Pioneer Park Restroom Project

Stormwater Site Plan

FINAL

Prepared for:

City of Puyallup

Parks and Recreation

808 Valley Ave NW

Puyallup, Washington

By:

City of Puyallup

Capital Improvements Projects Division

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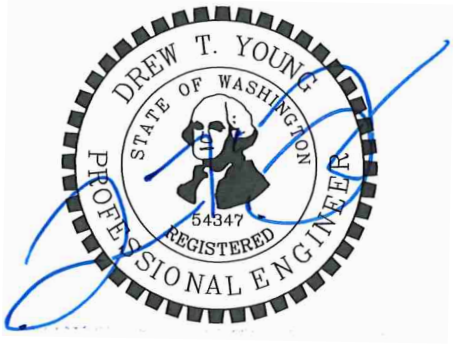
Puyallup, Washington

November 2022



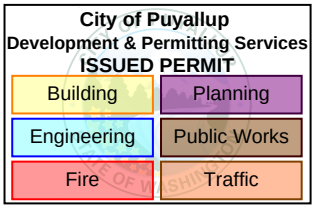


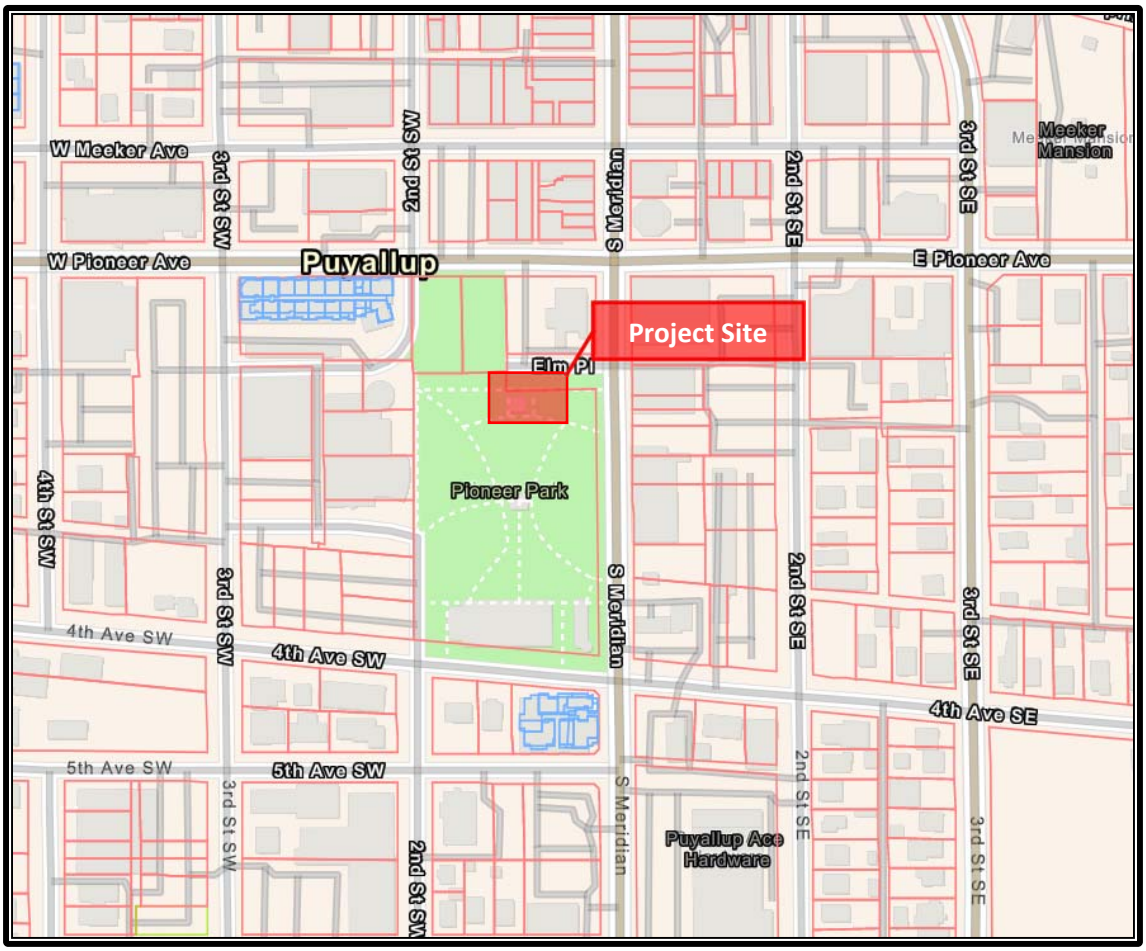
Table of Contents

1.0 Project Overview

The City of Puyallup Parks and Recreation Department (The Owner) is proposing to improve the Pioneer Park restroom building located at 324 South Meridian, parcel 5745001680. See Figure 1 below for site location. The existing building will undergo a significant remodel with an expansion to double the size of the existing restroom to better serve the surrounding uses of the downtown city park. Sidewalks will be replaced and expanded to provide access to the renovated building from other existing amenities in the park. In addition to these new features, a rain garden will be constructed to mitigate feasible stormwater runoff from applicable new and replaced hard surfaces.

This Stormwater Site Plan has been prepared to document how the Minimum Requirements of the 2019 Department of Ecology Stormwater Management Manual for Western Washington (SWMM) and the City of Puyallup – City Standards Section 200, Stormwater Management (rev. 2019) are applied and addressed.

Figure 1 – Site Location and Vicinity Map



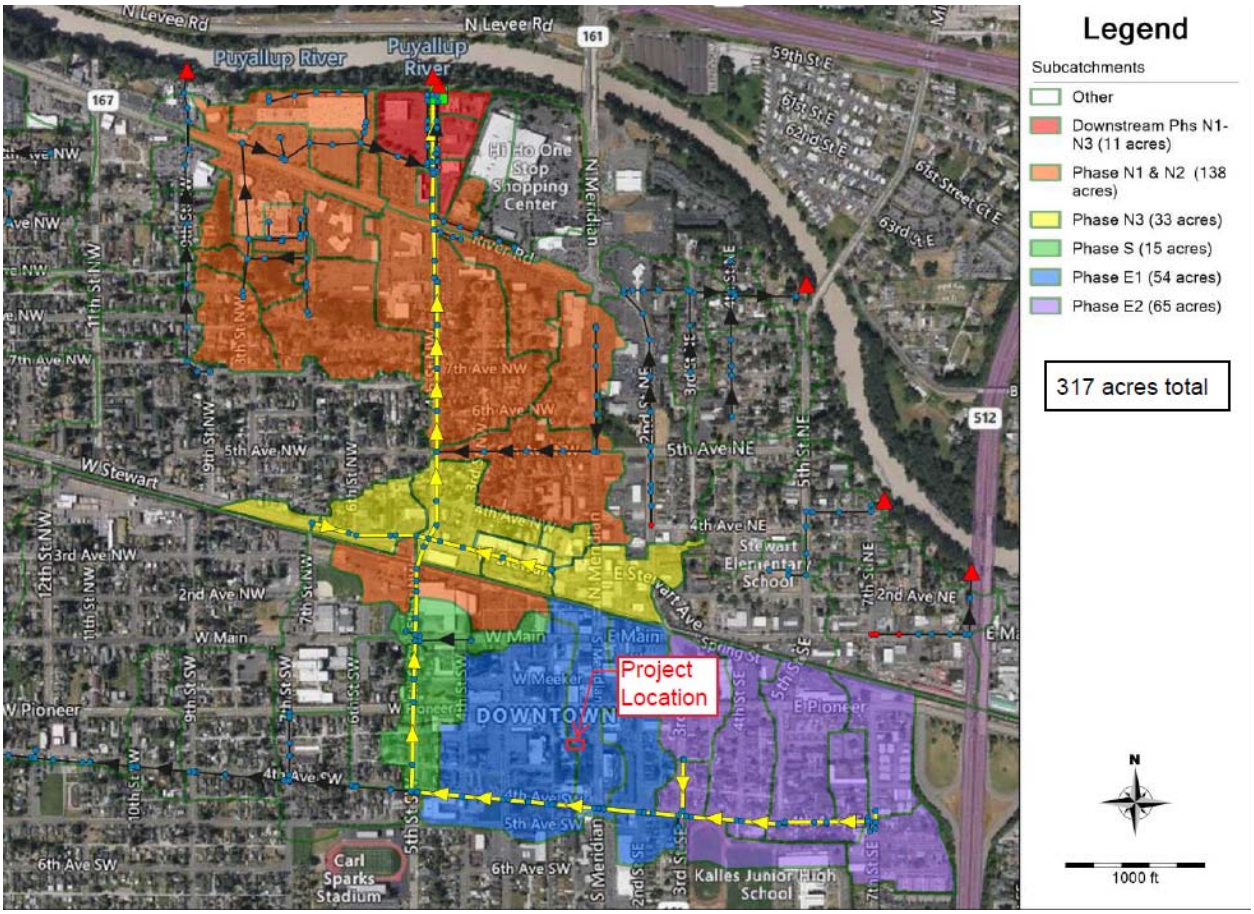
2.0 Existing Site Conditions

The site is currently developed as a city park in the PF (Public Facilities) zone. The parcel is approximately 3.15 acres in size and consists of a public restroom, public market building (known as the Pioneer Park Pavilion), playground, stage and miscellaneous open space features such as art, statutes, and benches. The Park also contains a seasonal spray park that is built on an adjoining parcel. The site has flat topography with existing utilities running along the north and west boundaries of the parcel that were previously vacated portions of public Right-of-Way.

The project site consists of approximately 10,423 square feet of the park parcel which consists of the existing Pioneer Park restroom, sidewalk, parking and landscape/open space areas. The existing sidewalk sheet flows stormwater to adjacent lawn and landscape areas within the park. The sidewalk along the north boundary of the parcel sheet flows stormwater north to the conveyance system in Elm Place. The existing building allows stormwater to drip from the existing roof eaves to a paver area below. Evidence of shallow ponding is seen along the perimeter of the sidewalk and other areas likely due to poor draining soil and over watering during the summer months.

The storm conveyance system within Elm Place flows east to South Meridian where it conveys water through a series of catch basins and pipes south to 4th Ave SW. Stormwater is then conveyed west to 14th St SW/15th St SW where it flows north to an existing outfall to the Puyallup River. This project drainage basin is currently in the design phase to incorporated into a direct discharge drainage basin as part of the 4th St NW/5th St NW Stormwater Project. Once implemented, stormwater will continue to be conveyed along the 4th Ave SW conveyance system but will be intercepted at the intersection of 4th Ave SW and 5th St SW. While this project is and will be within a flow control exempt basin, onsite stormwater management was deployed utilizing list #1 per Minimum Requirement #5 as a matter of best practice to reduce offsite drainage to the maximum extent feasible. A map is provided on the following page is provided for a reference of project location to future direct discharge improvement project location.

Figure 2 – Future Direct Discharge/Flow Control Exempt Basin Map



There are no known sensitive or critical areas within or adjacent to the project site. There are no known areas of contaminated soils within the project site. There are no known historical drainage problems within the project site or immediately downstream of the project.

3.0 Proposed Site Drainage

The project will modify the existing restroom to expand the building footprint west to double the existing facility size. The sidewalks will be replaced around the new structure to incorporate the new building pad elevation into the surrounding improvements. Additionally, an existing publicly maintained grinder pump and sewer force main system will be replaced due to frequent issues from public use and it has reached the end of its useful service life. To provide onsite stormwater management, portions of the new/replaced impervious surfaces will be conveyed to a new onsite rain garden. During high volume storm events, stormwater will overflow from the rain garden into a piped conveyance system to the storm main located within Elm Place, matching existing conditions.

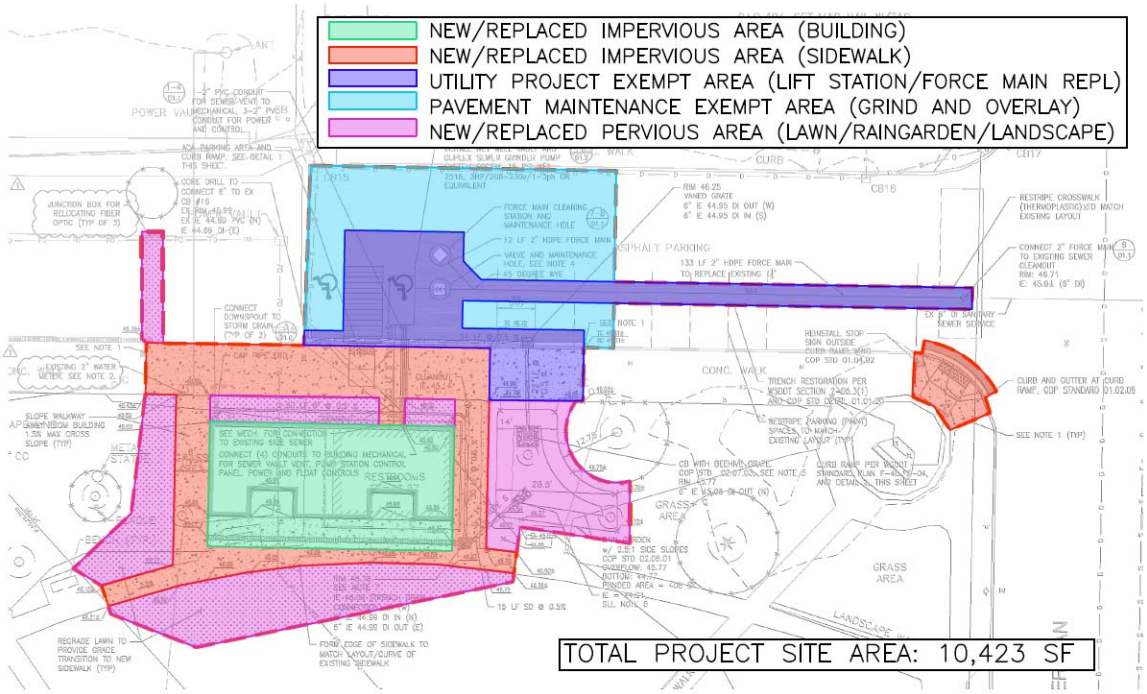
In total, approximately 10,423 square feet of land disturbing activity will be completed as part of the project. See Table 1 and Figure 3 on the following page for a summary of new

and replaced hard surfaces.

Table 1: Summary of Project Areas

Project Site Area (Total Disturb Area)	
10,423 SF	
Non-Exempt Hard Surfaces	
Description	**Area**
New/Replaced Concrete Sidewalk Impervious Area	2,295 SF
New/Replaced Building Impervious Area	1,673 SF
Total Non-Exempt Hard Surfaces	**3,968 SF**
Exempt Hard Surfaces	
Description	**Area**
New/Replaced Impervious Area over Utility Replacement (exempt per I-3.2)	1,785 SF
Pavement Maintenance Area (Exempt per I-3.2)	1,920 SF
Total Exempt Hard Surfaces	**3,705 SF**
Pervious Surfaces	
Description	**Area**
Lawn/Landscaping/Rain Garden	2,750 SF
Total Pervious Surfaces	**2,750 SF**

Figure 3 – Project Basin Map; New and Replaced Surface Areas



4.0 Conditions and Requirements Summary

Stormwater management for the Project has been designed per the 2019 Department of Ecology Stormwater Management Manual (SWMM) as adopted by the City of Puyallup.

The Project is defined as a Redevelopment in accordance with SWMM as the project limits currently has over 35% or more of existing hard surface coverage. Therefore, Figure I-3.2 was utilized to determine project minimum requirements.

