EXISTS.
7. ANY STRUCTURE AND/OR OBSTRUCTION WHICH REQUIRE REMOVAL OR RELOCATION RELATING TO THIS PROJECT, SHALL BE DONE SO AT THE DEVELOPER'S EXPENSE.
8. DURING CONSTRUCTION, ALL EXISTING AND NEWLY INSTALLED DRAINAGE STRUCTURES SHALL BE PROTECTED FROM SEDIMENTS.
9. ALL STORM MANHOLES SHALL CONFORM TO CITY STANDARD DETAIL NO. 02.01.01. FLOW CONTROL MANHOLE/OIL WATER SEPARATOR SHALL CONFORM TO CITY STANDARD DETAIL NO. 02.01.06 AND 02.01.07.
10. MANHOLE RING AND COVER SHALL CONFORM TO CITY STANDARD DETAIL 06.01.02.
11. CATCH BASINS TYPE I SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.02 AND 02.01.03 AND SHALL BE USED ONLY FOR DEPTHS LESS THAN 5 FEET FROM TOP OF THE GRATE TO THE INVERT OF THE STORM PIPE.
12. CATCH BASINS TYPE II SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.04 AND SHALL BE USED FOR DEPTHS GREATER THAN 5 FEET FROM TOP OF THE GRATE TO THE INVERT OF THE STORM PIPE.
13. CAST IRON OR DUCTILE IRON FRAME AND GRATE SHALL CONFORM TO CITY STANDARD DETAIL NO.02.01.05. GRATE SHALL BE MARKED WITH "DRAINS TO STREAM". SOLID CATCH BASIN LIDS (SQUARE UNLESS NOTED AS ROUND) SHALL CONFORM TO WSDOT STANDARD PLAN B-30.20-04 (OLYMPIC FOUNDRY NO. SM60 OR EQUAL). VANED GRATES SHALL CONFORM TO WSDOT STANDARD PLAN B-30.30-03 (OLYMPIC FOUNDRY NO. SM60V OR EQUAL).
14. STORMWATER PIPE SHALL BE ONLY PVC, CONCRETE, DUCTILE IRON, OR DUAL WALLED POLYPROPYLENE PIPE.
    A. THE USE OF ANY OTHER TYPE SHALL BE REVIEWED AND APPROVED BY THE ENGINEERING SERVICES STAFF PRIOR TO INSTALLATION.
    B. PVC PIPE SHALL BE PER ASTM D3034, SDR 35 FOR PIPE SIZE 15-INCH AND SMALLER AND F679 FOR PIPE SIZES 18 TO 27 INCH. MINIMUM COVER ON PVC PIPE SHALL BE 3.0 FEET.
    C. CONCRETE PIPE SHALL CONFORM TO THE WSDOT STANDARD SPECIFICATIONS FOR CONCRETE UNDERDRAIN PIPE. MINIMUM COVER ON CONCRETE PIPE SHALL NOT LESS THAN 3.0 FEET.
    D. DUCTILE IRON PIPE SHALL BE CLASS 50, CONFORMING TO AWWA C151. MINIMUM COVER ON DUCTILE IRON PIPE SHALL BE 1.0 FOOT.
    E. POLYPROPYLENE PIPE (PP) SHALL BE DUAL WALLED, HAVE A SMOOTH INTERIOR AND EXTERIOR CORRUGATIONS AND MEET WSDOT 9-05.24(1). 12-INCH THROUGH 30-INCH PIPE SHALL MEET OR EXCEED ASTM F2736 AND AASHTO M330, TYPE S, OR TYPE D. 36-INCH THROUGH 60-INCH PIPE SHALL MEET OR EXCEED ASTM F2881 AND AASHTO M330, TYPE S, OR TYPE D. TESTING SHALL BE PER ASTM F1417. MINIMUM COVER OVER POLYPROPYLENE PIPE SHALL BE 3-FEET.
15. TRENCHING, BEDDING, AND BACKFILL FOR PIPE SHALL CONFORM TO CITY STANDARD DETAIL NO. 06.01.01.
16. STORM PIPE SHALL BE A MINIMUM OF 10 FEET AWAY FROM BUILDING FOUNDATIONS AND/OR ROOF LINES.
17. ALL STORM DRAIN MAINS SHALL BE TESTED AND INSPECTED FOR ACCEPTANCE AS OUTLINED IN SECTION 406 OF THE CITY OF PUYALLUP SANITARY SEWER SYSTEM STANDARDS.
18. ALL TEMPORARY SEDIMENTATION AND EROSION CONTROL MEASURES, AND PROTECTIVE MEASURES FOR CRITICAL AREAS AND SIGNIFICANT TREES SHALL BE INSTALLED PRIOR TO INITIATING ANY CONSTRUCTION ACTIVITIES.

GRADING, EROSION AND SEDIMENTATION CONTROL NOTES:

1. ALL WORK IN CITY RIGHT-OF-WAY REQUIRES A PERMIT FROM THE CITY OF PUYALLUP. PRIOR TO ANY WORK COMMENCING, THE GENERAL CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING AT THE DEVELOPMENT SERVICES CENTER TO BE ATTENDED BY ALL CONTRACTORS THAT WILL PERFORM WORK SHOWN ON THE ENGINEERING PLANS, REPRESENTATIVES FROM ALL APPLICABLE UTILITY COMPANIES, THE PROJECT OWNER AND APPROPRIATE CITY STAFF. CONTACT ENGINEERING SERVICES TO SCHEDULE THE MEETING (253) 841-5568. THE CONTRACTOR IS RESPONSIBLE TO HAVE THEIR OWN APPROVED SET OF PLANS AT THE MEETING.
2. AFTER COMPLETION OF ALL ITEMS SHOWN ON THESE PLANS AND BEFORE ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBTAIN A "PUNCH LIST"PREPARED BY THE CITY'S INSPECTOR DETAILING REMAINING ITEMS OF WORK TO BE COMPLETED. ALL ITEMS OF WORK SHOWN ON THESE PLANS SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY PRIOR TO ACCEPTANCE OF THE WATER SYSTEM AND PROVISION OF SANITARY SEWER SERVICE.
3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS"), WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND AMERICAN PUBLIC WORKS ASSOCIATION, WASHINGTON STATE CHAPTER, LATEST EDITION, UNLESS SUPERSEDED OR AMENDED BY THE CITY OF PUYALLUP CITY STANDARDS FOR PUBLIC WORKS ENGINEERING AND CONSTRUCTION (HERINAFTER REFERRED TO AS THE "CITY STANDARDS").
4. A COPY OF THESE APPROVED PLANS AND APPLICABLE CITY DEVELOPER SPECIFICATIONS AND DETAILS SHALL BE ON SITE DURING CONSTRUCTION.
5. ANY REVISIONS MADE TO THESE PLANS MUST BE REVIEWED AND APPROVED BY THE DEVELOPER'S ENGINEER AND THE CITY ENGINEER PRIOR TO ANY IMPLEMENTATION IN THE FIELD. THE CITY SHALL NOT BE RESPONSIBLE FOR ANY ERRORS AND/OR OMISSIONS ON THESE PLANS.
6. THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL (811) AT LEAST TWO WORKING DAYS HOURS IN ADVANCE. THE OWNER AND HIS/HER ENGINEER SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT EXISTS.
7. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.
8. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITTEE.
9. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITTEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.
10. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.
11. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITTEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.
12. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.
13. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

GENERAL SITE NOTES:

1. THE CONTRACTOR SHALL OBTAIN AND HAVE AVAILABLE COPIES OF THE APPLICABLE GOVERNING AGENCY STANDARDS AT THE JOB SITE DURING THE RELATED CONSTRUCTION OPERATIONS.
2. CONTRACTOR SHALL ENSURE THAT ALL NECESSARY PERMITS HAVE BEEN OBTAINED PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, DIMENSION AND DEPTH OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION WHETHER SHOWN ON THESE PLANS OR NOT. UTILITIES OTHER THAN THOSE SHOWN MAY EXIST ON THIS SITE. ONLY THOSE UTILITIES WITH EVIDENCE OF THEIR INSTALLATION VISIBLE AT GROUND SURFACE OR SHOWN ON RECORD DRAWING PROVIDED BY OTHERS ARE SHOWN HEREON. EXISTING UNDERGROUND UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY AND ARE SUBJECT TO A DEGREE OF UNKNOWN VARIATION. SOME UNDERGROUND LOCATIONS SHOWN HEREON MAY HAVE BEEN TAKEN FROM PUBLIC RECORDS. BARGHAUSEN CONSULTING ENGINEERS, INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF PUBLIC RECORDS OR RECORDS OF OTHERS. IF CONFLICTS SHOULD OCCUR, THE CONTRACTOR SHALL CONSULT BARGHAUSEN CONSULTING ENGINEERS, INC. TO RESOLVE ALL PROBLEMS PRIOR TO PROCEEDING WITH CONSTRUCTION.
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW ALL OF THE DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THE PROJECT WORK SCOPE PRIOR TO THE INITIATION OF CONSTRUCTION. SHOULD THE CONTRACTOR FIND A CONFLICT WITH THE DOCUMENTS RELATIVE TO THE SPECIFICATIONS OR THE RELATIVE CODES, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE PROJECT ENGINEER OF RECORD IN WRITING PRIOR TO THE START OF CONSTRUCTION. FAILURE BY THE CONTRACTOR TO NOTIFY THE PROJECT ENGINEER SHALL CONSTITUTE ACCEPTANCE OF FULL RESPONSIBILITY BY THE CONTRACTOR TO COMPLETE THE SCOPE OF WORK AS DEFINED BY THE DRAWINGS AND IN FULL COMPLIANCE WITH LOCAL REGULATIONS AND CODES.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE APPROPRIATE UTILITIES INVOLVED PRIOR TO CONSTRUCTION.
6. INSPECTION OF SITE WORK WILL BE ACCOMPLISHED BY A REPRESENTATIVE OF THE GOVERNING JURISDICTION. INSPECTION OF PRIVATE FACILITIES WILL BE ACCOMPLISHED BY A REPRESENTATIVE OF THE OWNER. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE INSPECTOR 24 HOURS IN ADVANCE OF BACKFILLING ALL CONSTRUCTION.
7. PRIOR TO ANY CONSTRUCTION OR DEVELOPMENT ACTIVITY THE CONTRACTOR SHALL CONTACT THE AGENCY AND/OR UTILITY INSPECTION PERSONNEL AND ARRANGE ANY REQUIRED PRE-CONSTRUCTION MEETING(S). CONTRACTOR SHALL PROVIDE ONE WEEK MINIMUM ADVANCE NOTIFICATION TO OWNER, FIELD ENGINEER AND ENGINEER OF PRE-CONSTRUCTION MEETINGS.
8. THE CONTRACTOR IS RESPONSIBLE FOR WORKER AND SITE SAFETY AND SHALL COMPLY WITH THE LATEST OSHA STANDARDS AND REGULATIONS, OR ANY OTHER AGENCY HAVING JURISDICTION FOR EXCAVATION AND TRENCHING PROCEDURES. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE "MEANS AND METHODS" REQUIRED TO MEET THE INTENT AND PERFORMANCE CRITERIA OF OSHA, AS WELL AS ANY OTHER ENTITY THAT HAS JURISDICTION FOR EXCAVATION AND/OR TRENCHING PROCEDURES.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED.
10. PROTECTIVE MEASURES SHALL BE TAKEN BY THE CONTRACTOR TO PROTECT ALL ADJACENT PUBLIC AND PRIVATE PROPERTIES AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF ALL EXISTING UTILITY SERVICES THAT ARE TO REMAIN OPERATIONAL WITHIN THE CONSTRUCTION AREA WHETHER SHOWN OR NOT SHOWN ON THE PLANS.
11. TWO (2) COPIES OF THESE APPROVED PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS. ONE (1) SET WITH RECORDS OF AS-BUILT INFORMATION SHALL BE SUBMITTED TO BARGHAUSEN CONSULTING ENGINEERS, INC. AT COMPLETION OF PROJECT.
12. CONTRACTOR SHALL OBTAIN SERVICES OF A LICENSED LAND SURVEYOR TO STAKE HORIZONTAL CONTROL FOR ALL NEW IMPROVEMENTS. STAKING CONTROL SHALL BE TAKEN FROM ELECTRONIC PLAN FILES PROVIDED BY BARGHAUSEN CONSULTING ENGINEERS, INC.
13. CONTRACTOR SHALL REQUEST FROM BARGHAUSEN CONSULTING ENGINEERS, INC., PRIOR TO ANY CONSTRUCTION STAKING OR CONSTRUCTION WORK, A FORMAL CONSTRUCTION RELEASE PLAN SET OR SPECIFIC RELEASE IN WRITING. THE APPROVED AGENCY PERMIT DRAWINGS WILL NOT BE CONSIDERED CONSTRUCTION RELEASE PLANS BY BARGHAUSEN CONSULTING ENGINEERS, INC. UNLESS BARGHAUSEN CONSULTING ENGINEERS, INC. HAS GIVEN A FORMAL WRITTEN RELEASE OR ISSUED A CONSTRUCTION RELEASE PLAN SET.

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: NOTES AND LEGEND

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal NA Vertical N/A

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen
Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number 18510

Sheet C2 of 7

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

DEMOLITION / TESC PLAN

0 10' 20' 40'

SCALE: 1"=20'

EXISTING LEGEND:

(NOTE: NOT ALL SYMBOLS MAY APPEAR ON THE MAP)

- SURVEY MONUMENT (AS NOTED)
- SECTION CORNER (AS NOTED)
- SET REBAR/CAP (AS NOTED)
- FOUND REBAR/CAP (AS NOTED)
- SET 2"X2" HUB/TACK LINE STAKE
- MAG/WASHER OR LEAD/TACK (AS NOTED)
- BENCHMARK
- LUMINAIRE (LUM.)
- YARD LIGHT
- ORNAMENTAL LIGHT
- POWER POLE
- JUNCTION BOX (AS NOTED)
- TELEPHONE MANHOLE
- CATCH BASIN (CB)
- STORM MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- CLEANOUT (AS NOTED)
- GAS METER
- GAS VALVE
- WATER VALVE (WV)
- FIRE HYDRANT(FH) / CONNECTION(FDC)
- WATER MANHOLE
- WATER METER
- BLOW-OFF / AIRVAC
- MONITOR WELL
- SIGN
- DIRECTIONAL ARROW
- CHAIN LINK FENCE
- WOOD FENCE
- HOGWIRE FENCE
- SILT FENCE
- METAL/IRON FENCE
- GUARD RAIL/CABLE FENCE
- WATER LINE
- GAS LINE
- STEAM LINE
- T(XXX) TELEPHONE LINE (OH) OR (UG)
- P(XXX) POWER LINE (OH) OR (UG)
- STORM LINE
- SEWER LINE
- DECIDUOUS TREE
- CONIFEROUS TREE