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

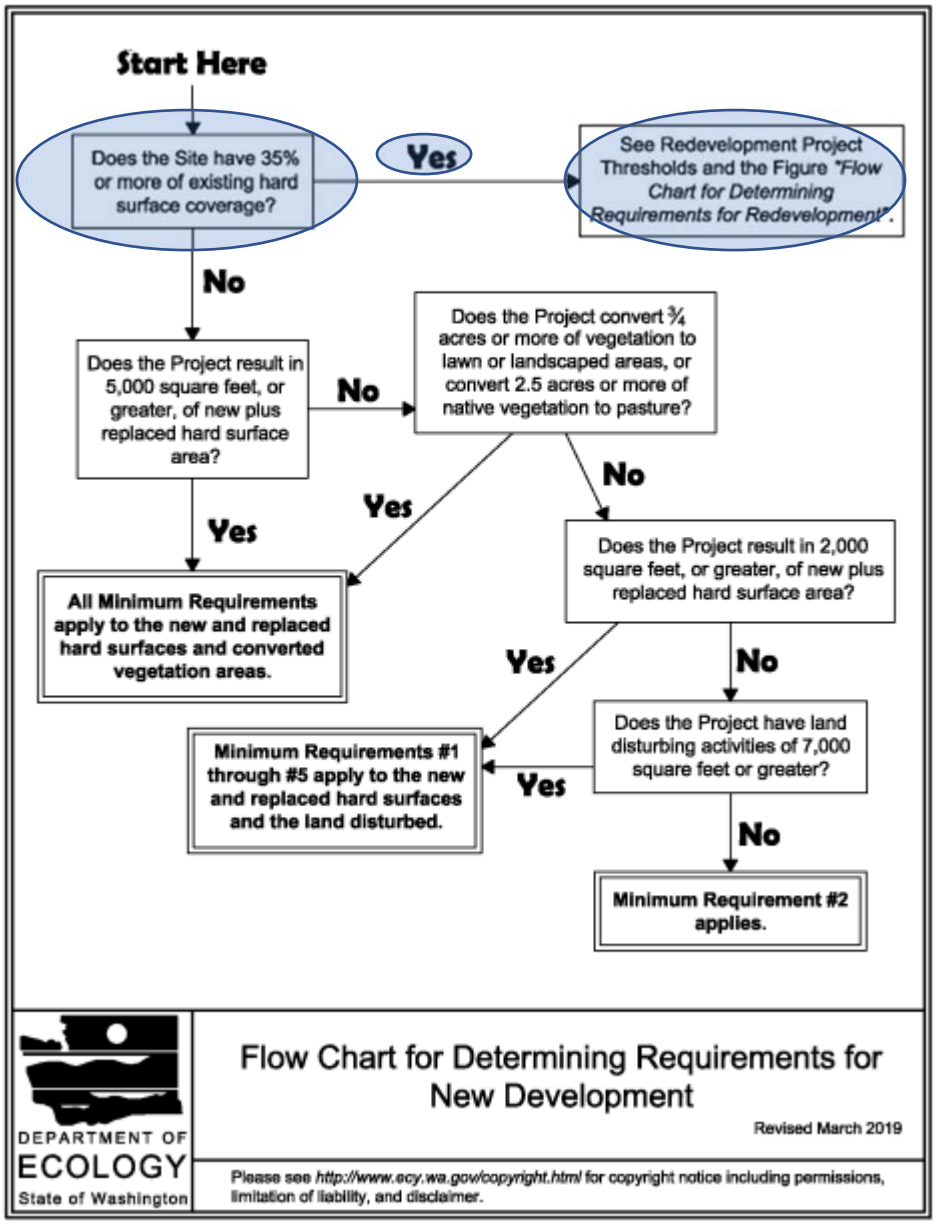
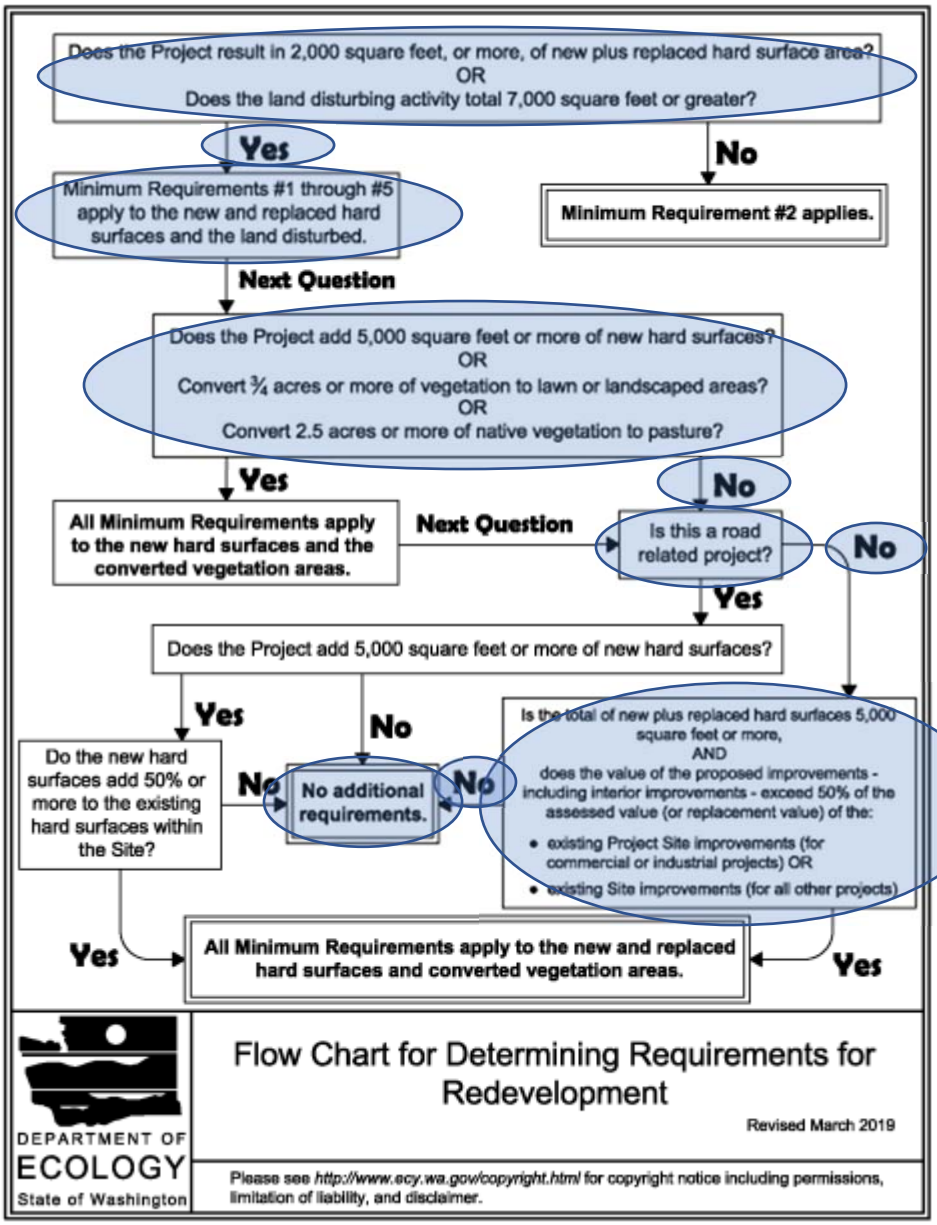


Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment



Following Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment, the project is required to implement Minimum Requirements (MR) #1 through #5 to the new and replaced hard surfaces and land disturbed. In total, 3,968 square feet of new/replaced hard surface and 2,750 square feet of new/replaced pervious surfaces are required to meet MR #1 through MR #5. A total of 3,705 square feet of exempt hard surfaces that are a result of utility replacement and pavement maintenance are required to meet minimum requirement #2 only.

4.1 Minimum Requirement (MR) Project Summary

The following is a review of the proposed project meets each applicable minimum requirement as required by the 2019 SWMM.

Minimum Requirement #1: Preparation of Stormwater Site Plans

This technical report and the associated construction plans satisfy the requirements for a Stormwater Site Plan. The Stormwater Site Plan has been included in Appendix A of this report.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (SWPPP)

A Construction Stormwater Pollution Prevention Plan is a written document to implement measures to identify, prevent, and control the contamination of stormwater for construction sites. The Contractor will be responsible for preparing the Construction SWPPP based on the contractor means and methods and is required to submit the SWPPP to the City for review and approval prior to the start of construction. The Contractor will be responsible for designating a certified erosion and sediment control lead (CESCL) that will oversee site controls and SWPPP implementation throughout the duration of the project. Additionally, the Contractor will be responsible for modifying the SWPPP to accommodate changing site conditions and to ensure site discharges are in accordance with

Minimum Requirement #3: Source Control of Pollution

Per Volume III, Section III-1 Choosing your BMPs, Source Control BMPs are not required as part of this project as it does not meet the site type requirements of the 2019 SWMM (commercial properties, industrial properties, multifamily properties, boatyards, sand and gravel mining operations) and the City of Puyallup PMC 21.10.221 for sites requiring Structural Source Control BMPs. The following source control BMPs are recommended/encouraged to be implemented into practice as part of this project:

- S454 BMPs for Preventative Maintenance/Good Housekeeping
- S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems
- S411 BMPs for Landscaping and Lawn/Vegetation Management

Highlighted applicable Source Control BMPs have been included in Appendix C of this report.

Construction Source Control BMPs will be identified in the SWPPP prepared by the Contractor as required as part of MR #2.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Discharge at the natural location for the site is maintained as new and replaced hard surfaces

will continue to drain to the public storm drain that serves the project site or will be infiltrated into the underlying native soils.

Minimum Requirement #5: On-Site Stormwater Management

As stated in section 2.0 of this report, the project will implement onsite stormwater management following List #1 for satisfying the list approach to MR 5 compliance.

Lawn/Landscape Areas:

1. BMP T5.13: Post Construction Soil Quality and Depth
    a. All disturbed lawn and landscaped areas will be required to implement BMP T5.13.

Roofs:

1. BMP T5.30: Full Dispersion or BMP T5.10A Full Infiltration
    a. Infeasible: Insufficient room to implement full dispersion and full infiltration is considered infeasible given that the site soils consist of alluvium (mottled silt and fine sand) SM/ML soil classifications which is considered to have a saturated hydraulic conductivity that is too small for adequate infiltration. A follow-up in-field falling head test yielded a long term ksat infiltration value of 0.5 inches per hour. The project site does not have sufficient room to fit an engineered infiltration facility to appropriately mitigated onsite stormwater.

2. BMP T5.14: Rain Gardens or BMP T7.30: Bioretention
    a. The project has selected BMP T5.14: Rain Gardens to provide onsite stormwater management for roof areas.

Other Hard Surfaces

1. BMP T5.30: Full Dispersion
    a. Infeasible: Insufficient room to implement full dispersion

2. BMP T5.15 Permeable Pavement or BMP T5.14: Rain Gardens or BMP T7.30: Bioretention
    a. The project has selected BMP T5.14: Rain Gardens to provide onsite stormwater management for other hard surfaces (i.e. Non-exempt hard surfaces).

5.0 On-site Stormwater Management

Analysis and Design

To meet the requirements of the 2019 SWMM, a rain garden is proposed to be installed to reduce the amount of stormwater that is discharged to the public stormwater system. The rain garden (BMP T5-14) will be installed to the east of the existing restroom building within an existing lawn area. The rain garden was designed in accordance with the *Rain Garden Handbook for Western Washington: A Guide for Design, Installation, and Maintenance* (Hinman et al., 2013) as per the 2019 SWMM requirements.

In total, the project requires the project to implement onsite stormwater management for approximately 3,968 square feet of new/replaced hard surfaces. However due to grading challenges, available depth of the public stormwater system, and location of new/replaced hard surfaces, only feasible hard surfaces areas that can sufficiently drain to the rain garden have been included in the design sizing. To minimize the amount of stormwater runoff as a result of the project, existing impervious areas that feasibly drain to the rain garden were included in the rain garden sizing. Table 2 and Figure 4 below provides a summary of the areas included in the rain garden sizing.

Table 2: Rain Garden Sizing Areas

Description	Area
New/Replaced Concrete Sidewalk Impervious Area	597 SF
New/Replaced Building Impervious Area	1,673 SF
Existing Impervious Area	250 SF
Total Impervious Areas	**2,520 SF**
Pervious Areas (Rain Garden/Lawn)	1,452 SF
Total Pervious Surfaces	**1,452 SF**
***Total Remaining Impervious Areas to Bypass Rain Garden (Table 1 Total Non-Exempt Impervious – Table 2 Total Impervious Areas)**	**1,448 SF**
*Note: the remaining impervious surfaces that will not flow to the new rain garden facility will sheet flow water to adjacent areas. The new sidewalk along the west side of the new restroom facility will sheet flow/disperse storm water over a vegetated lawn surface. During high volume stormwater events, any ponded water would flow north towards an existing trench drain system that discharges to the stormwater main within Elm Place. The new sidewalk along the north side of the new restroom will continue to sheet flow stormwater towards the curb and gutter of Elm Place, matching existing conditions.	

Figure 6 – Rain Garden Sizing Basin Areas

In accordance with the *Rain Garden Handbook for Western Washington: A Guide for Design, Installation, and Maintenance*, the following assumptions were made:

Rainfall Regions for Western Washington: **Region 3 (40 to 50 Inches)**

Design Performance Level Selection: **Good (80% of the water)**

Soil Drainage Rates: **0.50 to 0.99 Inches per Hour** (See Appendix B)

Result Sizing Factor: **8% of drainage area**

The top surface of the ponded area within the rain garden was sized by multiplying the total impervious contributing area by the sizing factor percentage.

Top Pond Area = 2,520 sf x 8% = 202 sf

Additionally, in accordance with the design guidelines for a rain garden per SWMM BMP T5.14:

> *"If lawn/landscape area will also be draining to the rain garden, Ecology recommends that the rain garden's horizontally projected surface area below the overflow be increased by 2% of the lawn/landscape area."*

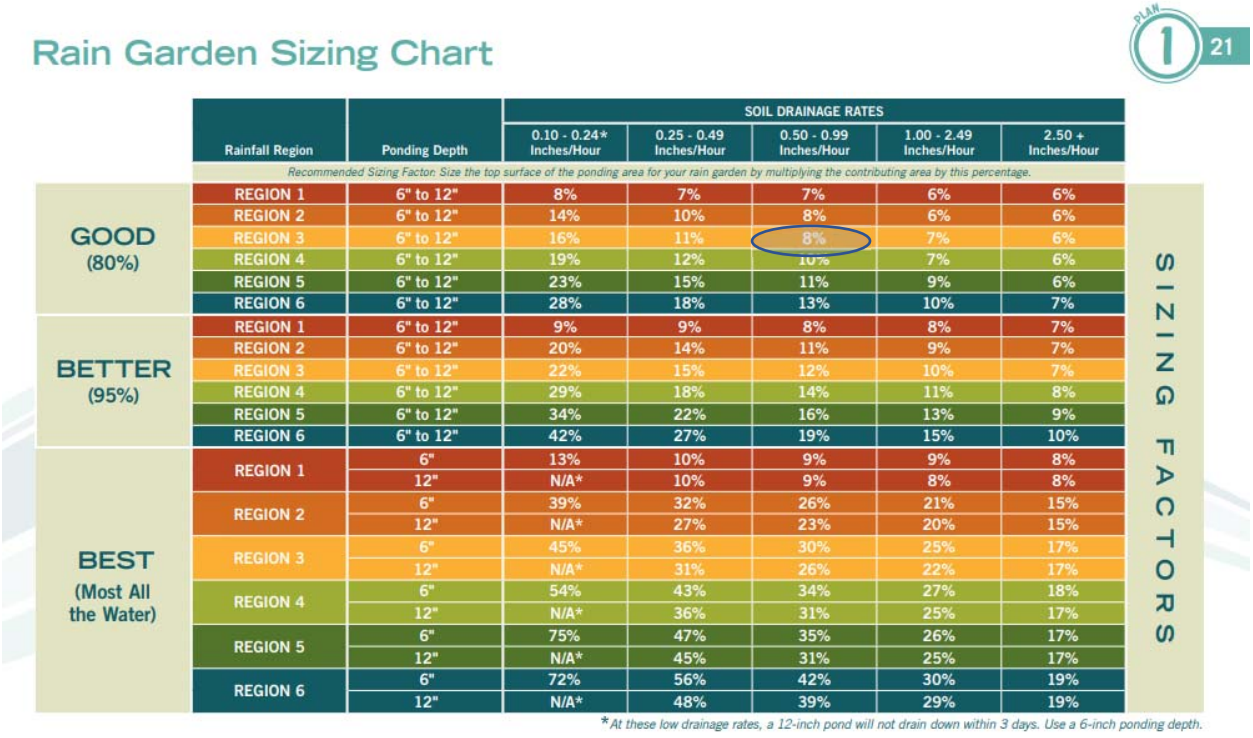
1,452 sf x 2% = 29 sf

Therefore, a total minimum top surface area of **231 sf**. A summary of the proposed rain garden is provided below in Table 3.

Table 3: Rain Garden Design Summary

Total Proposed Top Surface Area Proposed	408 SF
Top Pond Elevation	45.77
Bottom Elevation	44.77
Side Slopes	2.5:1
Top Overflow Elevation	46.27

Figure 7 – Rain Garden Sizing Chart



Rain Garden Sizing Chart

PLAN 1 21

	Rainfall Region	Ponding Depth	SOIL DRAINAGE RATES 0.10 - 0.24* Inches/Hour	0.25 - 0.49 Inches/Hour	0.50 - 0.99 Inches/Hour	1.00 - 2.49 Inches/Hour	2.50 + Inches/Hour
	Recommended Sizing Factor: Size the top surface of the ponding area for your rain garden by multiplying the contributing area by this percentage.						
GOOD (80%)	REGION 1	6" to 12"	8%	7%	7%	6%	6%
	REGION 2	6" to 12"	14%	10%	8%	6%	6%
	REGION 3	6" to 12"	16%	11%	8%	7%	6%
	REGION 4	6" to 12"	19%	12%	10%	7%	6%
	REGION 5	6" to 12"	23%	15%	11%	9%	6%
	REGION 6	6" to 12"	28%	18%	13%	10%	7%
BETTER (95%)	REGION 1	6" to 12"	9%	9%	8%	8%	7%
	REGION 2	6" to 12"	20%	14%	11%	9%	7%
	REGION 3	6" to 12"	22%	15%	12%	10%	7%
	REGION 4	6" to 12"	29%	18%	14%	11%	8%
	REGION 5	6" to 12"	34%	22%	16%	13%	9%
	REGION 6	6" to 12"	42%	27%	19%	15%	10%
BEST (Most All the Water)	REGION 1	6"	13%	10%	9%	9%	8%
		12"	N/A*	10%	9%	8%	8%
	REGION 2	6"	39%	32%	26%	21%	15%
		12"	N/A*	27%	23%	20%	15%
	REGION 3	6"	45%	36%	30%	25%	17%
		12"	N/A*	31%	26%	22%	17%
	REGION 4	6"	54%	43%	34%	27%	18%
		12"	N/A*	36%	31%	25%	17%
	REGION 5	6"	75%	47%	35%	26%	17%
		12"	N/A*	45%	31%	25%	17%
	REGION 6	6"	72%	56%	42%	30%	19%
		12"	N/A*	48%	39%	29%	19%

SIZING FACTORS

*At these low drainage rates, a 12-inch pond will not drain down within 3 days. Use a 6-inch ponding depth.

Excerpt from the *Rain Garden Handbook for Western Washington: A Guide for Design, Installation and Maintenance* (Hinman et al., 2013)

Appendix A
Permit Plans for Civil Site Improvements

PIONEER PARK RESTROOMS UPGRADE

PROJECT DESCRIPTION

SCOPE OF WORK:

THIS PROJECT INVOLVES A 1,200 SF RENOVATION/ EXPANSION TO AN EXISTING RESTROOM BUILDING WITHIN THE CITY OF PUYALLUP'S PIONEER PARK. ORIGINALLY CONSTRUCTED IN 1994, THE EXISTING BUILDING IS APPROXIMATELY 21' x 28'. THE RENOVATION WILL ENSURE A STRUCTURE THAT WILL SERVE A LARGER POPULATION AND ONE THAT WILL SIT IN COHESION WITH THE OTHER EXISTING STRUCTURES LOCATED AT THE SITE. SITE WORK INCLUDES SUMP PUMP REPLACEMENT, NEW/ MODIFIED WALKWAYS, AND UTILITIES.

SITE & BUILDING INFORMATION

EXISTING SITE AREA: 137,100 SF (UNCHANGED)
EXISTING BUILDING AREA: 535 SF
PROPOSED ADDITION AREA: 665 SF
TOTAL RENOVATION/ ADDITION AREA: 1,200 SF
CONSTRUCTION TYPE: VB
OCCUPANCY TYPE: U
SPRINKLER: N (EXEMPT)
EXISTING LAVATORIES: 2
PROPOSED LAVATORIES: 8
EXISTING WATER CLOSET/ URINAL: 4
PROPOSED WATER CLOSET/ URINAL: 13

GOVERNING CODES

PUYALLUP MUNICIPAL CODE

2018 INTERNATIONAL BUILDING CODE W/ WA STATE AMENDMENTS

2018 INTERNATIONAL EXISTING BUILDING CODE W/ WA STATE AMENDMENTS

ICC/ ANSI 117.1 - 2009 ACCESSIBILITY CODE

2018 WA STATE ENERGY CODE

2018 INTERNATIONAL MECHANICAL CODE

2018 UNIFORM PLUMBING CODE

2016 NFPA STANDARD 72

2016 NFPA STANDARD 13, 13-D, 13-R

2018 INTERNATIONAL FIRE CODE

SHEET INDEX

GENERAL NOTES

1. THE CONTRACT DOCUMENTS ARE COMPRISED OF THE DRAWINGS, SPECIFICATIONS, PROJECT MANUAL AND ADDENDA (IF ANY). THE CONTRACT DOCUMENTS ARE CONSIDERED INCOMPLETE UNLESS ALL ELEMENTS LISTED ARE PRESENT.

2. ALL WORK SHALL COMPLY WITH APPLICABLE CODES AND ORDINANCES. IN THE CASE OF A CONFLICT BETWEEN ANY ASPECT OF THE CONTRACT DOCUMENTS AND ANOTHER, CONTACT THE ARCHITECT IMMEDIATELY FOR DIRECTION.

3. DO NOT SCALE DRAWINGS

4. PERFORM EXCAVATION & FOUNDATION WORK IN CONFORMANCE WITH THE SOILS REPORT AND CONSTRUCTION DOCUMENTS

5. DRAWINGS INDICATE GENERAL & TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER, TYPICAL DETAILS SHALL APPLY.

PROJECT TEAM

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VICINITY MAP

PROJECT SITE

N.T.S. NORTH

LEGEND

ROOM NAME: 101 — ROOM NAME, ROOM NUMBER

DIMENSION POINT OR ELEVATION

PARTITION TYPE - SEE A7.1

DOOR NUMBER SEE A7.2

EXTERIOR ELEVATION: 1 Ref, A101 — DRAWING #, SHEET #

INTERIOR ELEVATION: 1 Ref, A101 — DRAWING #, SHEET #

BUILDING SECTION: 3, A1.1 — DRAWING #, SHEET #

BUILDING SECTION: 1, A1.1 — DRAWING #, SHEET #

DETAILS: 1, A1.1 — DETAIL #, SHEET #

DETAILS THAT ARE SIMILAR TO THE DETAIL SHOWN: 1, A1.1 SIM. — DETAIL #, SHEET #

DETAILS THAT ARE TYPICAL AND WILL OCCUR IN MULTIPLE LOCATIONS: 1, A1.1 TYP. — DETAIL #, SHEET #

CODE ANALYSIS

1

2018 WASHINGTON STATE BUILDING CODE ANALYSIS

CHAPTER 3 - OCCUPANCY CLASSIFICATION AND USE
PROPOSED CLASSIFICATION GROUPS:
U UTILITY AND MISCELLANEOUS GROUP U (SECTION 312)

CHAPTER 5 - GENERAL BUILDING HEIGHTS AND AREAS
TABLE 504.3 - ALLOWABLE BUILDING HEIGHT IN FEET ABOVE GRADE PLANE
OCCUPANCY CLASSIFICATION(S): U
SPRINKLERED BUILDING: N
TYPE OF CONSTRUCTION: VB
MAXIMUM HEIGHT ALLOWABLE: 40 '
HEIGHT PROPOSED: 14'

TABLE 504.4 ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE
GROUP U : 1

TABLE 506.2 - ALLOWABLE AREA FACTOR
OCCUPANCY CLASSIFICATION: U
SPRINKLERED BUILDING: N
TYPE OF CONSTRUCTION: VB
ALLOWABLE AREA FACTOR: 5,500 SF
PROPOSED AREA: 1,200 SF

CHAPTER 6 - TYPES OF CONSTRUCTION
SECTION 602.5 TYPE V - PROPOSED CONSTRUCTION VB

TABLE 601 - FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS) FOR TYPE VB:

PRIMARY STRUCTURAL FRAME:	0HR
BEARING WALLS:	0HR
NONBEARING WALLS, EXTERIOR:	0HR
NONBEARING WALLS, INTERIOR:	0HR
FLOOR CONSTRUCTION:	0HR
ROOF CONSTRUCTION:	0HR

TABLE 602 - FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE FOR TYPE VB:
X > 30'-0" FOR ALL BUILDINGS/ALL OCCUPANCIES ON SITE: REQUIRED RATING=0

CHAPTER 7 - FIRE AND SMOKE PROTECTION FEATURES
SECTION 705.8 - MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION.
FIRE SEPARATION DISTANCE > 30' TYP; THEREFORE NO LIMIT ON OPENING AREA IN UNPROTECTED, NON-SPRINKLERED

1

CHAPTER 8 - INTERIOR FINISHES
TABLE 803.11 - INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY
GROUP U, NON-SPRINKLERED, ROOMS AND ENCLOSED SPACES: NO RESTRICTIONS

CHAPTER 9 - FIRE PROTECTION AND LIFE SAFETY SYSTEMS
903.2.11 SPECIFIC BUILDING AREAS AND HAZARDS. - IN ALL OCCUPANCIES OTHER THAN GROUP U, AN AUTOMATIC SPRINKLER SYSTEM SHALL BE INSTALLED FOR BUILDING DESIGN OR HAZARDS IN THE LOCATIONS

CHAPTER 11 - ACCESSIBILITY
SECTION 1103.2.9 - EQUIPMENT SPACES:
SPACES FREQUENTED ONLY BY PERSONNEL FOR MAINTENANCE, REPAIR OR MONITORING OF EQUIPMENT ARE NOT REQUIRED TO BE ACCESSIBLE. SUCH SPACES INCLUDE, BUT ARE NOT LIMITED TO, ELEVATOR PITS, ELEVATOR PENTHOUSES, MECHANICAL, ELECTRICAL OR COMMUNICATIONS EQUIPMENT ROOM.

ROOM PROPOSED AS EQUIPMENT SPACES: CHASE 05

PUYALLUP MUNICIPAL CODE ANALYSIS

ZONING CLASSIFICATION & PROPOSED USES
ZONE: PF PUBLIC FACILITIES ZONE (20.44.000)

20.44.020 PROPERTY DEVELOPMENT STANDARDS – PF ZONE
MINIMUM LOT SIZE: NONE
MINIMUM LOT WIDTH: NONE
MINIMUM LOT DEPTH: NONE

MINIMUM FRONT YARD SETBACK: 20 FEET MIN, 331 FEET PROVIDED
MINIMUM REAR YARD SETBACK: 20 FEET, 15 FEET PROVIDED
MINIMUM SIDE YARD SETBACK: 20 FEET, 116 & 120 FEET PROVIDED

PARCEL NUMBER: 5745001680
PARCEL TYPE: BASE PARCEL
ZONING ORDINANCE: 2813
ZONING ORDINANCE DESCRIPTION: REDZONE
USE CODE: 6700
TAX AREA CODE: 096
LAND USE DESCRIPTION: GOVERNMENTAL SERVICES

WASHINGTON STATE ENERGY CODE (2018) ANALYSIS

C402 – BUILDING ENVELOPE REQUIREMENTS
C402.1 GENERAL BUILDING THERMAL ENVELOPE ASSEMBLIES FOR BUILDINGS THAT ARE INTENDED TO COMPLY WITH THE CODE ON A PRESCRIPTIVE BASIS, IN ACCORDANCE WITH THE COMPLIANCE PATH DESCRIBED IN ITEM 1 OF SECTION C401.2, SHALL COMPLY WITH THE FOLLOWING.
1. THE OPAQUE PORTIONS OF THE BUILDING THERMAL ENVELOPE SHALL COMPLY WITH THE SPECIFIC INSULATION REQUIREMENTS OF SECTION C402.2 AND THE THERMAL REQUIREMENTS OF EITHER THE R-VALUE BASED METHOD OF SECTION C402.1.3, THE U-, C- AND F-FACTOR BASED METHOD OF SECTION C402.1.4, OR THE COMPONENT PERFORMANCE ALTERNATIVE OF SECTION C402.1.5.
A. ROOFS (INSULATION ENTIRELY ABOVE DECK)– R-38CI PROVIDED (R-38CI REQUIRED)
B. WALLS, ABOVE GRADE (WOOD FRAMED AND OTHER – R-18+10CI STD PROVIDED (R-15+5CI STD REQUIRED)
C. WALLS, BELOW GRADE – N/A
D. SLAB-ON-GRADE FLOORS (UNHEATED SLABS) – R-10 FOR 24" BELOW PROVIDED (R-10 FOR 24" BELOW REQUIRED)
E. OPAQUE DOORS – R-4.75 PROVIDED (R-4.75 REQUIRED)
2. FENESTRATION IN THE BUILDING ENVELOPE ASSEMBLIES SHALL COMPLY WITH SECTION C402.4, OR THE COMPONENT PERFORMANCE ALTERNATIVE OF SECTION C402.1.5.
A. FIXED U-FACTOR – U 0.38 PROVIDED (U-0.38 REQUIRED)
B. ENTRANCE DOORS – N/A
C. SKYLIGHTS U-FACTOR – U-0.50 PROVIDED (U-0.50 REQUIRED)
D. MAXIMUM AREA (VERTICAL FENESTRATION)– 30% OF TOTAL BUILDING GROSS ABOVE-GRADE WALL AREA MAX (14.24% 1875F/1,313SF)
E. MAXIMUM AREA (HORIZONTAL FENESTRATION) – 5% SKYLIGHT TO ROOF AREA MAX (3.63% 525F/1,434SF)
3. AIR LEAKAGE OF BUILDING ENVELOPE ASSEMBLIES SHALL COMPLY WITH SECTION C402.5. - PROVIDED

ABBREVIATIONS

℄	ANGLE	D.F.	DRINKING FOUNTAIN	F.O.F.	FACE OF FOUNDATION	L.F.	LINEAL FEET	PTD.	PAINTED	SV	SHEET VINYL
℄	CENTER LINE	D.H.	DOUBLE HUNG	F.O.I.C.	FURNISHED BY OWNER / INSTALLED BY CONTRACTOR	LT.WT.	LIGHT WEIGHT	PTN.	PARTITION	SYM.	SYMMETRICAL
#	NUMBER	DIM.	DIMENSION					P.V.C.	POLYVINYL CHLORIDE PIPE	SYS.	SYSTEM
℄	PROPERTY LINE	DISP.	DISPENSER	F.O.I.O	FURNISHED BY OWNER/ INSTALLED BY OWNER	MAS.	MASONRY				
		DIV.	DIVISION			M.B.	MACHINE BOLT	Q.T.	QUARRY TILE	T.	TREAD
A.B.	ANCHOR BOLT	DN.	DOWN	F.O.M	FACE OF MASONRY	M.B.	MARKER BOARD			TB	TACK BOARD
A/C	AIR CONDITIONING	DR.	DOOR	F.O.S.	FACE OF STUD OR STRUCTURE	M.D.F.	MEDIUM DENSITY FIBERBOARD	R.	RADIUS, RISER	T.O.C.	TOP OF CURB
A.C.T.	ACOUSTICAL TILE CEILING	D.S.	DOWN SPOUT	F.P.	FIRE PROOF	M.D.O.	MEDIUM DENSITY OVERLAY	REF.	REFRIENCE)	TEL.	TELEPHONE
ADJ.	ADJACENT	DWG.	DRAWING			M.D.X.	MEDIUM DENSITY EXTERIOR OVERLAY	REFR.	REFRIGERATOR	TER	TERRAZZO
A.F.F.	ABOVE FINISH FLOOR			GA.	GUAGE	MECH.	MECHANICAL	REINF.	REINFORCED	T.O.P.	TOP OF PLATE OR PAVEMENT
ALT.	ALTERNATE	E	EAST (COORDINATE)	GALV.	GALVANIZED	MEMB.	MEMBRANE	RESIL.	RESILIENT	T.P.D.	TOILET PAPER DISPENSER
ARCH.	ARCHITECT(URAL)	EA.	EACH	G.C.	GENERAL CONTRACTOR	MFG.	MANUFACTURING	REV.	REVISION, REVISED	T.O.W.	TOP OF WALL
AVG.	AVERAGE	E.B.	EXPANSION BOLT	GLULAM	GLUE LAMINATED	MFR.	MANUFACTURER	R.O.	ROUGH OPENING	TYP.	TYPICAL
A.W.P.	ACOUSTICAL WALL PANEL	E.J.	EXPANSION JOINT	GND.	GROUND	MIN.	MINIMUM	RWL	RAIN WATER LEADER		
		ELEC.	ELECTRICAL	GR.	GRADE	MIR.	MIRROR			UNF.	UNFINISHED
BD.	BOARD	ELEV.	ELEVATION	G.W.B.	GYPSUM WALLBOARD	M.O.	MASONRY OPENING	S.	SOUTH	U.O.N.	UNLESS OTHERWISE NOTED
BLK'G.	BLOCKING	ENCL.	ENCLOSURE			MTL.	METAL	SAM	SELF-ADHERED MEMBRANE		
BOT.	BOTTOM	EQ.	EQUAL	H.B.	HOSE BIB			S.C.	SOLID CORE	V.	VENT
		EQUIP.	EQUIPMENT	H.C.	HOLLOW CORE	N.	NORTH	S.C.D.	SEAT COVER DISPENSER	V.B.	VAPOR BARRIER
CAB.	CABINET	E.W.C.	ELECTRIC WATER COOLER	HDBD.	HARDBOARD	N.I.C.	NOT IN CONTRACT	S.D.	SOAP DISPENSER, STORM DRAIN	V.C.T.	VINYL COMPOSITION TILE
C.B.	CATCH BASIN	EXT.	EXTERIOR	HDR.	HEADER	NOM.	NOMINAL	S.F.	SQUARE FEET		
C.F.	CUBIC FEET			HDWR.	HARDWARE	N.T.S.	NOT TO SCALE	SHT.	SHEET	W.	WEST, EIDTH
C.J.	CONTROL JOINT	F.A.	FIRE ALARM	HDWD.	HARDWOOD			SHWR.	SHOWER	W.C.	WATER CLOSET
CLG.	CEILING	F.C.O.	FLOOR CLEANOUT	H.M.	HOLLOW METAL	O.C.	ON CENTER	SIM.	SIMILAR	WD.	WOOD
CLR.	CLEAR(ANCE)	F.D.	FLOOR DRAIN	H.V.A.C	HEATING / VENTILATION / AIR CONDITIONING	O.H.	OPPOSITE HAND	S.N.D.	SANITARY NAPKIN DISPENSER	WDW.	WINDOW
C.M.U.	CONCRETE MASONRY UNIT	F.E.	FIRE EXTINGUISHER			OPNG.	OPENING	S.N.R.	SANITARY NAPKIN RECEPACLE	W.G.	WIRED GLASS
C.O.	CLEAN OUT	F.E.C.	FIRE EXTINGUISHER CABINET			OPP.	OPPOSITE	S.S.	STAINLESS STEEL	W.H.	WATER HEATER
COL.	COLUMN	F.F.	FINISH FLOOR	I.D.	INSIDE DIAMETER (DIM.)			STL.	STEEL	WIN.	WINDOW
CONC.	CONCRETE	F.F.E.	FINISH FLOOR ELEVATION	INSUL.	INSULATED / INSULATION	PERF.	PERFORATED	STA.	STATION	W.P.	WATER PROOF(ING)
CONT.	CONTINUOUS	F.S.	FROM SLAB	INT.	INTERIOR	P.L.	PROPERTY LINE	S.T.C	SOUND TRANSMISSION CLASS	W.R.	WATER RESISTANT
COORD.	COORDINATE	F.H.	FIRE HYDRANT			P-LAM.	PLASTIC LAMINATE	ST.S.	STANDING SEAM	WT.	WEIGHT
CPT.	CARPET	FIN.	FINISH	JT.	JOINT	PR.	PAIR	SUB.	SUBSTITUTE	W.W.F.	WELDED WIRE FABRIC
C.T.	CERAMIC TILE	FND.	FOUNDATION	KIT.	KITCHEN	PT.	PINT, POINT	SUSP.	SUSPENDED	W.O.M.	WALK OFF MAT
C.Y.	CUBIC YARDS	F.O.C.	FACE OF CONCRETE	LAF	LIQUID-APPLIED MEMBRANE FLASHING	P.T.	PRESSURE TREATED				

arc architecture resource collaborative
119 MAIN ST, STE #200
SEATTLE, WA 98104-2579
(206) 322-3322

10135 REGISTERED ARCHITECT
JEFFREY JOSEPH WANDASIEWICZ
STATE OF WASHINGTON

CITY OF PUYALLUP STATE OF WASHINGTON

PIONEER PARK RESTROOMS UPGRADE

324 S MERIDIAN
PUYALLUP, WA 98371

PERMIT
REVISIONS #1

ISSUE DATE: OCTOBER 7, 2022

REVISION	DATE	DESCRIPTION
R1	OCT. 7, 2022	PERMIT REVISIONS #1

CONTENTS:

PROJECT INFO

SCALE: 1/4" = 1'-0"
DRAWN: AP
CHECKED: JW
PROJECT NO: 2021016.000

SHEET:

T1.0

TOPOGRAPHIC SURVEY

NE 1/4 SE 1/4 SEC. 28, T20N, R4E, W.M. PIERCE COUNTY, WASHINGTON

LEGAL DESCRIPTION

PARCEL A

LOTS 7 TO 11, INCLUSIVE, BLOCK 18, MEEKER'S SECOND ADDITION TO THE TOWN OF PUYALLUP, W.T., ACCORDING TO PLAT RECORDED IN BOOK 2 OF PLATS AT PAGE 93, IN PIERCE COUNTY, WASHINGTON.