DEMOLITION AND EXCAVATION NOTES:

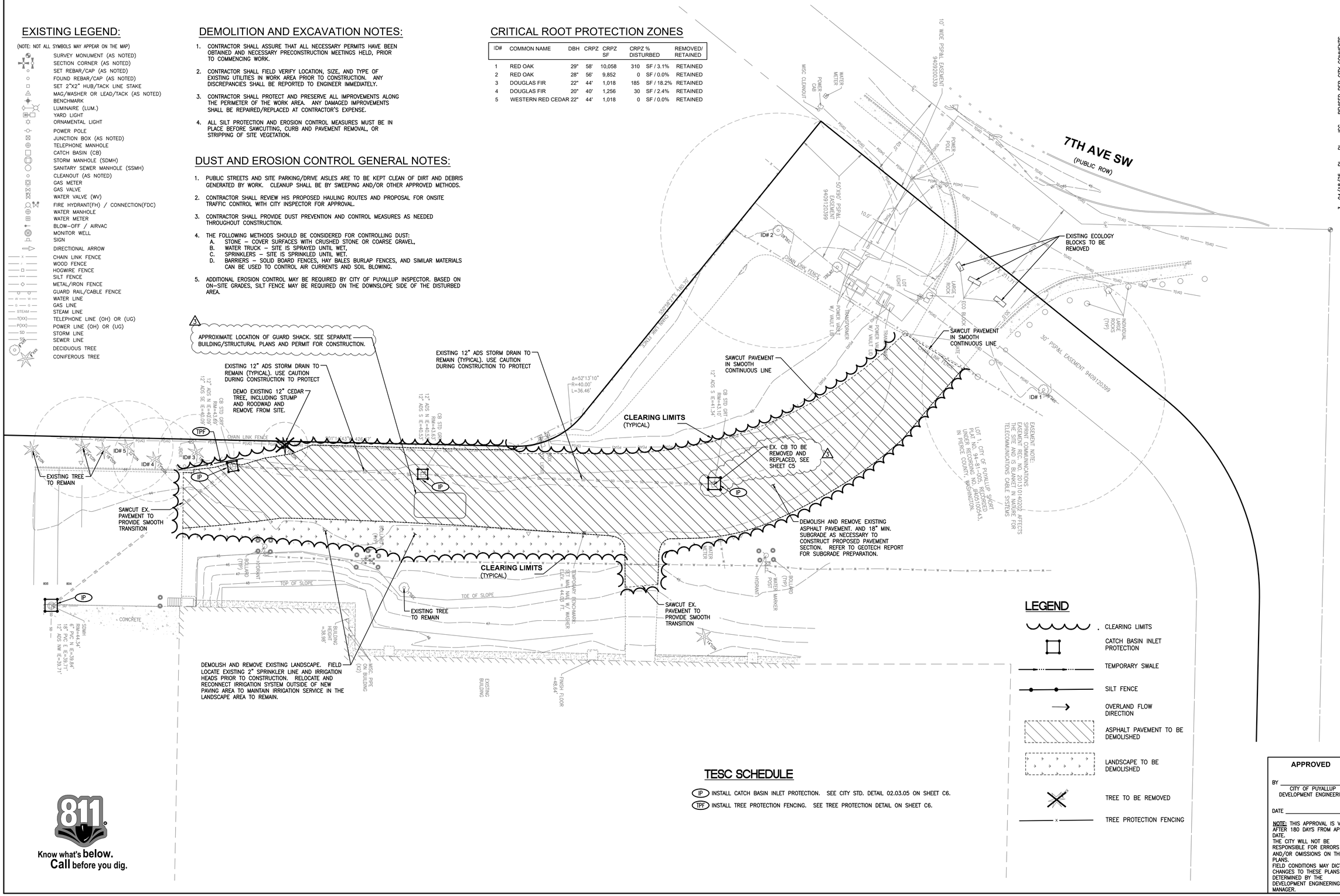
1. CONTRACTOR SHALL ASSURE THAT ALL NECESSARY PERMITS HAVE BEEN OBTAINED AND NECESSARY PRECONSTRUCTION MEETINGS HELD, PRIOR TO COMMENCING WORK.
2. CONTRACTOR SHALL FIELD VERIFY LOCATION, SIZE, AND TYPE OF EXISTING UTILITIES IN WORK AREA PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED TO ENGINEER IMMEDIATELY.
3. CONTRACTOR SHALL PROTECT AND PRESERVE ALL IMPROVEMENTS ALONG THE PERIMETER OF THE WORK AREA. ANY DAMAGED IMPROVEMENTS SHALL BE REPAIRED/REPLACED AT CONTRACTOR'S EXPENSE.
4. ALL SILT PROTECTION AND EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE SAWCUTTING, CURB AND PAVEMENT REMOVAL, OR STRIPPING OF SITE VEGETATION.

DUST AND EROSION CONTROL GENERAL NOTES:

1. PUBLIC STREETS AND SITE PARKING/DRIVE AISLES ARE TO BE KEPT CLEAN OF DIRT AND DEBRIS GENERATED BY WORK. CLEANUP SHALL BE BY SWEEPING AND/OR OTHER APPROVED METHODS.
2. CONTRACTOR SHALL REVIEW HIS PROPOSED HAULING ROUTES AND PROPOSAL FOR ONSITE TRAFFIC CONTROL WITH CITY INSPECTOR FOR APPROVAL.
3. CONTRACTOR SHALL PROVIDE DUST PREVENTION AND CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.
4. THE FOLLOWING METHODS SHOULD BE CONSIDERED FOR CONTROLLING DUST:
   A. STONE – COVER SURFACES WITH CRUSHED STONE OR COARSE GRAVEL,
   B. WATER TRUCK – SITE IS SPRAYED UNTIL WET,
   C. SPRINKLERS – SITE IS SPRINKLED UNTIL WET,
   D. BARRIERS – SOLID BOARD FENCES, HAY BALES BURLAP FENCES, AND SIMILAR MATERIALS CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.
5. ADDITIONAL EROSION CONTROL MAY BE REQUIRED BY CITY OF PUYALLUP INSPECTOR. BASED ON ON-SITE GRADES, SILT FENCE MAY BE REQUIRED ON THE DOWNSLOPE SIDE OF THE DISTURBED AREA.

CRITICAL ROOT PROTECTION ZONES

ID#	COMMON NAME	DBH	CRPZ	CRPZ SF	CRPZ % DISTURBED	REMOVED/ RETAINED
1	RED OAK	29"	58'	10,058	310 SF / 3.1%	RETAINED
2	RED OAK	28"	56'	9,852	0 SF / 0.0%	RETAINED
3	DOUGLAS FIR	22"	44'	1,018	185 SF / 18.2%	RETAINED
4	DOUGLAS FIR	20"	40'	1,256	30 SF / 2.4%	RETAINED
5	WESTERN RED CEDAR	22"	44'	1,018	0 SF / 0.0%	RETAINED



TESC SCHEDULE

(IP) INSTALL CATCH BASIN INLET PROTECTION. SEE CITY STD. DETAIL 02.03.05 ON SHEET C6.

(TPF) INSTALL TREE PROTECTION FENCING. SEE TREE PROTECTION DETAIL ON SHEET C6.