TOGETHER WITH THOSE PORTIONS OF VACATED 2ND ST. SW AND ELM ST. ABUTTING THEREON, PURSUANT TO ORDINANCE NO. 2682 OF THE CITY OF PUYALLUP.

PARCEL B

A TRACT OF LAND BOUNDED ON THE NORTH BY ELM PLACE, ON THE EAST BY MERIDIAN STREET, ON THE SOUTH BY PARK AVENUE AND ON THE WEST BY WALNUT STREET, ALL IN MEEKER'S SECOND ADDITION TO THE TOWN OF PUYALLUP, W.T., ACCORDING TO THE PLAT THEREOF RECORDED IN VOLUME 2 OF PLATS, PAGE(S) 93 RECORDS OF PIERCE COUNTY, WASHINGTON;

TOGETHER WITH THOSE PORTIONS OF VACATED 2ND ST. SW AND ELM ST. ABUTTING THEREON, PURSUANT TO ORDINANCE NO. 2682 OF THE CITY OF PUYALLUP.

NOTES

1. HORIZONTAL DATUM: NAD 83/11 WASHINGTON PLANE COORDINATE SYSTEM, SOUTH ZONE.

2. VERTICAL DATUM: NAVD88, BASED UPON GPS DERIVED ELEVATION'S ADJUSTED TO WSDOT GP27512-100.

3. SURVEY PERFORMED USING LEICA 1200 GPS ON THE WSRN NETWORK TO ESTABLISH BASIS OF BEARING OF GRID NORTH, WASHINGTON PLANE COORDINATE SYSTEM, SOUTH ZONE, BETWEEN SET MAG NAILS (G+O NO.'S 4 & 5). ALL OTHER SURVEY WAS PERFORMED USING LEICA 1203 TCRA 3 SECOND TOTAL STATION, USING TRAVERSE AND RADIAL SURVEY METHODS. SURVEY MEETS OR EXCEEDS ACCURACY REQUIREMENTS CONTAINED IN WAC 332-130-090.

4. THIS SURVEY DOES NOT PURPORT TO SHOW ALL EASEMENTS OF RECORD OR OTHERWISE. BOUNDARY LINES, AS ESTABLISHED HEREON FOR THIS SURVEY, ARE FROM DEED DESCRIPTION AND MAY NOT CONFORM TO EXISTING LINES OF OCCUPATION AND/OR FENCE LINES AND COULD RESULT IN POSSIBLE BOUNDARY DISPUTES.

5. FOUND MONUMENTS VISITED IN NOVEMBER OF 2013, UNLESS NOTED OTHERWISE.

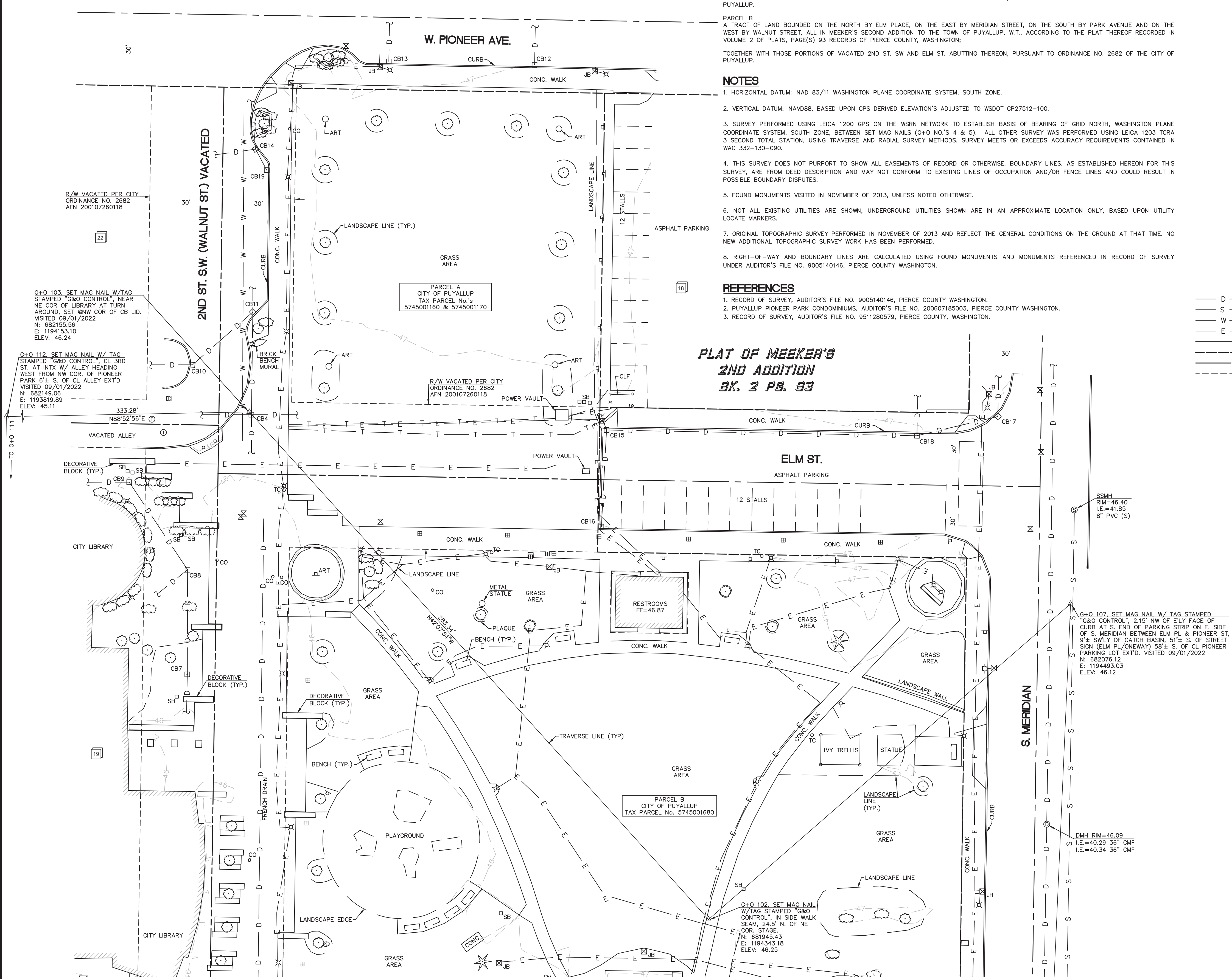
6. NOT ALL EXISTING UTILITIES ARE SHOWN, UNDERGROUND UTILITIES SHOWN ARE IN AN APPROXIMATE LOCATION ONLY, BASED UPON UTILITY LOCATE MARKERS.

7. ORIGINAL TOPOGRAPHIC SURVEY PERFORMED IN NOVEMBER OF 2013 AND REFLECT THE GENERAL CONDITIONS ON THE GROUND AT THAT TIME. NO NEW ADDITIONAL TOPOGRAPHIC SURVEY WORK HAS BEEN PERFORMED.

8. RIGHT-OF-WAY AND BOUNDARY LINES ARE CALCULATED USING FOUND MONUMENTS AND MONUMENTS REFERENCED IN RECORD OF SURVEY UNDER AUDITOR'S FILE NO. 9005140146, PIERCE COUNTY WASHINGTON.

REFERENCES

1. RECORD OF SURVEY, AUDITOR'S FILE NO. 9005140146, PIERCE COUNTY WASHINGTON.
2. PUYALLUP PIONEER PARK CONDOMINIUMS, AUDITOR'S FILE NO. 200607185003, PIERCE COUNTY WASHINGTON.
3. RECORD OF SURVEY, AUDITOR'S FILE NO. 9511280579, PIERCE COUNTY, WASHINGTON.



LEGEND

Symbol	Description
	FOUND MONUMENT IN CASE / SURFACE MONUMENT
	SET LARGE MAG NAIL W/TAG STAMPED "G&O CONTROL"
	WATER VALVE
	WATER METER
	MONITORING WELL
	FIRE HYDRANT
	LIGHT POLE/YARD LIGHT
FP	FLAG POLE
SB	SPRINKLER CONTROL BOX
CB	CATCH BASIN
	DRAIN MANHOLE/TYPE 2 CATCH BASIN
	SEWER MANHOLE
CO	SEWER CLEANOUT
	GAS VALVE
T	PHONE PEDESTAL
	PHONE MANHOLE
JB	ELEC. JUNCTION BOX
TC	TRASH CAN
	SIGN
	DECIDUOUS TREE W/APPROX. DIAMETER
	CONIFEROUS TREE W/APPROX. DIAMETER
	SHRUBS/HEDGE
	TREE STUMP (CARVED AS CHAIR)
	LANDSCAPE ROCK
CLF	CHAIN LINK FENCE
18	BLOCK NUMBER WITHIN PLAT
D D	STORM DRAIN LINE (APPROX. LOCATION) BASED UPON FIELD OBSERVATION
S S	SANITARY SEWER LINE (APPROX. LOCATION) BASED UPON FIELD OBSERVATION
W W	WATER LINE (APPROX. LOCATION) BASED UPON UTILITY PAINT MARK
E E	ELECTRICAL LINE (APPROX. LOCATION) BASED UPON UTILITY PAINT MARK
	CALCULATED RIGHT-OF-WAY CENTERLINE
	CALCULATED RIGHT-OF-WAY LINE
	CALCULATED BOUNDARY LINE
	CALCULATED LOCATION OF VACATED RIGHT-OF-WAY

STORM STRUCTURE'S

CB1 RIM=45.04
I.E.=42.34 6" PVC (N)
I.E.=41.84 8" DI (SW)
I.E.=42.74 4" PVC (S)
I.E.=42.99 2" PVC (E)

CB2 RIM=45.47
I.E.=44.52 3" PVC (N)

CB3
UNABLE TO OPEN

CB4 RIM=46.23
I.E.=40.78 8" PVC (N)
I.E.=40.68 8" CONC (S)
I.E.=42.78 8" CONC (S)
I.E.=42.83 6" DI (W)
I.E.=43.83 4" CONC (E)

CB5 RIM=44.09
I.E.=41.59 6" PVC (NW)
I.E.=40.94 8" PVC (E)

CB6 (TYPE 2) RIM=44.61
I.E.=40.61± 8" PVC (W)
I.E.=40.61± 6" PVC (NW)
I.E.=40.11 12" PVC (N)
I.E.=40.16 12" PVC (S)
I.E.=41.91 12" PVC (E)

CB7 RIM=44.98
I.E.=43.63 6" PVC (N)
I.E.=43.73 6" PVC (S)

CB8 RIM=45.19
I.E.=43.34 6" PVC (NW)
I.E.=43.49 6" PVC (S)
I.E.=43.29 6" PVC (SW)

CB9 RIM=45.92
I.E.=43.02 6" PVC (W)
I.E.=43.12 6" PVC (SE)

CB10 RIM=45.04
I.E.=41.74 8" PVC (NE)
I.E.=41.64 8" PVC (W)

CB11 RIM=46.14
I.E.=41.24 8" PVC (N)
I.E.=41.14 8" PVC (S)
I.E.=41.04 8" PVC (SW)

CB12 RIM=46.53
I.E.=44.03 8" PVC (N)

CB13 RIM=46.08
I.E.=42.53 8" PVC (N)

CB14 RIM=45.86
I.E.=41.46 12" DI (N)
I.E.=41.61 8" ADS (SE)
I.E.=41.51 8" ADS (W)

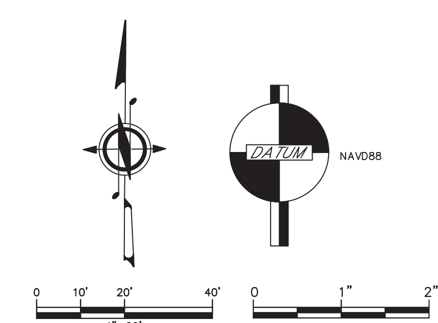
CB15 RIM=46.19
I.E.=44.59 6" PVC (S)
I.E.=44.49 8" CONC (E)
I.E.=44.44 12" CONC (N/NW)

CB16 RIM=45.99
I.E.=44.69 6" PVC (N)

CB17 RIM=46.23
I.E.=42.08 12" CONC (N)
I.E.=42.18 12" CONC (W)

CB18 RIM=46.46
I.E.=42.08 12" CONC (N)
I.E.=42.18 12" CONC (W)

CB19 RIM=45.86
I.E.=42.11 8" ADS (NW)



TWO INCHES AT FULL SCALE.
IF NOT, SCALE ACCORDINGLY

Gray & Osborne, Inc.
CONSULTING ENGINEERS
1130 RAINIER AVENUE SOUTH, SUITE 300
SEATTLE, WASHINGTON 98144 (206) 284-0860

DATE: 9/13/2022
SCALE: NOTED
DRAWN: RB
CHECKED:
APPROVED:

No.	REVISION	DATE	APP'D

CITY OF PUYALLUP
PIERCE COUNTY WASHINGTON

TOPOGRAPHIC SURVEY
PIONEER PARK IMPROVEMENTS
SURVEY PLAN

SHEET: 1 OF: 2

JOB NO.: 13569/22583
DWG: 13569 TOPO.DWG

CITY GENERAL 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 APPROVED ENGINEERING PLANS, REPRESENTATIVES FROM ALL APPLICABLE UTILITY COMPANIES, THE PROJECT OWNER AND APPROPRIATE CITY STAFF. CONTACT ENGINEERING SERVICES AT (253-841-5568) TO SCHEDULE THE MEETING. THE CONTRACTOR IS RESPONSIBLE TO HAVE THEIR OWN SET OF APPROVED 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 CITY 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 THAT REQUIRES REMOVAL OR RELOCATION RELATING TO THIS PROJECT SHALL BE DONE SO AT THE DEVELOPER'S EXPENSE.
8. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE TRUE ELEVATIONS AND LOCATIONS OF HIDDEN UTILITIES. ALL VISIBLE ITEMS SHALL BE THE ENGINEER'S RESPONSIBILITY.
9. THE CONTRACTOR SHALL INSTALL, REPLACE, OR RELOCATE ALL SIGNS, AS SHOWN ON THE PLANS OR AS AFFECTED BY CONSTRUCTION, PER CITY STANDARDS.
10. POWER, STREET LIGHT, CABLE, AND TELEPHONE LINES SHALL BE IN A TRENCH LOCATED WITHIN A 10-FOOT UTILITY EASEMENT ADJACENT TO PUBLIC RIGHT-OF-WAY. RIGHT-OF-WAY CROSSINGS SHALL HAVE A MINIMUM HORIZONTAL SEPARATION FROM OTHER UTILITIES (SEWER, WATER, AND STORM) OF 5 FEET.
11. ALL CONSTRUCTION SURVEYING FOR EXTENSIONS OF PUBLIC FACILITIES SHALL BE DONE UNDER THE DIRECTION OF A WASHINGTON STATE LICENSED LAND SURVEYOR OR A WASHINGTON STATE LICENSED PROFESSIONAL CIVIL ENGINEER.
12. DURING CONSTRUCTION, ALL PUBLIC STREETS ADJACENT TO THIS PROJECT SHALL BE KEPT CLEAN OF ALL MATERIAL DEPOSITS RESULTING FROM ON-SITE CONSTRUCTION, AND EXISTING STRUCTURES SHALL BE PROTECTED AS DIRECTED BY THE CITY.
13. CERTIFIED RECORD DRAWINGS ARE REQUIRED PRIOR TO PROJECT ACCEPTANCE.
14. A NPDES STORMWATER GENERAL PERMIT MAY BE REQUIRED BY THE DEPARTMENT OF ECOLOGY FOR THIS PROJECT. FOR INFORMATION CONTACT THE DEPARTMENT OF ECOLOGY, SOUTHWEST REGION OFFICE AT (360)407-6300.
15. ANY DISTURBANCE OR DAMAGE TO CRITICAL AREAS AND ASSOCIATED BUFFERS, OR SIGNIFICANT TREES DESIGNATED FOR PRESERVATION AND PROTECTION SHALL BE MITIGATED IN ACCORDANCE WITH A MITIGATION PLAN REVIEWED AND APPROVED BY THE CITY'S PLANNING DIVISION. PREPARATION AND IMPLEMENTATION OF THE MITIGATION PLAN SHALL BE AT THE DEVELOPER'S EXPENSE

CITY 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.

CITY ROADWAY 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 REQUIRES REMOVAL OR RELOCATION RELATING TO THIS PROJECT, SHALL BE DONE SO AT THE DEVELOPER'S EXPENSE.
8. NOT USED.
9. CURB AND GUTTER INSTALLATION SHALL CONFORM TO CITY STANDARD DETAIL 01.02.09.
10. SIDEWALKS AND DRIVEWAYS SHALL BE INSTALLED AS LOTS ARE BUILT ON. SIDEWALKS AND DRIVEWAYS SHALL CONFORM TO CITY STANDARD DETAIL 01.02.01, 01.02.02 AND 01.02.12. IF ASPHALT IS DAMAGED DURING REPLACEMENT OF CURB AND GUTTER, THE REPAIR SHALL CONFORM TO CITY STANDARD DETAIL 01.02.10.
11. NOT USED.
12. NOT USED.
13. PRIOR TO ANY SIGN OR STRIPING INSTALLATION OR REMOVAL THE CONTRACTOR SHALL CONTACT THE CITY SIGN SPECIALIST (253) 841-5471 TO ARRANGE FOR AN ON-SITE MEETING TO DISCUSS PLACEMENT AND UNIFORMITY.
14. NEW OR REVISED STOP SIGNS OR YIELD SIGNS SHALL BE ADVANCE WARNED USING THE PROCEDURE OUTLINED IN THE MUTCD. ADVANCE WARNING SIGNS AND FLAGS SHALL BE MAINTAINED BY INSTALLER FOR 30 DAYS AND THEN REMOVED.

CITY SANITARY SEWER 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 SEWER 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. NOT USED.
9. SIDE SEWERS SHALL BE INSTALLED IN ACCORDANCE WITH CITY STANDARD AND THE DETAILS IN THE PLANS. SIDE SEWER INSTALLATION WORK SHALL BE DONE IN ACCORDANCE WITH THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT (WISHA).
10. ALL SEWER PIPE SHALL BE PVC, POLYPROPYLENE, OR DUCTILE IRON. PVC SEWER PIPE SHALL CONFORM TO ASTM D-3034, SDR35 FOR PIPE SIZES 15-INCH AND SMALLER AND ASTM F679 FOR PIPE SIZES 18- TO 27-INCH, DUCTILE IRON PIPE SHALL BE CLASS 51 OR GREATER, LINED WITH PROTECTO 401TM EPOXY LINING OR EQUIVALENT, UNLESS OTHERWISE NOTED. 12-INCH THROUGH 30-INCH POLYPROPYLENE PIPE (PP) SHALL BE DUAL WALLED, HAVE A SMOOTH INTERIOR AND EXTERIOR CORRUGATIONS AND MEET WSDOT 9-05.24(2). IT SHALL MEET OR EXCEED ASTM F2764. 36-INCH THROUGH 60-INCH PP PIPE SHALL BE TRIPLE WALLED AND MEET WSDOT 9-05.24(2). IT SHALL MEET OR EXCEED ASTM F2764. PP SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PII WHEN TESTED IN ACCORDANCE WITH ASTM D2412. TESTING SHALL BE PER ASTM F1417. TRENCHING, BEDDING, AND BACKFILL SHALL BE IN ACCORDANCE WITH CITY STANDARD NO. 06.01.01. MINIMUM COVER ON PVC AND PP PIPE SHALL BE 3.0 FEET. MINIMUM COVER ON DUCTILE IRON PIPE SHALL BE 1.0 FOOT.
11. NOT USED.
12. NOT USED.
13. NOT USED.
14. NOT USED.
15. NOT USED.
16. ONCE SEWER AND ALL OTHER UTILITY CONSTRUCTION IS COMPLETED, ALL SANITARY SEWER MAINS AND SIDE SEWERS SHALL BE TESTED PER SECTION 406 OF THE CITY STANDARDS.

CITY STORM DRAINAGE 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. NOT USED.
10. NOT USED.
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 GRATE TO THE INVERT OF THE STORM PIPE.
12. NOT USED.
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.

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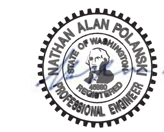


PIONEER PARK RESTROOM UPDATES

324 S MERIDIAN
PUYALLUP, WA 98371

PERMIT SET

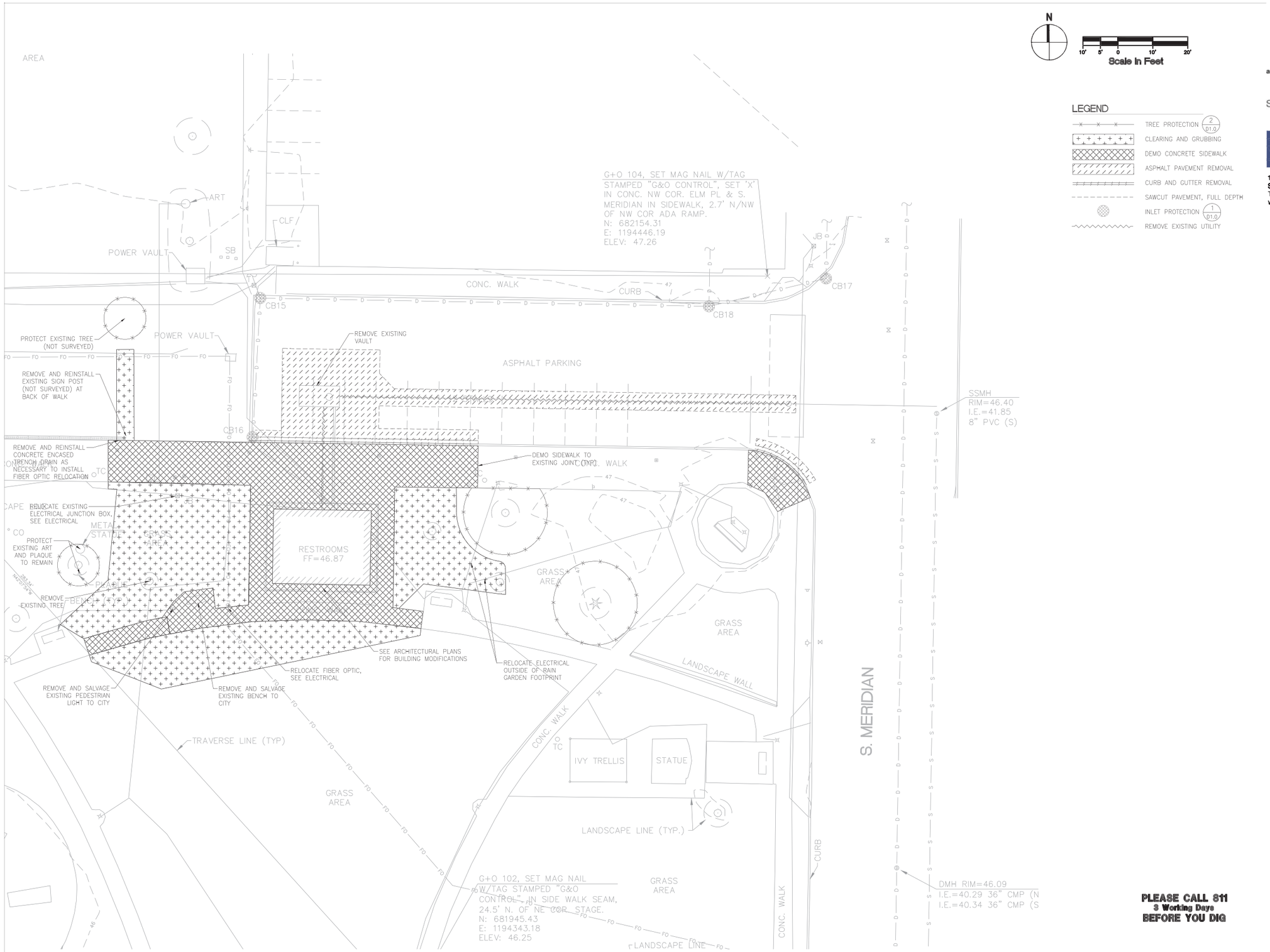
ISSUE DATE: NOVEMBER 3, 2022

REVISION	DATE	DESCRIPTION
1	08/12/2022	PERMIT REVISIONS #1

CONTENTS:
CITY OF PUYALLUP GENERAL NOTES

SCALE:	AS SHOWN
DRAWN:	AT
CHECKED:	MD
PROJECT NO:	0000000.00

SHEET:
G1.0



N

10' 5' 0 10' 20'

Scale In Feet

LEGEND

- TREE PROTECTION (2 / D1.0)
- CLEARING AND GRUBBING
- DEMO CONCRETE SIDEWALK
- ASPHALT PAVEMENT REMOVAL
- CURB AND GUTTER REMOVAL
- SAWCUT PAVEMENT, FULL DEPTH
- INLET PROTECTION (1 / D1.0)
- REMOVE EXISTING UTILITY

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PIONEER PARK RESTROOM UPDATES

324 S MERIDIAN
PUYALLUP, WA 98371

PERMIT SET

ISSUE DATE: NOVEMBER 3, 2022

REVISION	DATE	DESCRIPTION

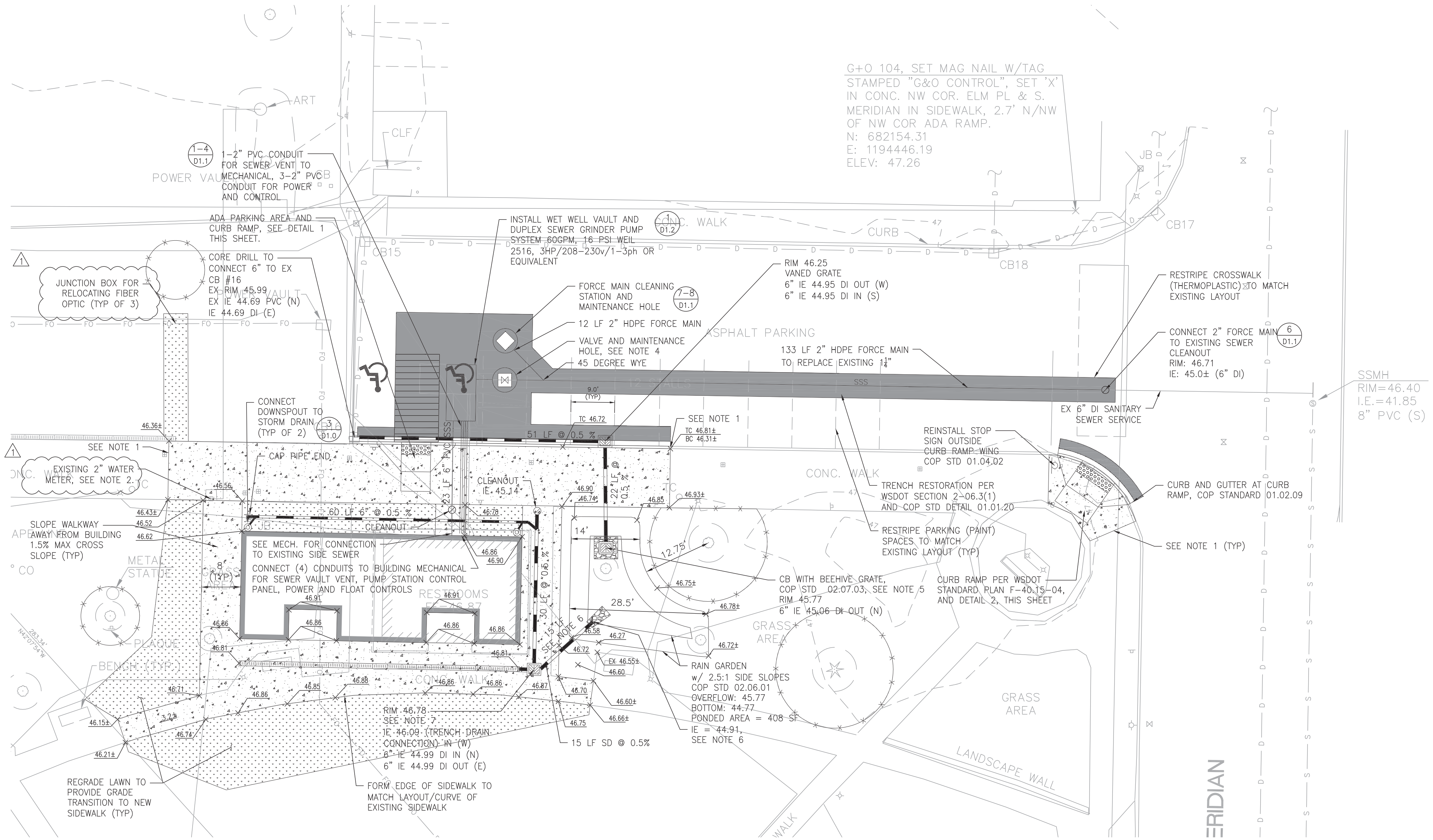
CONTENTS:

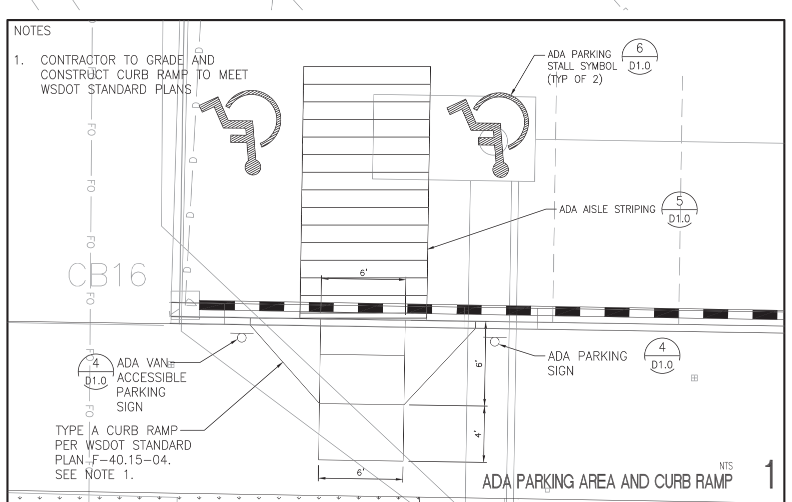
DEMO AND TESC PLAN

SCALE:	1" = 10'-0"
DRAWN:	AT
CHECKED:	MD
PROJECT NO:	0000000.00

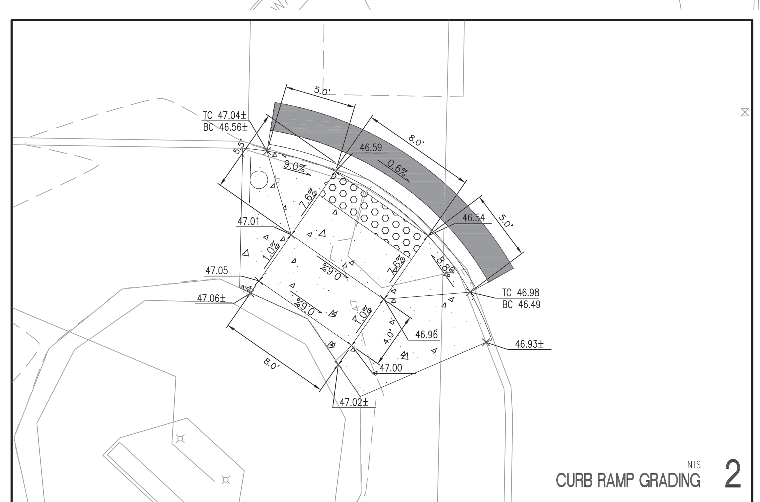
SHEET:

C1.0





ADA PARKING AREA AND CURB RAMP 1



CURB RAMP GRADING 2

Scale In Feet

LEGEND

- PROPOSED BUILDING
- TREE PROTECTION (2 / D1.0)
- SPOT ELEVATION
- SANITARY SEWER SERVICE
- CLEANOUT (8 / D1.0)
- 6" DUCTILE IRON STORM DRAIN
- TYPE 1 CATCH BASIN
- BUILDING DOWNSPOUT
- ASPHALT PAVEMENT COP STD 01.01.20
- CONCRETE SIDEWALK COP STD 01.02.01
- CURB AND GUTTER RESTORATION
- SEEDED LAWN, SEE HAND SEEDING SPECIFICATION
- TRENCH DRAIN

NOTES:

1. REPLACE SIDEWALK OR CURB TO EXISTING JOINT (TYP).
2. EXISTING WATER METER AND SERVICE (NOT SURVEYED) TO REMAIN. SEE MECHANICAL FOR BACKFLOW PREVENTION ASSEMBLY, WHICH IS LOCATED INSIDE THE BUILDING.
3. MAINTAIN POSITIVE DRAINAGE ACROSS NEW AND REPLACED SIDEWALK AND RESTORED SEEDED LAWN AREAS
4. MAINTENANCE HOLE AND VAVE SHALL BE PER NOTES 1-9 AND 11-12 OF DETAIL 8, SHEET D1.1.
5. PROVIDE 12" WIDTH OF COBBLES AROUND ENTIRE PERIMETER OF BEEHIVE GRATE SIMILAR TO COP STANDARD 02.07.03
6. BEVEL END OF PIPE AND INSTALL COBBLE PAD AT PIPE OUTLET TO RAIN GARDEN PER DETAIL 7, D1.0
7. PROVIDE SOLID, LOCKING, SLIP RESISTANT COVER FOR CATCH BASIN IN CONCRETE SIDEWALK

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PIONEER PARK RESTROOM UPDATES

324 S MERIDIAN
PUYALLUP, WA 98371

PERMIT SET

ISSUE DATE: NOVEMBER 3, 2022

REVISION	DATE	DESCRIPTION
1	06/08/2022	PERMIT REVISIONS #1

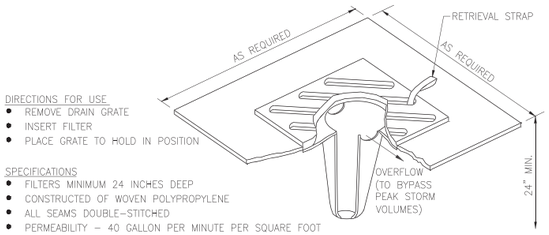
CONTENTS:

PAVING, GRADING, AND UTILITY PLAN

SCALE:	1" = 10'-0"
DRAWN:	AT
CHECKED:	MD
PROJECT NO:	0000000.00

SHEET:

C2.0

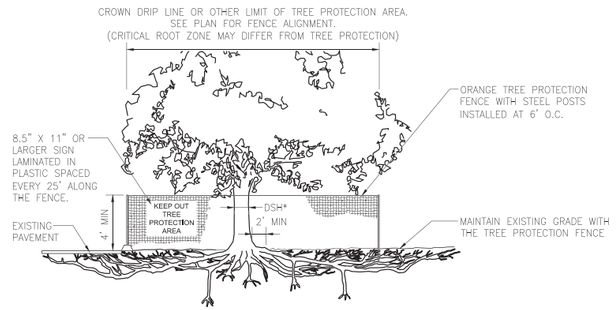


DIRECTIONS FOR USE
- REMOVE DRAIN GRATE
- INSERT FILTER
- PLACE GRATE TO HOLD IN POSITION

SPECIFICATIONS
- FILTERS MINIMUM 24 INCHES DEEP
- CONSTRUCTED OF WOVEN POLYPROPYLENE
- ALL SEAMS DOUBLE-STITCHED
- PERMEABILITY – 40 GALLON PER MINUTE PER SQUARE FOOT
- REUSABLE OR THROW-AWAY

MAINTENANCE
- REMOVE WHEN FILLED TO HALF-WAY MARK (USE FRONT LOADER OR OTHER EQUIPMENT FOR REMOVAL)
- CLEAN AND RE-USE, OR REPLACE

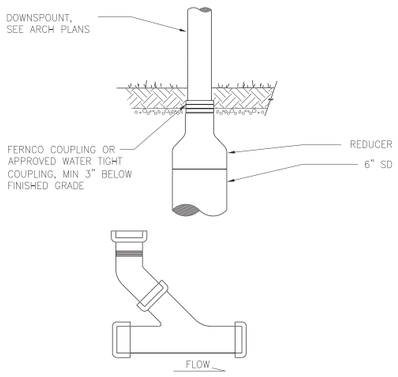
NTS 1 Storm Drain Inlet Protection



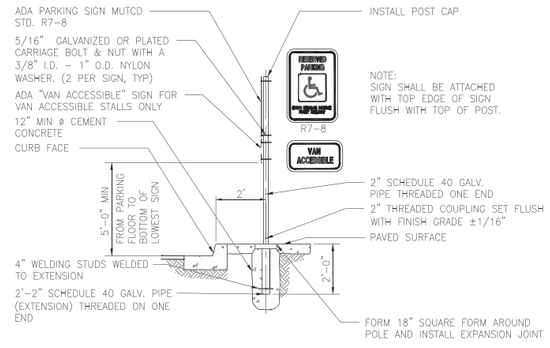
NOTES:

1. SEE SPECIFICATIONS FOR ADDITIONAL TREE PROTECTION REQUIREMENTS.
2. ALL PRUNING SHALL BE PERFORMED BY APPROVED ISA CERTIFIED ARBORIST.
3. NO EQUIPMENT SHALL OPERATE INSIDE THE PROTECTIVE ZONE FENCE AREA INCLUDING DURING FENCE INSTALLATION AND REMOVAL.
4. EQUIPMENT OR STORAGE SHALL NOT OCCUR WITHIN 10' OF TREE PROTECTION FENCE OR WITHIN SPECIFIED CRITICAL ROOT ZONE.
5. DSH* – DIAMETER OF TRUNK AT STANDARD HEIGHT.