LEGEND

- CLEARING LIMITS
- CATCH BASIN INLET PROTECTION
- TEMPORARY SWALE
- SILT FENCE
- OVERLAND FLOW DIRECTION
- ASPHALT PAVEMENT TO BE DEMOLISHED
- LANDSCAPE TO BE DEMOLISHED
- TREE TO BE REMOVED
- TREE PROTECTION FENCING

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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **DEMOLITION / TESC PLAN**

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUGHES — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER — 04/18/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C3 of 7

P:\18000s\18510\engineering\2024 CIVIL SET\18510-EXCON.dwg 4/18/2025 2:48 PM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

SITE PLAN

N

0 10' 20' 40'

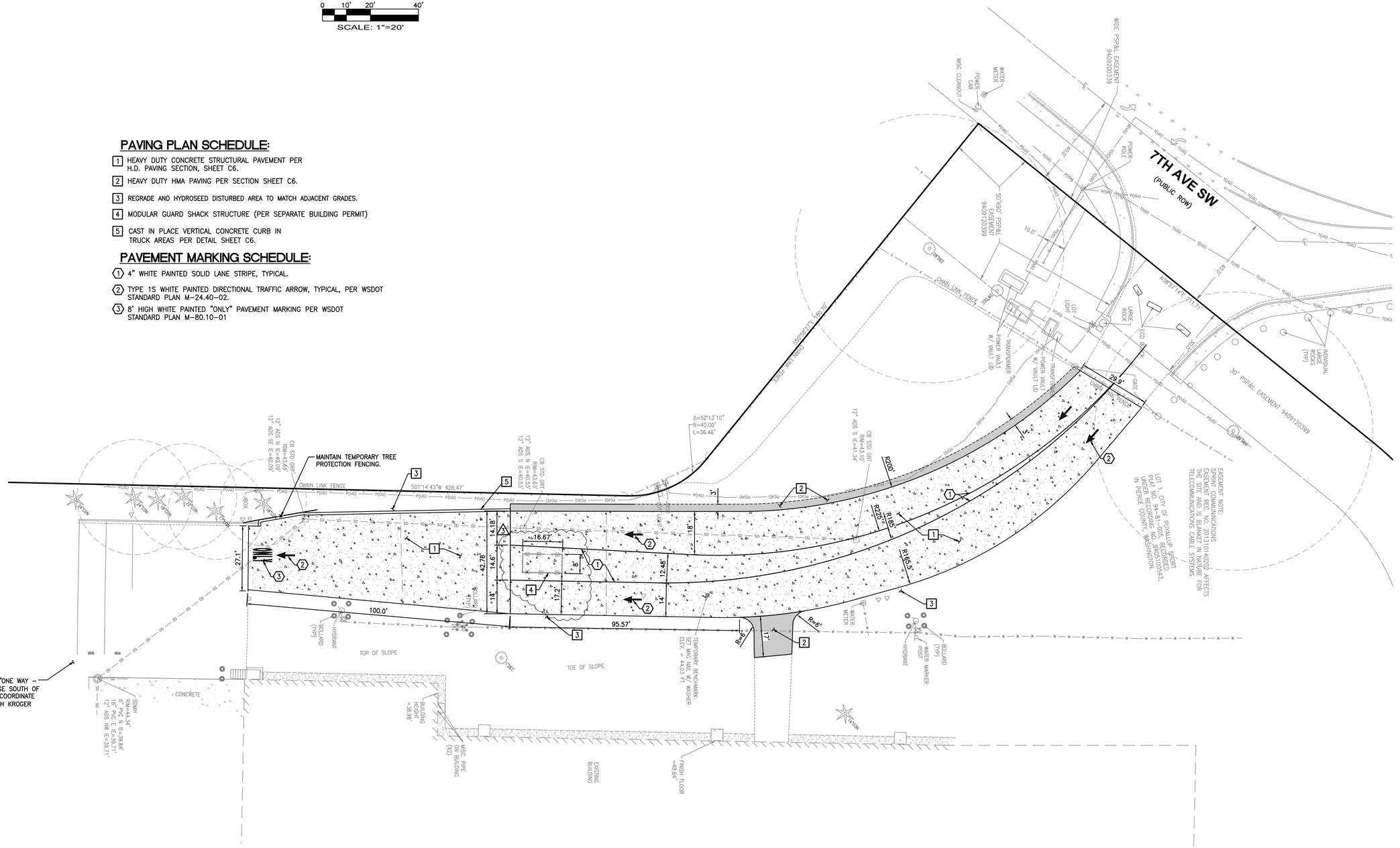
SCALE: 1"=20'

PAVING PLAN SCHEDULE:

1. HEAVY DUTY CONCRETE STRUCTURAL PAVEMENT PER H.D. PAVING SECTION, SHEET C6.
2. HEAVY DUTY HMA PAVING PER SECTION SHEET C6.
3. REGRADE AND HYDROSEED DISTURBED AREA TO MATCH ADJACENT GRADES.
4. MODULAR GUARD SHACK STRUCTURE (PER SEPARATE BUILDING PERMIT)
5. CAST IN PLACE VERTICAL CONCRETE CURB IN TRUCK AREAS PER DETAIL SHEET C6.

PAVEMENT MARKING SCHEDULE:

1. 4" WHITE PAINTED SOLID LANE STRIPE, TYPICAL.
2. TYPE 1S WHITE PAINTED DIRECTIONAL TRAFFIC ARROW, TYPICAL, PER WSDOT STANDARD PLAN M-24.40-02.
3. 8' HIGH WHITE PAINTED "ONLY" PAVEMENT MARKING PER WSDOT STANDARD PLAN M-80.10-01



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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
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No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **SITE PLAN**

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBARD — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number **18510**

Sheet **C4** of **7**

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PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