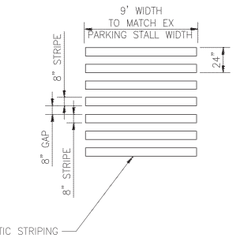
NTS 2 Tree Protection and Protection Fencing



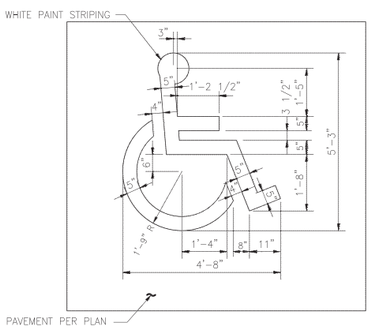
NTS 3 Downspout Connectin to Storm Drain



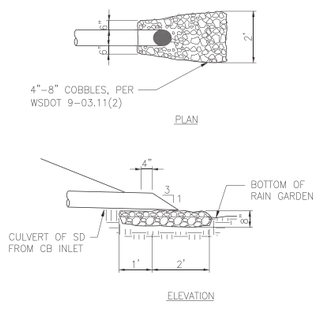
NTS 4 ADA Parking Sign



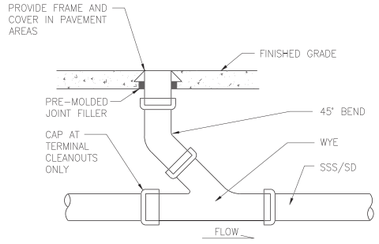
NTS 5 ADA Aisle Striping



NTS 6 ADA Parking Stall Striping



NTS 7 Pipe Inlet at Rain Garden



NOTE:
1. DOCUMENT LOCATION OF CLEANOUT AND INVERT ELEVATION AT CLEANOUT ON AS-BUILTS.

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NTS 8 Cleanout

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NATHAN ALAN POLANSKY — STATE OF WASHINGTON — PROFESSIONAL ENGINEER

PIONEER PARK RESTROOM UPDATES

324 S MERIDIAN
PUYALLUP, WA 98371

PERMIT SET

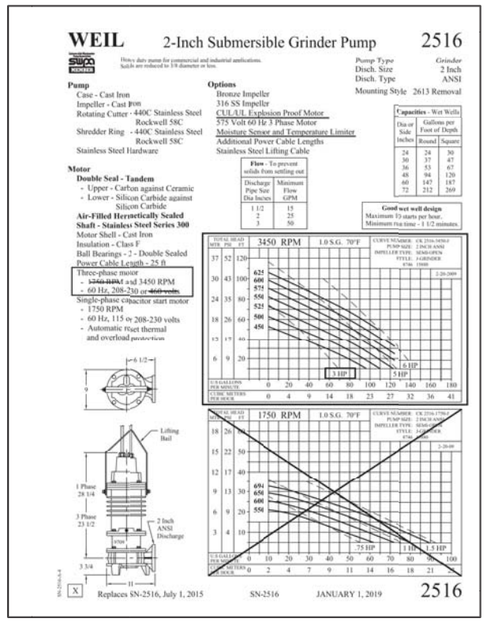
ISSUE DATE: NOVEMBER 3, 2022

REVISION	DATE	DESCRIPTION

CONTENTS:
DETAILS

SCALE:	AS SHOWN
DRAWN:	AT
CHECKED:	MD
PROJECT NO:	0000000.00

SHEET:
D1.0



WEIL 2-Inch Submersible Grinder Pump 2516

Heavy duty motor for commercial and industrial applications. Solids are reduced to 1/8 diameter or less.

Pump
Case - Cast Iron
Impeller - Cast Iron
Rotating Cutter - 440C Stainless Steel Rockwell 58C
Shredder Ring - 440C Stainless Steel Rockwell 58C
Stainless Steel Hardware

Motor
Double Seal - Tandem
- Upper - Carbon against Ceramic
- Lower - Silicon Carbide against Silicon Carbide

Air-Filled Hermetically Sealed
Shaft - Stainless Steel Series 300
Motor Shell - Cast Iron
Insulation - Class F
Ball Bearings - 2 - Double Sealed
Power Cable Length - 25 ft
Three-phase motor
- ~~1740 RPM~~ and 3450 RPM
- 60 Hz, 208-230 or ~~460 volts~~
Single-phase capacitor start motor
- 1750 RPM
- 60 Hz, 115 or 208-230 volts
- Automatic reset thermal and overload protection

Options
Bronze Impeller
316 SS Impeller
CUL/UL Explosion Proof Motor
575 Volt 60 Hz 3 Phase Motor
Moisture Sensor and Temperature Limiter
Additional Power Cable Lengths
Stainless Steel Lifting Cable

Pump Type	Grinder
Disch. Size	2 Inch
Disch. Type	ANSI
Mounting Style	2613 Removal

Flow - To prevent solids from settling out

Discharge Pipe Size Dia Inches	Minimum Flow GPM
1 1/2	15
2	25
3	50

Capacities - Wet Wells

Dia of Sump Inches	Gallons per Foot of Depth Round	Square
24	24	30
30	37	47
36	53	67
48	94	120
60	147	187
72	212	269

Good wet well design
Maximum 15 starts per hour.
Minimum run time - 1 1/2 minutes

Replaces SN-2516, July 1, 2015 SN-2516 JANUARY 1, 2019 2516

NTS Submersible Grinder Pump 1

OVERVIEW

The 331 Control Panel is designed for three phase duplex pump applications (three voltages 208/240/480 VAC, one panel). The panel utilizes the robust DPC-4F controller which provides the pump control ON & OFF sequence, pump alternation selection, lag pump delay time, and highwater alarm and float out-of-sequence alarm conditions. Models available with intrinsically safe relay for circuit extension into hazardous locations.

MODELS AVAILABLE

- **1061040 331SS** Stainless Steel Wall Mount NEMA 4X Enclosure
- **1061041 331FG** Fiberglass Wall Mount NEMA 4X Enclosure
- **1059965 331SS-IS** Stainless Steel Wall Mount NEMA 4X Enclosure Intrinsically Safe
- **1059966 331FG-IS** Fiberglass Wall Mount NEMA 4X Enclosure Intrinsically Safe

*Overload modules sold separately based on motor FLA, order quantity 2.

OPTIONS (Customer Installed)

- ~~1033804 (1.36-6.0) FLA Overload Module~~
- **1023500** (4.5-18.0) FLA Overload Module
- **1033806** (8.0-32.0) FLA Overload Module
- **1036351** Surge arrestor and bracket
- **1027807** Pedestal painted steel
- **1027824** Pedestal stainless steel
- **1025530** Pedestal fiberglass

SPECIFICATIONS

- Padlockable wall mount NEMA 4X
- White painted steel inner door and backplate
- Single-point power connection
- IEC HP rated motor starter with adjustable class 10 ambient compensated overloads
- 10 HP max @208VAC, 240VAC
- 20 HP max @480VAC
- Pump short circuit disconnect/overload reset through inner door
- Overtemp shutdown for motor winding switches (auto reset)
- DPC-4F controller
  - Pump sequence control
  - Pump selector switch (Alt. 1-2, 2-1)
  - Pump lag delay time adjustable (0-60 sec)
  - High water alarm
  - Float out of sequence alarm and float reassignment during event
  - Pump call (green), control power (green), float status (amber) and alarm (red) LED indicators
- Tri-voltage stepdown control transformer
- Dual Seal Fail module, adjustable 1kΩ-250kΩ with red LED indicators
- Red flashing alarm beacon and audible horn
- Alarm silence and push-to-test 22mm
- Hand-Off-Auto selector switches 22mm
- Pump Run (green) LED indicators 22 mm
- Elapse time meters
- Auxiliary contacts
- 4-channel intrinsically safe relay (I.S. models only)

PRIMEX
WATER SYSTEM INFORMATION AND CONTROLS PROVIDER
(844-4PRIMEX [477-4639])
WWW.PRIMEXCONTROLS.COM

NTS Pump Control Panel 2

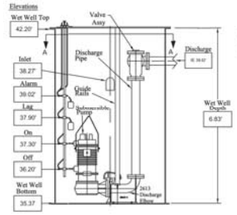
NTS Not Used 3

WEIL Duplex Submersible Pump S-9016

Duplex - With Rail

2613 Removal System - Discharge Below Cover
Valve Assembly Below Cover

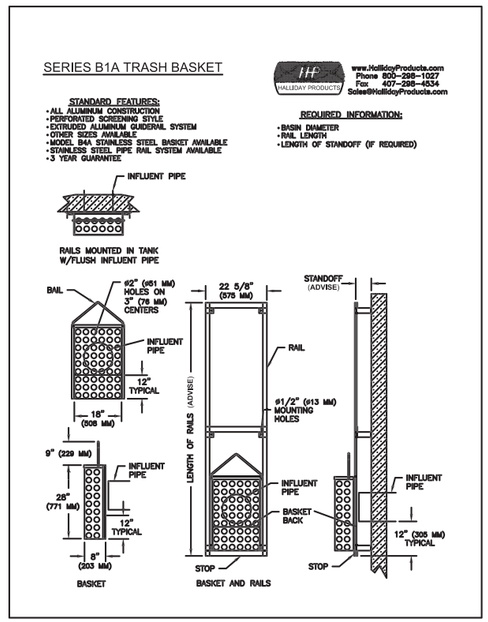
Date: _____
Project: PIONEER PARK
Item: _____
Spec Reference: _____
Contractor: _____
Engineer: _____
- Pump: 2516 Qty: 2
  - GPM: 50 GPM Head: 37FT
  - HP: 3 HP RPM: 3450
  - PH: 3 Hz: 60 Volts: 208-230
  - Solid Size: _____
  - Pump Discharge Size: _____
- Removal System 2613 Size: _____
- Valve Size: _____
- Wet Well: 5' x10.5'
  - Diameter: N/A
  - Depth: 6.83'
  - Minimum Water Level: 0"
- Wet Well Cover: EXISTING
  - Diameter: _____
  - Pump Opening EXISTING
  - X _____ from Cover 8804 or 8815
  - H _____ from Cover 8804 or 8815
- Control Panel: 1059965 331SS-IS
- Level Control System: PRIMEX/KIN/KSWITCH



Notes:
1. Minimum Wet Well Diameter
   3 inch Discharge - 42 inch
   4 inch Discharge
   7 inch Pump Case - 48 inch
   9 inch Pump Case - 54 inch
   12 inch Pump Case - 60 inch
2. 10 Starts per hour maximum.
3. Minimum water level 1 inch above pump case.
4. Installation of this equipment to conform to local and/or national codes and ordinances and is the responsibility of the installer.
5. Pump openings with doors on cover:
   2 and 3 inch Discharge - 1
   4 inch Discharge - 2
6. Not to be used for construction purposes unless certified.

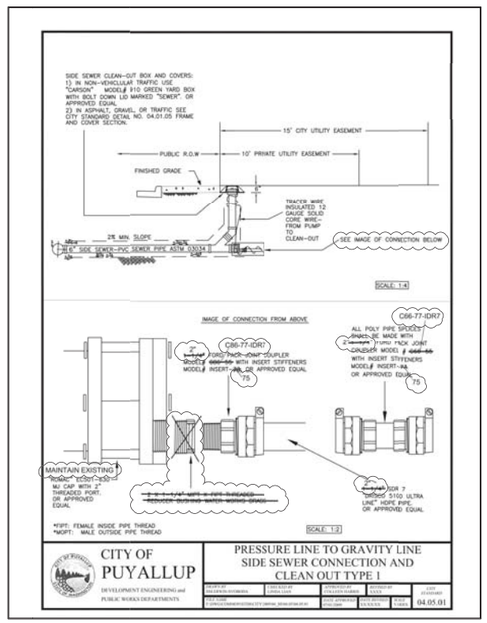
Weill Pump Company Inc. S-9016 Installation C10

NTS Duplex Submersible Pump 4



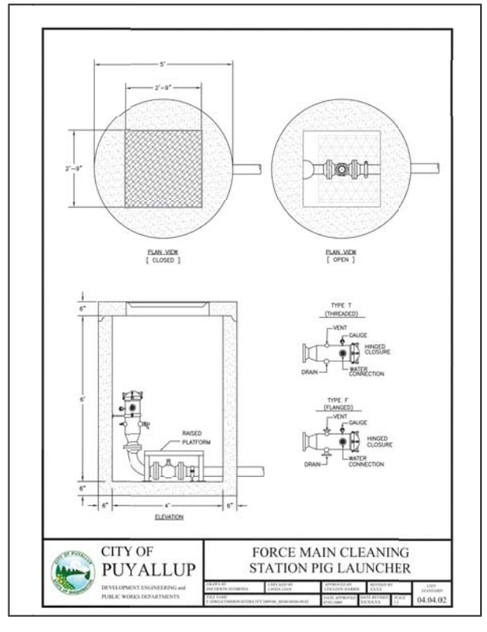
NOTE: COORDINATE INSTALLATION DETAIL WITH CITY INCLUDING LENGTH OF RAIL AND CABLE ASSEMBLY.

NTS Trash Basket 5

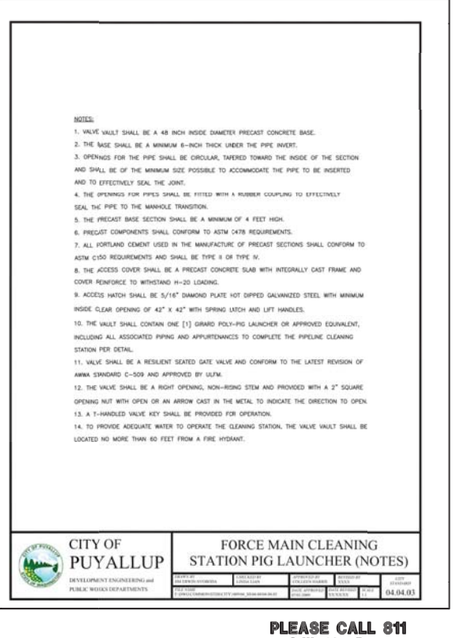


NOTE: THIS DETAIL IS REFERENCED TO SHOW THE CONNECTION FROM FORCE MAIN TO GRAVITY LINE

NTS Pressure to Gravity Line Side Sewer Connection and Clean Out Type 1 6



NTS Force Main Cleaning Station Pig Launcher 7



PLEASE CALL 811
3 Working Days
BEFORE YOU DIG

NTS Force Main Cleaning Station Pig Launcher (Notes) 8

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KAZARU TSUCHIYA REGISTERED PROFESSIONAL ENGINEER

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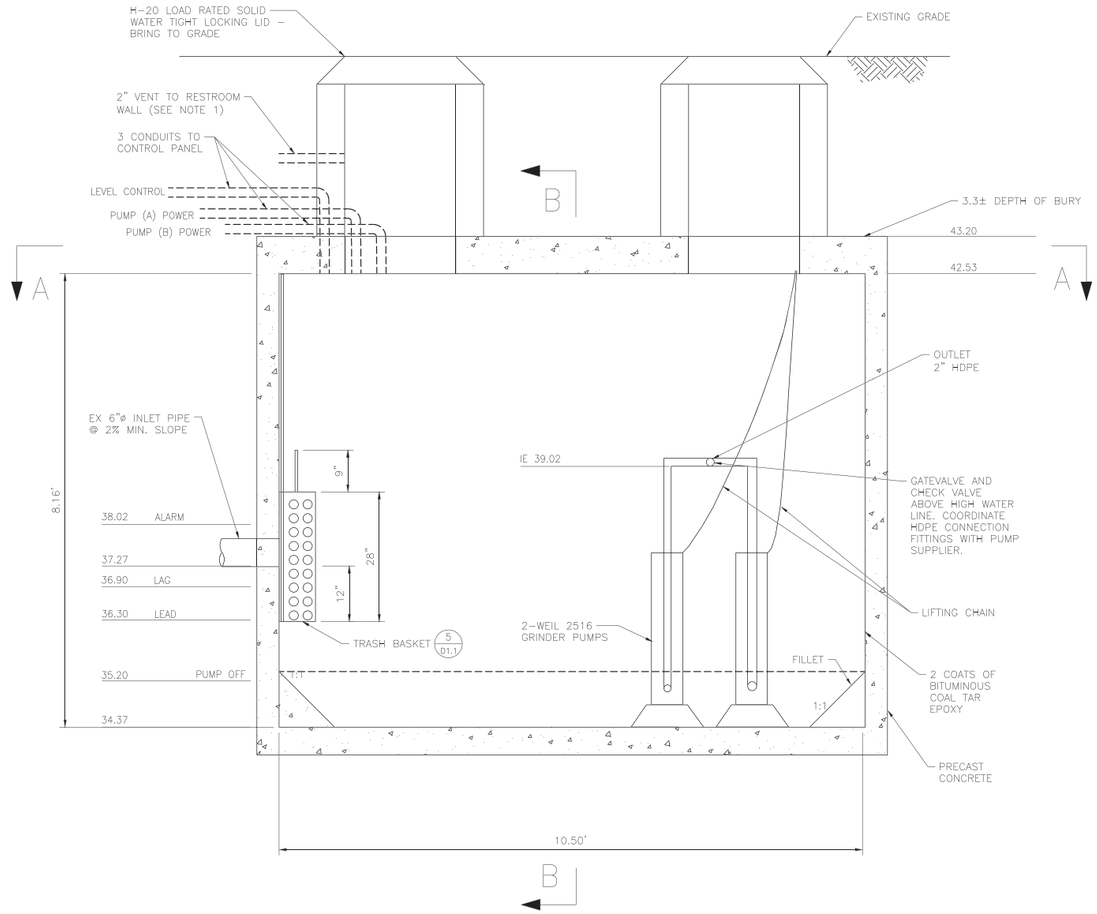