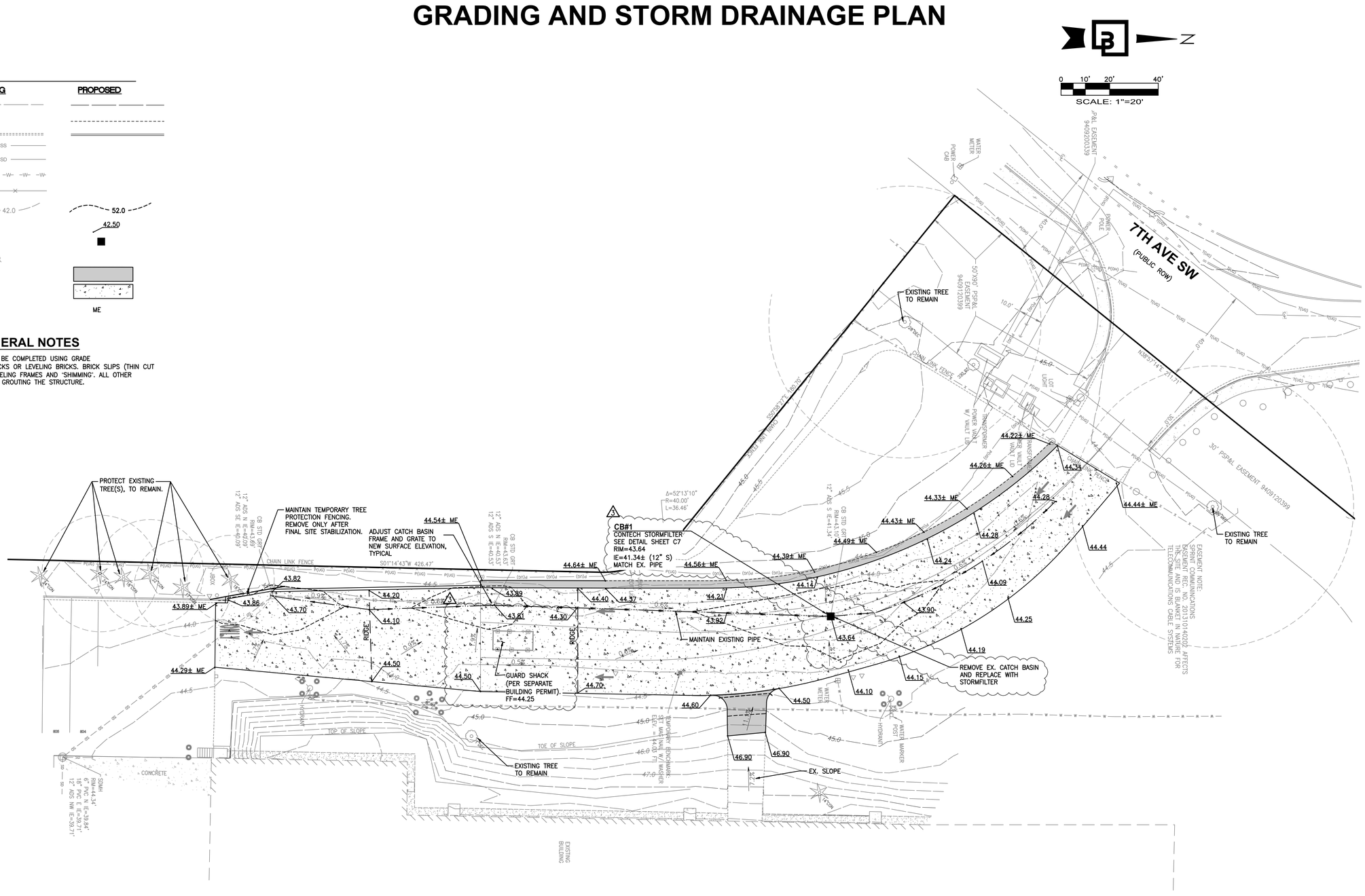
GRADING AND STORM DRAINAGE PLAN

LEGEND

DESCRIPTION	EXISTING	PROPOSED
EASEMENT		
SAWCUT LINE		
CURB		
SANITARY SEWER	SS	
STORM	SD	
WATER	-W-	
FENCE		
GROUND CONTOUR	42.0	52.0
SPOT ELEVATION		42.50
CATCH BASIN (CB)		
FIRE HYDRANT		
ASPHALT PAVEMENT		
CONCRETE PAVEMENT		
MATCH EXISTING ELEVATION		ME

CONSTRUCTION GENERAL NOTES

1. FRAME AND GRATE ADJUSTMENTS SHALL BE COMPLETED USING GRADE RINGS, RISER SECTIONS, AND RISER BRICKS OR LEVELING BRICKS. BRICK SLIPS (THIN CUT RISER BRICKS) MAY BE USED WHEN LEVELING FRAMES AND 'SHIMMING'. ALL OTHER MATERIAL SHALL BE REMOVED PRIOR TO GROUTING THE STRUCTURE.



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

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
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No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: **GRADING AND STORM DRAINAGE PLAN**

FRED MEYER - DISTRIBUTION CENTER

For: **DOUG HARDY**
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBARD — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal 1"=20' Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

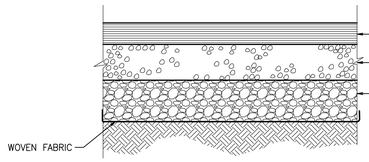
Job Number **18510**

Sheet **C5** of **7**

P:\18000s\18510\engineering\2024 CIVIL SET\18510-GM.dwg 4/18/2025 2:08 PM KHARRIS

PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

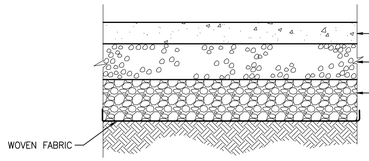
CONSTRUCTION DETAILS



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR HMA, AND CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

ASPHALT PAVEMENT SECTION

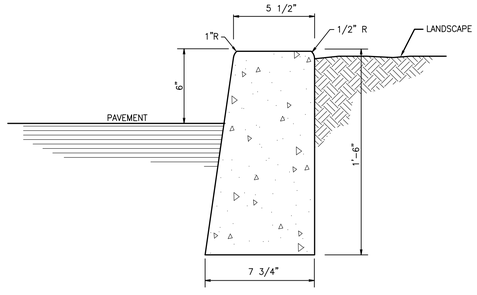
NOT TO SCALE



NOTE: THE PAVING MATERIALS USED SHALL CONFORM TO THE WSDOT SPECIFICATIONS FOR CRB SURFACING (9-03.9(3) CRUSHED SURFACING).

CONCRETE PAVEMENT SECTION

NOT TO SCALE



ONSITE BARRIER CURB

NOT TO SCALE

MATERIALS OF CONSTRUCTION

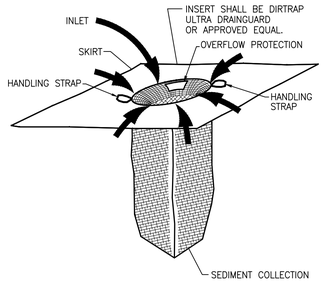
FABRIC:	NEEDLE PUNCHED NON-WOVEN GEOTEXTILE MATERIAL. FABRIC IS IS RESISTANT TO ULTRAVIOLET AND BIOLOGICAL DEGRADATION AND A BROAD RANGE OF CHEMICALS.
APPARENT OPENING SIZE (AOS):	80 US STANDARD SIEVE (0.180 MM)
GRAB TENSILE STRENGTH:	200 LBS
PUNCTURE STRENGTH:	130 LBS
MULLEN BURST:	400 PSI
TRAPEZOIDAL TEAR:	85 LBS
WATER FLOW RATE:	110 GPM/FT2
PERMEABILITY:	0.38 CM/SECOND

DIMENSIONS:

SKIRT:	24"x36"
SOCK FILTER/SEPARATOR:	10" D x 24" L

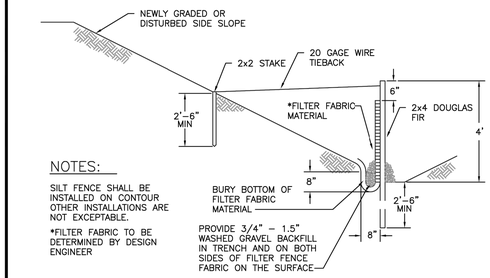
DISPOSAL REQUIREMENTS:

CONSULT FEDERAL, STATE, AND LOCAL REGULATIONS FOR DISPOSAL OF INSERTS



CATCH BASIN INSERT

NOT TO SCALE

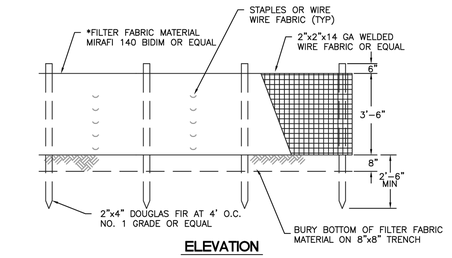


NOTES:

SILT FENCE SHALL BE INSTALLED ON CONTOUR OTHER INSTALLATIONS ARE NOT EXCEPTABLE.

*FILTER FABRIC TO BE DETERMINED BY DESIGN ENGINEER

TYPICAL CROSS SECTION



ELEVATION

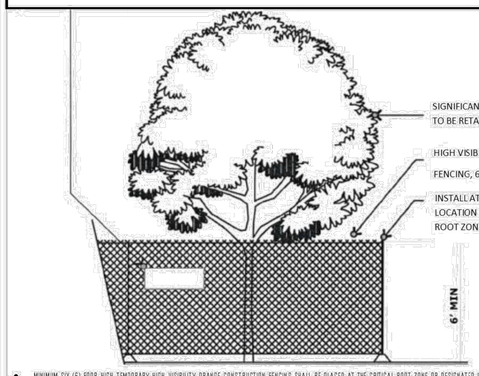
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SILTATION FENCE

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	02.03.02
FILE NAME: P:\DWG\COMMON\STDS\CITY\200502_SD202.03.02		DATE APPROVED: 06/01/1992	DATE REVISED: 06/01/2003	SCALE: NTS

TREE PROTECTION ZONE (TPZ)

NO ENTRY. NO GRADE CHANGES, STORAGE/STOCKPILING OF MATERIALS OR EQUIPMENT, PLACEMENT OF FILL OR TOP SOIL, TRENCHING OR VEHICULAR/FOOT TRAFFIC PERMITTED WITHIN THE TPZ. THIS TREE BARRIER SHALL NOT BE REMOVED WITHOUT AUTHORIZATION FROM PUYALLUP PLANNING DEPARMENT—SUBJECT TO FINES AND ENFORCEMENT ACTION BY THE CITY—TO REPORT VIOLATIONS OR FOR MORE INFORMATION—CALL (253) 864.4165



- MINIMUM SIX (6) FOOT HIGH TEMPORARY HIGH VISIBILITY ORANGE CONSTRUCTION FENCING SHALL BE PLACED AT THE CRITICAL ROOT ZONE OR DESIGNATED LIMIT OF DISTURBANCE ON APPROVED FINAL LANDSCAPE PLAN SET. FENCING SHALL BE INSTALLED USING POSTS DRIVEN INTO GROUND—PIER BLOCKS SHALL NOT BE USED. AVOID POSTS DRIVEN INTO ROOTS LARGER THAN 1" DIAMETER. FENCING SHALL BE INSTALLED PRIOR TO WORK COMMENCING ON SITE AND REMAIN IN PLACE THROUGHOUT ALL PHASES ON CONSTRUCTION—CALL THE CITY'S PLANNING DIVISION WITH REQUESTS TO MODIFY THE LOCATION OF THE TREE PROTECTION FENCING—(253) 864-4165
- TREATMENT OF ROOTS EXPOSED DURING CONSTRUCTION: FOR ROOTS OVER ONE (1) INCH DIAMETER DAMAGED DURING CONSTRUCTION, MAKE A CLEAN STRAIGHT CUT TO REMOVE DAMAGED PORTION OF ROOT. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING AND COVERED WITH SOIL AS SOON AS POSSIBLE. OTHER PRE-TREATMENT MEASURES MAY BE REQUIRED TO PROTECT ROOT SYSTEM—SEE APPROVED TREE PROTECTION OR FINAL LANDSCAPE PLAN FOR FURTHER DETAILS
- NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, PLACEMENT OF TOP SOIL OR FILL MATERIAL, STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMITS OF THE ESTABLISHED FENCING. FENCING SHALL NOT BE MOVED OR REMOVED UNLESS APPROVED BY THE CITY PLANNING DIVISION. WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY UNDER THE SUPERVISION OF THE ON-SITE ARBORIST WITH PRIOR WRITTEN APPROVAL BY THE CITY PLANNING DIVISION.
- THE ABOVE REFERENCED TPZ SIGNS SHALL BE PLACED EVERY 15 FEET ALONG THE FENCING AND SHALL REMAIN IN PLACE THROUGHOUT ALL PHASES OF CONSTRUCTION.

TREE PROTECTION FENCING DETAIL
(for public and private trees)

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.

3. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.

4. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.

5. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.

6. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.

7. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

GRADING, EROSION, AND SEDIMENTATION CONTROL NOTES

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM DEWEY-SVOBODA	LINDA LIAN	COLLEEN HARRIS	LINDA LIAN	05.02.01
FILE NAME: P:\DWG\COMMON\STDS\CITY\200905_GRD05.01\05.02.01		DATE APPROVED: 03/01/2009	DATE REVISED: 11/18/2014	SCALE: 0:1

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
2	01/07/25	DL	DL	JSG	REVISED PER CITY COMMENTS

Title: CONSTRUCTION DETAILS

FRED MEYER - DISTRIBUTION CENTER

For:
DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL — STATE OF WASHINGTON — 38950 — REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal AS SHOWN Vertical NA

Designed DL Drawn RDC Checked DL Approved JGH Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

Job Number 18510

Sheet C6 of 7

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PORTION OF THE NE1/4 OF SEC. 21, TWP. 20 N., RGE 4 E., W. M.

CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON

CONSTRUCTION DETAILS

STORMFILTER STEEL CATCHBASIN DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. 3 CARTRIDGE CATCHBASIN HAS A MAXIMUM OF THREE CARTRIDGES. SYSTEM IS SHOWN WITH A 27" CARTRIDGE, AND IS ALSO AVAILABLE WITH AN 18" CARTRIDGE. STORMFILTER CATCHBASIN CONFIGURATIONS ARE AVAILABLE WITH A DRY INLET BAY FOR VECTOR CONTROL.
PEAK HYDRAULIC CAPACITY PER TABLE BELOW. IF THE SITE CONDITIONS EXCEED PEAK HYDRAULIC CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27"			18"			18" DEEP		
RECOMMENDED HYDRAULIC DROP (H)	3.05'			2.3'			3.3'		
SPECIFIC FLOW RATE (gpm/sf)	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf	2 gpm/sf	1.67* gpm/sf	1 gpm/sf
CARTRIDGE FLOW RATE (gpm)	22.5	18.79	11.25	15	12.53	7.5	15	12.53	7.5
PEAK HYDRAULIC CAPACITY	1.0			1.0			1.8		
INLET PERMANENT POOL LEVEL (A)	1'-0"			1'-0"			2'-0"		
OVERALL STRUCTURE HEIGHT (B)	4'-9"			3'-9"			4'-9"		

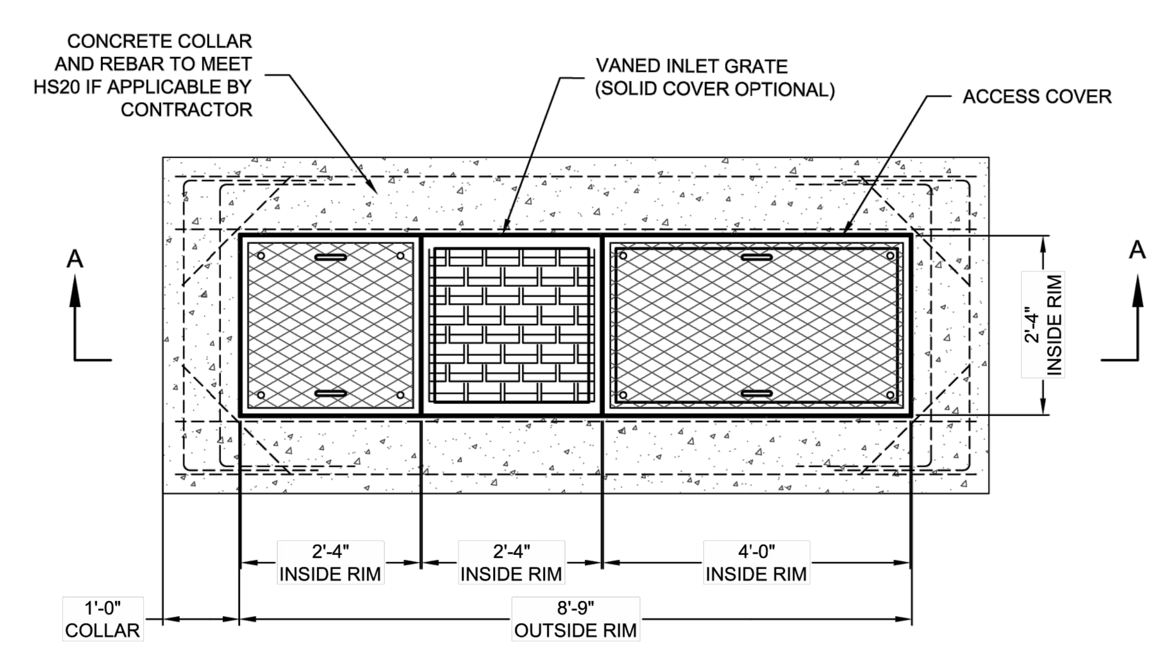
* 1.67 gpm/sf SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB ® (PSORB) MEDIA ONLY