NOTES:

1. PROVIDE VENT TO RESTROOM WALL PER D.O.E. MINIMUM REQUIREMENTS.
2. PUMP SHALL BE WEIL 2516, 3HP/208-230V/1-3PH. SEE DETAIL 1, 2 &4/D1.1.
3. WET WELL H-20 LOAD RATED UTILITY VAULT 1,500 GALLON MODEL OLDCASTLE 5106GA VAULT MODIFIED WITH 24" EXTENSION OR APPROVED EQUAL. COORDINATE ACCESS SIZE, AND LOCATIONS WITH CITY.
4. TRASH BASKET SHALL BE HALLIDAY PRODUCTS B1A OR APPROVED EQUAL. COORDINATE INSTALLATION DETAIL WITH CITY INCLUDING LENGTH OF RAIL AND CABLE ASSEMBLY. SEE 5/D1.1.

PLEASE CALL 811
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NTS
Wet Well 1

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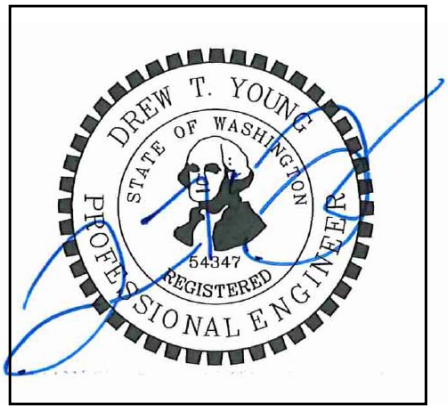
Appendix B
Summary of Native Soil Infiltration Rate for Pioneer Park Restroom Upgrade Project

City of Puyallup

Public Works Engineering
City Hall - 333 S. Meridian Puyallup, WA 98371 – 3rd Floor

Technical Memorandum

Date: October 25th, 2022



MIG
119 Pine Street, Suite 400
Seattle, Washington 98101

From: Drew Young, PE, Capital Improvement Projects
CJ Corpuz, Capital Project Inspector
Ron Johnson, Capital Project Inspector

To: Nathan Polanski, PE, Senior Civil Engineer, MIG

RE: Summary of Native Soil Infiltration Rate for the Pioneer Park Restroom Upgrade Project

INTRODUCTION

This technical report summarizes the results of the City of Puyallup's subsurface exploration to support the redevelopment of the Pioneer Park Restroom project. This project consists of a significant remodel of the existing restroom with associated site improvements to support the current and future use of the city owned park.

PURPOSE AND SCOPE

The purpose of the subsurface exploration was to determine field measured infiltration rates meeting the requirements of the Department of Ecology's 2019 Stormwater Management Manual for Western Washington (SWMMWW) for sizing onsite stormwater management systems. While a small-scale PIT test is the minimum required test stated in the 2019 SWMMWW, the City of Puyallup has adopted a policy for smaller infill developments to allow for the use of the "Falling Head Percolation Test Procedure" (as modified for Pierce County) in lieu of small-scale PIT tests. This finding is based on the fact the Pierce County Stormwater and Site Development Manual has been deemed equivalent by the Department of Ecology which allows for the use of this procedure in certain circumstances. In addition, because the proposed project only triggers minimum requirements 1 through 5 due to the limited amount of impervious surfaces created/replaced as part of the project and based on the fact that a redundant system/overflow that would allow for this onsite stormwater facility to function as a perforated stub out if infiltration was further reduced, the City has determined that the Falling Head Percolation Test Procedure (as modified for Pierce County) will provide an adequate level of accuracy needed in determining in-situ infiltration rate. The following scope was completed as part of the exploration:

- Conducted a field exploration that included excavating three test pits and completed falling head percolation tests in each test pit.
- Summarization of findings in the preparation of this technical memorandum.

SITE CONDITIONS

Site conditions were observed during the required in-field testing. The testing location was isolated to the proposed area for onsite stormwater management as part of the bathroom remodel project. This area consists of well-maintained lawn area directly east of the existing building that is currently proposed to be the future location of a rain garden. Three test locations were selected spaced 10 to 15 feet apart.

Photo 1: Test Pit Locations #1, #2, and #3.

Subsurface conditions at the site were evaluated by excavating test pits with hand tools. The first 4 to 6 inches of each test pit consisted of a sandy fill material with the first 3 inches being the grass root zone. Below the 6-inch fill layer consisted of silty sand that could be characterized as Alluvium deposits which is consistent with known soil conditions throughout the area. Some wood debris was found near 18-inches below existing grade when excavating test pit 1 and broken glass was found throughout the excavation of test pit 2. Test pit 3 showed slightly higher sand content but similar characteristics to the soil samples taken with no debris or other items found at time of excavation. Excavation was completed at 24-inches below existing grade for each test pit which is the approximate elevation of the proposed bottom of the rain garden for this area. Test pit 3 was over-excavated following the completion of the falling head test to see if any perched water existed below the testing location. No groundwater seepage was observed at time of excavation.

INFILTRATION TESTING

Falling Head Percolation Tests were completed at test pit 1, 2 and 3 in general conformance with the Pierce County modified Falling Head Percolation Test Procedure.

Each of the three test pits consisted of a 24-inch (2 feet) depth hole approximately 8-inch in diameter. A 6-inch PVC pipe was placed approximately 6-inches into the bottom area of the test pit with 2-inches of washed crushed rock placed inside of the pipe.

Photo 2: Test pit 2 infiltration testing.

A soaking period that allows for at least 4 hours of a constant 12-inch depth of water was completed during the following times for each test pit:

Test Pit #	Soaking Period Date & Start Time	Soaking Period Date & End Time	Total Time (hrs) 4 hrs min.
1	10/20/2022 @ 11:40 AM	10/20/2022 @ 4:20 PM	4.6
2	10/20/2022 @ 12:00 AM	10/20/2022 @ 4:20 PM	4.3
3	10/24/2022 @ 9:45 AM	10/24/2022 @ 2:00 PM	4.25

A percolation rate measurement is completed following the soaking period with a minimum time to complete the test of 15 hours from when the soaking period began to 30 hours maximum. The water level is adjusted to 6 inches above the gravel (or 8 inches above the bottom of the hole). The water level is measured from a fixed reference point to the nearest $1/16^{th}$-inch at 30-minute intervals. The test is continued until two successive water level drops do not vary by more than 1/16 inch within a 90-minute period. A minimum of 3 measurements were made at each test pit location. The last water level drop is used to calculate field measured percolation rate.

Photo 3: Test Pit 2 during percolation period.

Test Pit 1 Percolation Rate Field Testing				
Measurement #	Time of Measurement	Initial Depth (inches)	Final Depth (inches)	Difference (inches)
1*	10/21/2022; 8:18 AM to 8:48 AM	6-0”	5-2/16”	14/16”
2	10/21/2022; 8:50 AM to 9:20 AM	6-0”	5-4/16”	12/16”
3**	10/21/2022; 9:23 AM to 9:53 AM	6-0”	5-4/16”	**12/16”**
Final Field Measured Percolation Rate for Test Pit 1 (inches per hour)(I_{f1})				1.5
*Note: Initial Measurement Taken 20 hours after soaking period began which is within the 15 hours to 30 hours acceptable range. **Note: Testing completed as it met the criteria of less than 1/16” difference over a 90-minute duration with a minimum of 3 tests completed.				

Test Pit 2 Percolation Rate Field Testing				
Measurement #	Time of Measurement	Initial Depth (inches)	Final Depth (inches)	Difference (inches)
1*	10/21/2022; 8:18 AM to 8:50 AM	6-1/2”	5-0”	24/16”
2	10/21/2022; 8:52 AM to 9:22 AM	6-0”	5-0”	16/16”
3	10/21/2022; 9:24 AM to 9:54 AM	6-0”	5-6/16”	10/16”
4**	10/21/2022; 9:57 AM to 10:27 AM	6-0”	5-5/16”	**11/16”**
Final Field Measured Percolation Rate for Test Pit 2 (inches per hour) (I_{f2})				1.375
*Note: Initial Measurement Taken 20 hours after soaking period began which is within the 15 hours to 30 hours acceptable range. **Note: Testing completed as it met the criteria of less than 1/16” difference over a 90-minute duration with a minimum of 3 tests completed.				

Test Pit 3 Percolation Rate Field Testing				
Measurement #	Time of Measurement	Initial Depth (inches)	Final Depth (inches)	Difference (inches)
1*	10/25/2022; 9:06 AM to 9:36 AM	6-0”	5-1/16”	15/16”
2	10/25/2022; 9:38 AM to 10:08 AM	6-0”	5-4/16”	12/16”
3	10/25/2022; 10:10 AM to 10:40 AM	6-0”	5-8/16”	8/16”
4**	10/25/2022; 10:42 AM to 11:12 AM	6-0”	5-5/16”	**11/16”**
Final Field Measured Percolation Rate for Test Pit 3 (inches per hour)(I_{f3})				1.375
*Note: Initial Measurement Taken 23 hours after soaking period began which is within the 15 hour to 30 hour acceptable range. **Note: Testing completed as it met the criteria of less than 1/16” difference over a 90 minute duration with a minimum of 3 tests completed.				

Final Field Infiltration Rate
$I_{field}=(I_{f1} + I_{f2} + I_{f3})/3$ (Average Rate over the 3 test locations)
$I_{field}=(1.5+1.375+1.375) / 3 =$ **1.42 inches/hour**

DESIGN INFILTRATION RATE (I_{DESIGN})

The following equation was applied to field recorded infiltration rates as recommended in the Pierce County modified Falling Head Percolation Test to apply the appropriate safety factors for long term infiltration rates:

$I_{Design}= (I_{field})x(F_{testing})x(F_{geometry})x(F_{Plugging})$

$F_{testing}$ = 0.50 (for smaller scale infiltration tests (falling head test))

$F_{geometry}$ = 4 x D/W + 0.05 ($0.25 \leq F_{geometry} \leq 1.0$);

where D = depth from bottom of proposed facility to maximum wet season water table or nearest impervious layer, whichever is less and W = width of facility. D is assumed to be 6 feet (or 8 feet below existing grade) however, a value of 2 feet was used as a conservative design approach. W = 6 feet (approx. bottom width of rain garden)

$F_{geometry}$ = 4 x 2/6 + 0.05 = 1.383 = 1.0 maximum

$F_{Plugging}$ = 0.7 for Loams and Sandy Loams

Therefore, after appropriate safety factors are applied to the field measured percolation rate, the final design infiltration rate was utilized for designing the onsite rain garden.

I_{design} = (1.42 in/hr) (0.5) (1) (0.7)

I_{design} = 0.497 = **0.50 inches per hour**

LIST OF REFERENCED ATTACHMENTS

Attachment 1: 2015 Pierce County Stormwater and Site Development Manual, Volume 3 Hydrologic Analysis and Flow Control BMPs, Appendix III-A, Methods of Determining Design Infiltration Rates, Falling Head Percolation Test Procedure (as modified for Pierce County)

Appendix III-A – Methods for Determining Design Infiltration Rates

Determine Design Infiltration Rate:

There are three acceptable methods for estimating initial infiltration rates. Each is described in detail in this appendix. A safety/correction factor is applied to the initial rate to determine the design infiltration rate. Note that the subgrade safety/correction factors in this appendix may not apply to bioretention, permeable pavement, and rain gardens. Refer to Sections 3.4, 3.5, and 3.8 for additional guidance on infiltration testing methods and application of appropriate safety/correction factors specific to bioretention, permeable pavement, and rain gardens.

- Method 1. Field Testing Procedures (must incorporate safety factor)
    - U.S. EPA Falling Head Percolation Test Procedure (as Modified for Pierce County). This test applies to all infiltration facilities, but may not be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.
    - Large-Scale Pilot Infiltration Test (PIT). This test applies to infiltration facilities with drainage areas greater than one acre and may be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.
    - Small-Scale (PIT). This test applies to infiltration facilities with drainage areas less than one acre and may be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.
- Method 2. USDA Soil Textural Classification. This method only applies to projects sites that trigger Minimum Requirement #1 through #5 (not #1 through #10) AND are underlain by Spanaway soils (as defined by the Soils Survey of Pierce County Area, 1979, and field verified by a qualified professional). This method may not be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.
- Method 3. Soil Grain Size Analysis. This method applies to project sites that are that are underlain by type A soils (see Appendix III-B Table B.5 Major Soil Groups in Pierce County), and may not be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.

Method 1 – Field Testing Procedures

- Excavate to the bottom elevation of the proposed infiltration facility. Measure the infiltration rate of the underlying soil using either the **U.S. EPA falling**

head percolation test procedure as modified for Pierce County (presented below), the double ring infiltrometer test (ASTM D3385, not presented in this appendix), or Ecology large and small scale Pilot Infiltration Test (PIT) described below and presented in the 2014 Ecology Stormwater Management Manual for Western Washington.

- Fill test hole or apparatus with water and maintain at depths above the test elevation for the saturation periods specific for the appropriate test.
- Following the saturation period, the infiltration rate shall be determined in accordance with the specified test procedures.
- Perform at least three small-scale tests for each proposed infiltration facility location to determine a representative infiltration rate.
- **For all field testing procedures, apply safety factor to obtain design infiltration rate (see next section).**

Safety Factor for Field Measurements

The following equation incorporates safety factors to adjust for uncertainties related to testing, depth to the water table or impervious strata, infiltration receptor geometry, and long-term reductions in permeability due to biological activity and accumulation of fines. Note that the safety factors below may not apply to the infiltration testing conducted for bioretention, permeable pavement and/or rain gardens (see Sections 3.4, 3.5, and 3.8 for additional information). This equation estimates the maximum design infiltration rate, I_{design}. Additional reduction of the design infiltration rate may be appropriate depending on site conditions. **In no case may the design infiltration rate exceed 30 inches/hour**.

$$I_{design} = I_{measured} \times F_{testing} \times F_{geometry} \times F_{plugging}$$

$F_{testing}$ accounts for uncertainties in the testing methods. For the full scale PIT method, $F_{testing} = 0.75$; for the small-scale PIT method, $F_{testing} = 0.50$; for smaller-scale infiltration tests such as the double-ring infiltrometer test, $F_{testing} = 0.40$; for grain size analysis, $F_{testing} = 0.40$. These values are intended to represent the difference in each test's ability to estimate the actual saturated hydraulic conductivity. The assumption is the larger the scale of the test, the more reliable the result.

$F_{geometry}$ accounts for the influence of facility geometry and depth to the water table or impervious strata on the actual infiltration rate. A shallow water table or impervious layer will reduce the effective infiltration rate of a large pond, but this would not be reflected in a small scale test. $F_{geometry}$ must be between 0.25 and 1.0 as determined by the following equation:

$$F_{geometry} = 4\ D/W + 0.05$$

Where:

D = depth from the bottom of the proposed facility to the maximum wet season water table or nearest impervious layer, whichever is less.

W = width of facility

$F_{plugging}$ accounts for reductions in infiltration rates over the long term due to plugging of soils. This factor is:

- 0.7 for loams and sandy loams
- 0.8 for fine sands and loamy sands
- 0.9 for medium sands
- 1.0 for coarse sands or cobbles.

Falling Head Percolation Test Procedure (as Modified for Pierce County) (Source: U.S. EPA, On-site Wastewater Treatment and Disposal Systems, 1980)

Note: This test may not be used to demonstrate infeasibility of bioretention, permeable pavement, or rain gardens in meeting Minimum Requirement #5.

1. Number and Location of Tests

   A minimum of three tests shall be performed within the area proposed for an absorption system. They shall be spaced uniformly throughout the area. If soil conditions are highly variable, more tests may be required.

2. Preparation of Test Hole (as modified for Pierce County)

   The diameter of each test hole is 8 inches, dug or bored to the proposed depths of the absorption systems or to the most limiting soil horizon. To expose a natural soil surface, the bottom of the hole is scratched with a sharp pointed instrument and the loose material is removed from the test hole. A 6-inch-inner-diameter, 4-foot long, PVC pipe is set into the hole and pressed into the soil 6 inches and then 2 inches of one-half to three-fourths-inch rock are placed in the pipe to protect the bottom from scouring when water is added.