GENERAL NOTES

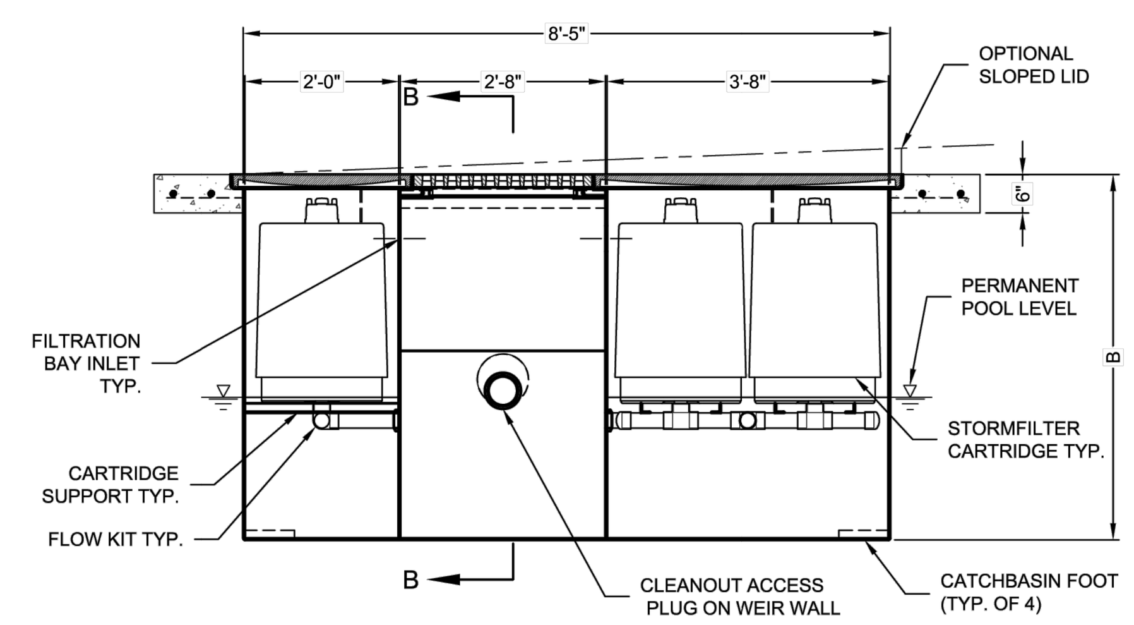
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STORMFILTER CATCHBASIN STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ANGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
3. STORMFILTER CATCHBASIN WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
4. INLET SHOULD NOT BE LOWER THAN OUTLET. INLET (IF APPLICABLE) AND OUTLET PIPING TO BE SPECIFIED BY ENGINEER AND PROVIDED BY CONTRACTOR.
5. MANUFACTURER TO APPLY A SURFACE BEAD WELD IN THE SHAPE OF THE LETTER "O" ABOVE THE OUTLET PIPE STUB ON THE EXTERIOR SURFACE OF THE STEEL SFCB.
6. STORMFILTER CATCHBASIN EQUIPPED WITH 4 INCH (APPROXIMATE) LONG STUBS FOR INLET (IF APPLICABLE) AND OUTLET PIPING. STANDARD OUTLET STUB IS 8 INCHES IN DIAMETER. MAXIMUM OUTLET STUB IS 15 INCHES IN DIAMETER. CONNECTION TO COLLECTION PIPING CAN BE MADE USING FLEXIBLE COUPLING BY CONTRACTOR.
7. STEEL STRUCTURE TO BE MANUFACTURED OF 1/4 INCH STEEL PLATE. CASTINGS SHALL MEET AASHTO M306 LOAD RATING. TO MEET HS20 LOAD RATING ON STRUCTURE, A CONCRETE COLLAR IS REQUIRED. WHEN REQUIRED, CONCRETE COLLAR WITH #4 REINFORCING BARS TO BE PROVIDED BY CONTRACTOR.
8. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
9. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft).

INSTALLATION NOTES

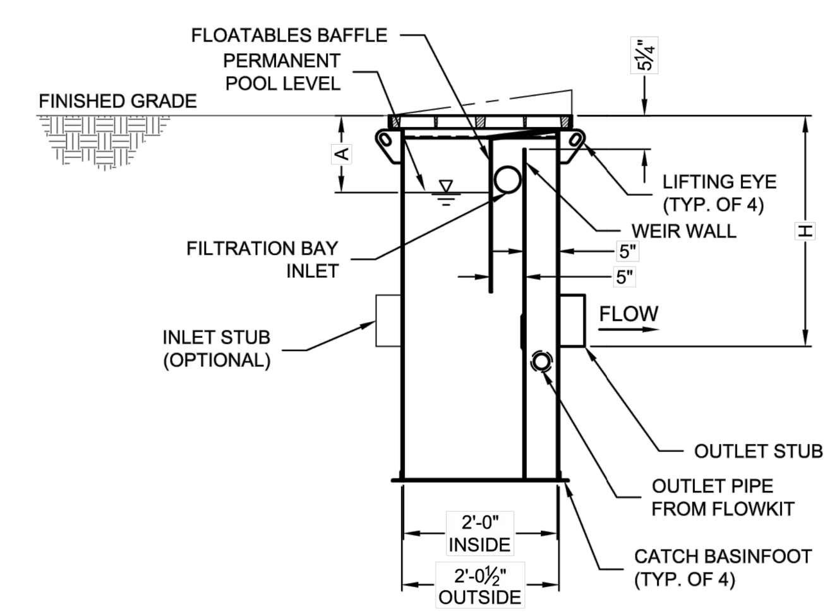
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CATCHBASIN (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.



PLAN VIEW



SECTION A-A



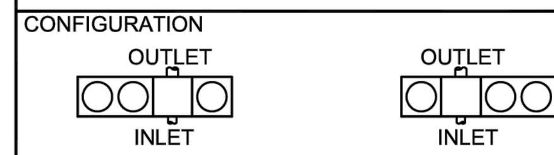
SECTION B-B

3-CARTRIDGE CATCHBASIN STORMFILTER DATA

STRUCTURE ID	CB#1
WATER QUALITY FLOW RATE (cfs)	0.0438 CFS
PEAK FLOW RATE (<1 cfs)	0.5519
RETURN PERIOD OF PEAK FLOW (yrs)	100
CARTRIDGE FLOW RATE (gpm)	7.5
MEDIA TYPE (PERLITE, ZPG, PSORB)	ZPG
RIM ELEVATION	43.64'

PIPE DATA:	I.E.	DIAMETER
INLET STUB	XXX.XX'	N/A
OUTLET STUB	41.34	12"

CONFIGURATION



SLOPED LID	YES\NO
SOLID COVER	YES\NO

NOTES/SPECIAL REQUIREMENTS:

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

3 CARTRIDGE CATCHBASIN STORMFILTER STANDARD DETAIL

No.	Date	By	Ckd.	Appr.	Revision
3	04/18/25	DL	DL	JSG	REVISED PER CITY COMMENTS
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Title: CONSTRUCTION DETAILS

FRED MEYER - DISTRIBUTION CENTER

For: DOUG HARDY
WEST REGION ENGINEER
KROGER LOGISTICS
MAINTENANCE & ENGINEERING
2201 SOUTH WILMINGTON AVE.
COMPTON, CA 90220

JASON GUY HUBBELL
STATE OF WASHINGTON
38950
REGISTERED PROFESSIONAL ENGINEER
04/18/2025

Scale: Horizontal AS SHOWN Vertical NA

Designed DL
Drawn RDC
Checked DL
Approved JGH
Date 2/16/24

Barghausen Consulting Engineers, LLC.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222
barghausen.com

APPROVED

BY ____________
CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
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FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

Job Number 18510

Sheet C6 of 7

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Appendix B
Maintenance Guidelines

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault			compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Appendix C
Maintenance Log

INSPECTION/MAINTENANCE CHECKLIST

STRUCTURE/ FACILITY	DATE OF INSPECTION MAINTENANCE		
	RESULTS/ MAINTENANCE	DATE	COMMENTS
General Grounds	Inspection Results		
	Maintenance Done		
Onsite catch basins and pipes	Inspection Results		
	Maintenance Done		
Cleanouts and Downspouts	Inspection Results		
	Maintenance Done		
Vegetated Bioswales	Inspection Results		
	Maintenance Done		

I hereby certify that the above noted inspections and maintenance was performed in accordance with the approved Operations and Maintenance Manual for Fred Meyer Distribution-Puyallup.

_____

Signature Date

_____

Title

CONTECH®
ENGINEERED SOLUTIONS

OPERATION AND MAINTENANCE

CatchBasin StormFilter™

Important: These guidelines should be used as a part of your site stormwater plan.

Overview

The CatchBasin StormFilter™ (CBSF) consists of a multi-chamber steel, concrete, or plastic catch basin unit. The steel CBSF is offered both as a standard and as a deep unit for additional internal overflow and sediment capacity.

The CBSF is installed flush with the finished grade and is applicable for both constrained lot and retrofit applications. Steel and concrete units can accept surface and piped influent for roof leaders or similar applications.

The steel, concrete and plastic CBSF units have capacities of 4, 8 and 2 cartridges, respectively. Internal overflow capacity varies by system type from 0.5 cfs for the plastic, 1.3 cfs for the concrete and 1.0 or 1.8 cfs for the steel unit.

Design Operation

The CBSF is installed as the primary receiver of runoff, similar to a standard, grated catch basin. The steel and concrete CBSF units have an H-20 rated, traffic bearing lid that allows the filter to be installed in parking lots, and for all practical purposes, takes up no land area. Plastic units can be used in landscaped areas or other non-traffic-bearing applications.

The steel CBSF consists of a sumped inlet chamber and cartridge chamber(s). Runoff enters the sumped inlet chamber either by sheet flow from a paved surface or from an inlet pipe discharging directly to the unit vault. The inlet chamber is equipped with an internal baffle, which traps debris and floating oil and grease, and an overflow weir. While in the inlet chamber, heavier solids are allowed to settle into the deep sump, while lighter solids and soluble pollutants are directed into the cartridge chamber through a port between the baffle and the overflow weir.

The concrete and plastic units operate similarly minus the presence of the inlet chamber or deep sump.

Once in the cartridge chamber, polluted water ponds and percolates horizontally through the media in the filter cartridges. Treated water collects in the cartridge's center tube from where it is directed to the outlet chamber and discharged to the outlet pipe on the downstream side of the overflow weir.

When influent flows exceed the water quality design value, excess water spills over the overflow weir, bypassing the cartridge bay, and discharges to the outlet pipe.

Applications

The CBSF is particularly useful where small flows are being treated or for sites that have little available hydraulic head. The unit is ideal for applications in which standard catch basins are to be used. Both water quality and catchment issues can be resolved with the use of the CBSF.

Retro-Fit

The retrofit market has many possible applications for the CBSF. The CBSF can be installed by replacing an existing catch basin without having to "chase the grade," thus reducing the high cost of re piping the storm system.

CatchBasin StormFilter™

Maintenance Guidelines

Maintenance procedures for typical catch basins can be applied to the CatchBasin StormFilter (CBSF). The filter cartridges contained in the CBSF are easily removed and replaced during maintenance activities according to the following guidelines.

1. Establish a safe working area as per typical catch basin service activity.
2. Remove steel grate and diamond plate cover (weight 100 lbs. each) or plastic grating.
3. Turn cartridge(s) approximately ¼ turn counter-clockwise to disconnect from pipe manifold.
4. Remove cartridge(s) from catch basin by hand or with appropriate hoisting equipment.
5. Remove accumulated sediment via vactor truck from all interior chambers.
6. Rinse interior of both bays and vactor remaining water and sediment.
7. Install fresh cartridge(s), by rotating ¼ turn clockwise, taking care not to damage cartridge connectors.
8. Replace cover(s).
9. Dispose of accumulated debris and spent media in accordance with local regulations.
10. Return used, empty cartridges to Contech for refurbishing.

Media may be removed from the filter cartridges using the vactor truck before the cartridges are removed from the catch basin structure once the top cap and hood are removed. The vactor truck must be equipped with a hose capable of reaching areas of restricted clearance.

Empty cartridges can be easily removed from the catch basin structure by hand. Empty cartridges should be reassembled and returned to Contech as appropriate.

Refurbished cartridges are available from Contech on an exchange basis. Contact the maintenance department of Contech at 513-645-7770 for more information.

Onsite maintenance is estimated at 26 minutes once setup for a single cartridge unit. Add approximately 5 minutes for each additional cartridge.

Mosquito Abatement

In certain areas of the United States, mosquito abatement is desirable to reduce the incidence of vectors.

In BMPs with standing water, which could provide mosquito breeding habitat, certain abatement measures can be taken.

1. Periodic observation of the standing water to determine if the facility is harboring mosquito larvae.
2. Regular catch basin maintenance.
3. Use of larvicides containing Bacillus thuringiensis israelensis (BTI). BTI is a bacterium toxic to mosquito and black fly larvae.

In some cases, the presence of petroleum hydrocarbons may interrupt the mosquito growth cycle.

Using Larvicides in the CatchBasin StormFilter

Larvicides should be used according to manufacturer's recommendations.

Two widely available products are Mosquito Dunks and Summit B.t.i. Briquets. For more information, visit https://www.amvac.com/products/summit-bti-briquets.

The larvicide must be in contact with the permanent pool. The larvicide should also be fastened to the CatchBasin StormFilter to prevent displacement by high flows. A magnet can be used with a steel catch basin.

For more information on mosquito abatement in stormwater BMPs, refer to the following: https://anrcatalog.ucanr.edu/pdf/8125.pdf.