3. Soaking Period

   The pipe is carefully filled with at least 12 inches of clear water. The depth of water must be maintained for at least 4 hours and preferably overnight if clay soils are present. A funnel with an attached hose or similar device may be used to prevent water from washing down the sides of the hole. Automatic siphons or float valves may be employed to automatically maintain the water level during the soaking period. It is extremely important that the soil be allowed to soak for a sufficiently long period of time to allow the soil to swell if accurate results are to be obtained.

   In sandy soils with little or no clay, soaking is not necessary. If, after filling the pipe twice with 12 inches of water, the water seeps completely away in less than 10 minutes, the test can proceed immediately.

4. Measurement of the Percolation Rate

Except for sandy soils, percolation rate measurements are made 15 hours but no more than 30 hours after the soaking period began. The water level is adjusted to 6 inches above the gravel (or 8 inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6 inches above the gravel. Immediately after adjustment, the water level is measured from a fixed reference point to the nearest 1/16th-inch at 30 minute intervals. The test is continued until two successive water level drops do not vary by more than 1/16-inch within a 90-minute period. At least three measurements are to be made.

After each measurement, the water level is readjusted to the 6-inch level. The last water level drop is used to calculate the percolation rate.

In sandy soils or soils in which the first 6 inches of water added after the soaking period seeps away in less than 30 minutes, water level measurements are made at 10 minute intervals for a 1-hour period. The last water level drop is used to calculate the percolation rate.

5. Calculation of the Percolation Rate

The percolation rate is calculated for each test site by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of minutes/inch. To determine the percolation rate for the area, the rates obtained from each hole are averaged. (If tests in the area vary by more than 20 minutes/inch, variations in soil type are indicated. Under these circumstances, percolation rates should not be averaged.) **To compute the design infiltration rate (I_{design}), the final percolation rates must then be adjusted by the appropriate safety factors outlined previously.**

Example: If the last measured drop in water level after 30 minutes is five-eighths-inch, then:

percolation rate = (30 minutes)/(⅝ inch) = 48 minutes/inch. (At a minimum, a safety factor "$F_{testing}$" of 0.5 is be applied to all field methods for determining infiltration rates.)

Alternative Washington Department of Ecology Infiltration Pit Method

Large-Scale Pilot Infiltration Test (PIT)

Large-scale in-situ infiltration measurements, using the Pilot Infiltration Test (PIT) described below is the preferred method for estimating the measured (initial) saturated hydraulic conductivity (K_{sat}) of the soil profile beneath the proposed infiltration facility. The PIT reduces some of the potential scale errors associated with relatively small-scale such as the Modified Falling Head Percolation Test, double ring infiltrometer or "stove-pipe" infiltration tests. It is not a standard test but rather a practical field procedure recommended by Ecology's Technical Advisory Committee.

Infiltration Test:

- Excavate the test pit to the depth of the bottom of the proposed infiltration facility. Lay back the slopes sufficiently to avoid caving and erosion during the test. Alternatively, consider shoring the sides of the test pit.
- The horizontal surface area of the bottom of the test pit should be approximately 100 square feet.
- Accurately document the size and geometry of the test pit.
- Install a vertical measuring rod (minimum 5 feet long) marked in half-inch increments in the center of the pit bottom.
- Use a rigid 6-inch diameter pipe with a splash plate on the bottom to convey water to the pit and reduce side-wall erosion or excessive disturbance of the pond bottom. Excessive erosion and bottom disturbance will result in clogging of the infiltration receptor and yield lower than actual infiltration rates.
- Add water to the pit at a rate that will maintain a water level between 6 and 12 inches above the bottom of the pit. A rotameter can be used to measure the flow rate into the pit.

Note: For infiltration facilities serving large drainage areas, designs with multiple feet of standing water can have infiltration tests with greater than 1 foot of standing water. The depth must not exceed the proposed maximum depth of water expected in the completed facility.

Every 15 to 30 minutes, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at the same point on the measuring rod.

Add water to the pit until 1 hour after the flow rate into the pit has stabilized (constant flow rate; a goal of 5 percent variation or less variation in the total flow) while maintaining the same pond water level (usually 6 hours). The total of the pre-soak time plus one hour after the flow rate has stabilized should be no less than 6 hours.

After the flow rate has stabilized for at least 1 hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty. Consider running this falling head phase of the test several times to estimate the dependency of infiltration rate with head.

Data Analysis:

Calculate and record the infiltration rate in inches per hour in 30 minutes or 1-hour increments until 1 hour after the flow has stabilized.

Note: Use statistical/trend analysis to obtain the hourly flow rate when the flow stabilizes. This would be the lowest hourly flow rate.

To compute the design infiltration rate (I_{design}), apply appropriate safety factors outlined previously.

Example:

The area of the bottom of the test pit is 8.5-feet by 11.5-feet.

Water flow rate was measured and recorded at intervals ranging from 15 to 30 minutes throughout the test. Between 400 minutes and 1,000 minutes, the flow rate stabilized between 10 and 12.5 gallons per minute or 600 to 750 gallons per hour, or an average of (9.8 + 12.3) / 2 = 11.1 inches per hour.

To compute the design infiltration rate (Idesign), the infiltration rate must then be adjusted by the appropriate safety factors outlined previously.

Small-Scale Pilot Infiltration Test

A smaller-scale PIT can be used in any of the following instances:

- The drainage area to the infiltration site is less than one acre
- The testing is for bioretention areas or permeable pavement surfaces that either serve small drainage areas and/or are widely dispersed throughout a project site
- The site has a high infiltration rate, making a large-scale PIT difficult, and the site geotechnical investigation suggests uniform subsurface characteristics.

Infiltration Test

- Excavate the test pit to the estimated surface elevation of the proposed infiltration facility. In the case of bioretention, excavate to the estimated elevation at which the imported soil mix will lie on top of the underlying native soil. For permeable pavement, excavate to the elevation at which the imported subgrade materials, or the pavement itself, will contact the underlying native soil. If the native soils (road subgrade) will have to meet a minimum subgrade compaction requirement, compact the native soil to

that requirement prior to testing. Note that the permeable pavement design guidance recommends compaction not exceed 90 – 92 percent. Finally, lay back the slopes sufficiently to avoid caving and erosion during the test. Alternatively, consider shoring the sides of the test pit.

- The horizontal surface area of the bottom of the test pit should be 12 to 32 square feet. It may be circular or rectangular, but accurately document the size and geometry of the test pit.
- Install a vertical measuring rod adequate to measure the ponded water depth and that is marked in half-inch increments in the center of the pit bottom.
- Use a rigid pipe with a splash plate on the bottom to convey water to the pit and reduce side-wall erosion or excessive disturbance of the pond bottom. Excessive erosion and bottom disturbance will result in clogging of the infiltration receptor and yield lower than actual infiltration rates. Use a 3 inch diameter pipe for pits on the smaller end of the recommended surface area, and a 4 inch pipe for pits on the larger end of the recommended surface area.
- Pre-soak period: Add water to the pit so that there is standing water for at least 6 hours. Maintain the pre-soak water level at least 12 inches above the bottom of the pit.
- At the end of the pre-soak period, add water to the pit at a rate that will maintain a 6-12 inch water level above the bottom of the pit over a full hour. The depth should not exceed the proposed maximum depth of water expected in the completed facility.
- Every 15 minutes, record the cumulative volume and instantaneous flow rate in gallons per minute necessary to maintain the water level at the same point (between 6 – 12 inches) on the measuring rod. The specific depth should be the same as the maximum designed ponding depth (usually 6 – 12 inches).
- After one hour, turn off the water and record the rate of infiltration (the drop rate of the standing water) in inches per hour from the measuring rod data, until the pit is empty.
- A self-logging pressure sensor may also be used to determine water depth and drain-down.

Data Analysis

See the explanation under the guidance for large-scale pilot infiltration tests.

Method 2 – USDA Soil Textural Classification

Infiltration rates may be estimated from soil grain size distribution (gradation) data using the USDA textural analysis approach. Conduct the grain size distribution test in accordance with the USDA test procedure (Soil Survey Manual, USDA, October 1993, page 136). This manual only considers soil passing the US #10 sieve to determine percentages of sand, silt, and clay for use in Figure A.1. **This method may only be applied to projects sites that trigger Minimum Requirement #1 through #5 and that are underlain by Spanaway soils (as defined by the Soils Survey of Pierce County Area, 1979, and field verified by a qualified professional).**

Short-term (field) infiltration rates, required correction factors, and design (long-term) infiltration rates based on gradations from soil samples and textural analysis are summarized in Table A.1. With prior approval by Pierce County, the correction factors may be reduced (to a minimum of 2.0) if there is little soil variability, there will be a high degree of long-term facility maintenance, and there is adequate pretreatment to reduce total suspended solids in influent stormwater.

Table A.1. Recommended Infiltration Rates Based on USDA Soil Textural Classification.

	Short-Term Infiltration Rate (in./hr)[1]	Correction Factor CF	Estimated Design (Long-term) Infiltration Rate (in./hr)
Clean sandy gravels and gravelly sands (i.e., 90% of the total soil sample is retained in the US #10 sieve)	20	2	10
Sand	8	4	2
Loamy Sand	2	4	0.5
Sandy Loam	1	4	0.25
Loam	0.5	4	0.13

Source: Stormwater Management Manual for Western Washington (Ecology 2005).

[1] From WEF/ASCE (1998).

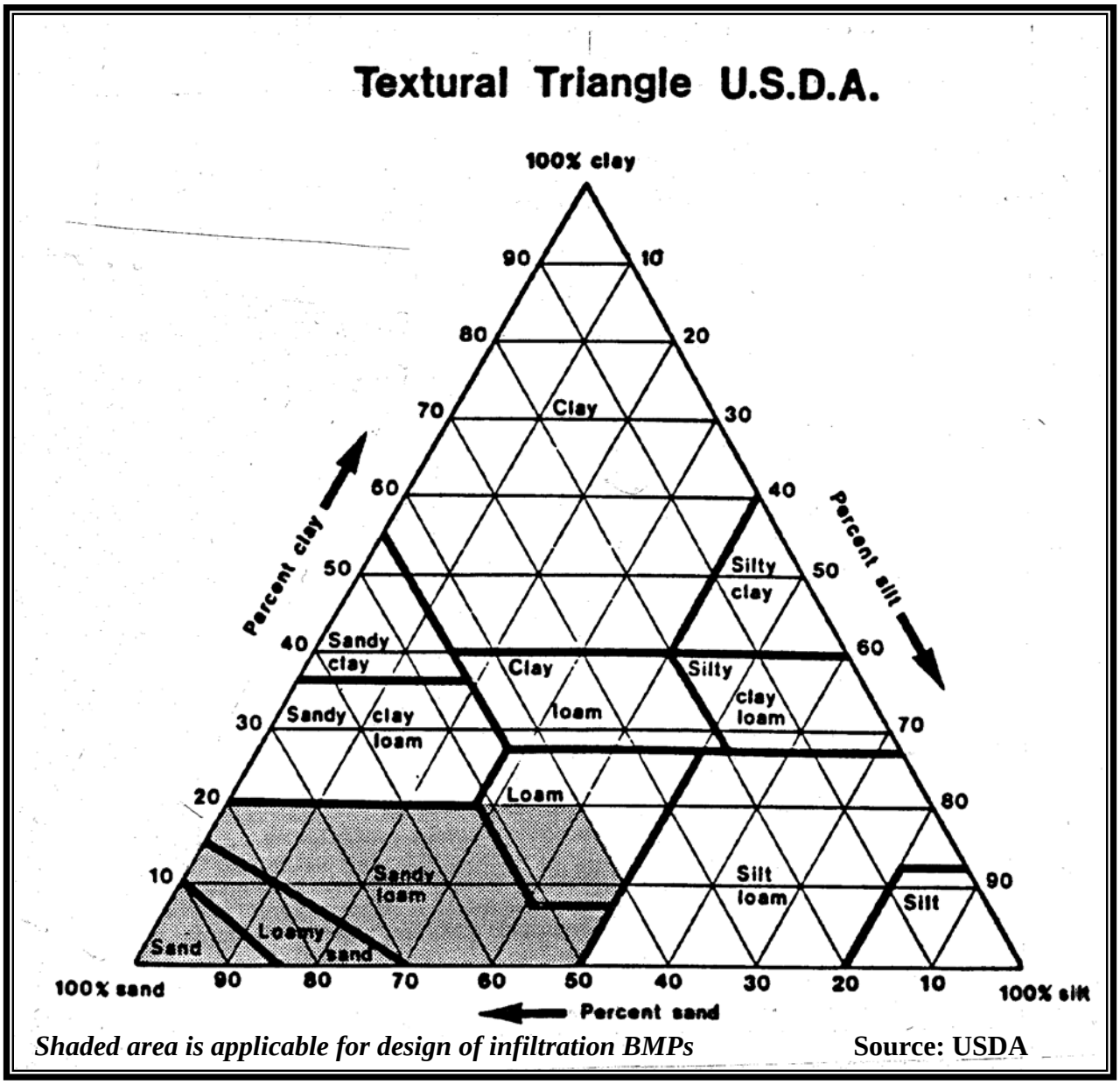


Figure A.1. USDA Textural Triangle.

Method 3 – Soil Grain Size Analysis Method

For each defined layer below the infiltration basin to a depth below the pond bottom of 2.5 times the maximum depth of water in the pond, but not less than 10 feet, estimate the initial saturated hydraulic conductivity (K_{sat}) in cm/sec using the following relationship (see Massmann 2003). **This method may only be applied to project sites that are underlain by type A soils. See Appendix III-B Table B.5 Major Soil Groups in Pierce County.**

For large infiltration facilities serving drainage areas of 10 acres or more, soil grain size analyses should be performed on layers up to 50 feet deep (or no more than 10 feet below the water table).

$$\log_{10}(K_{sat}) = -1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08f_{fines} \quad (1)$$

Where, D_{10}, D_{60}, and D_{90} are the grain sizes in mm for which 10 percent, 60 percent, and 90 percent of the sample is more fine and f_{fines} is the fraction of the soil (by weight) that passes the US #200 sieve (K_{sat} is in cm/s).

For bioretention areas, analyze each defined layer below the top of the final bioretention area subgrade to a depth of at least 3 times the maximum ponding depth, but not less than 3 feet (1 meter). For permeable pavement, analyze for each defined layer below the top of the final subgrade to a depth of at least 3 times the maximum ponding depth within the base (reservoir) course, but not less than 3 feet (1 meter).

If the licensed professional conducting the investigation determines that deeper layers will influence the rate of infiltration for the facility, soil layers at greater depths must be considered when assessing the site's hydraulic conductivity characteristics. Massmann (2003) indicates that where the water table is deep, soil or rock strata up to 100 feet below an infiltration facility can influence the rate of infiltration. Note that only the layers near and above the water table or low permeability zone (e.g., a clay, dense glacial till, or rock layer) need to be considered, as the layers below the groundwater table or low permeability zone do not significantly influence the rate of infiltration. Also note that this equation for estimating K_{sat} assumes minimal compaction consistent with the use of tracked (i.e., low to moderate ground pressure) excavation equipment.

If the soil layer being characterized has been exposed to heavy compaction (e.g., due to heavy equipment with narrow tracks, narrow tires, or large lugged, high pressure tires) the hydraulic conductivity for the layer could be approximately an order of magnitude less than what would be estimated based on grain size characteristics alone (Pitt, 2003). In such cases, compaction effects must be taken into account when estimating hydraulic conductivity.

For clean, uniformly graded sands and gravels, the reduction in K_{sat} due to compaction will be much less than an order of magnitude. For well-graded sands and gravels with moderate to high silt content, the reduction in K_{sat} will be close to an order of magnitude.

For soils that contain clay, the reduction in K_{sat} could be greater than an order of magnitude.

If greater certainty is desired, the in-situ saturated conductivity of a specific layer can be obtained through the use of a pilot infiltration test (PIT). Note that these field tests generally provide a K_{sat} combined with a hydraulic gradient. In some of these tests, the hydraulic gradient may be close to 1.0; therefore, in effect, the test infiltration rate result is the same as the hydraulic conductivity. In other cases, the hydraulic gradient may be close to the gradient that is likely to occur in the full-scale infiltration facility. The hydraulic gradient will need to be evaluated on a case-by-case basis when interpreting the results of field tests. It is important to recognize that the gradient in the test may not be the same as the gradient likely to occur in the full-scale infiltration facility in the long-term (i.e., when groundwater mounding is fully developed).

Once the K_{sat} for each layer has been identified, determine the effective average K_{sat} below the pond. K_{sat} estimates from different layers can be combined using the harmonic mean:

$$K_{equiv} = \frac{d}{\sum \frac{d_i}{K_i}} \qquad (2)$$

Where, d is the total depth of the soil column, d_i is the thickness of layer "i" in the soil column, and K_i is the saturated hydraulic conductivity of layer "i" in the soil column. The depth of the soil column, d, typically would include all layers between the pond bottom and the water table. However, for sites with very deep water tables (>100 feet) where groundwater mounding to the base of the pond is not likely to occur, it is recommended that the total depth of the soil column in Equation 2 be limited to approximately 20 times the depth of pond, but not more than 50 feet. This is to ensure that the most important and relevant layers are included in the hydraulic conductivity calculations. Deep layers that are not likely to affect the infiltration rate near the pond bottom should not be included in Equation 2.

Equation 2 may over-estimate the effective K_{sat} value at sites with low conductivity layers immediately beneath the infiltration basin. For sites where the lowest conductivity layer is within five feet of the base of the pond, it is suggested that this lowest K_{sat} value be used as the equivalent hydraulic conductivity rather than the value from Equation 2. Using the layer with the lowest K_{sat} is advised for designing bioretention areas or permeable pavement surfaces. The harmonic mean given by Equation 2 is the appropriate effective hydraulic conductivity for flow that is perpendicular to stratigraphic layers, and will produce conservative results when flow has a significant horizontal component such as could occur due to groundwater mounding.

Recommended Modifications to ASTM D 2434 When Measuring Hydraulic Conductivity for Bioretention Soil Mixes

Developed by the City of Seattle in cooperation with local soils laboratories.

Proctor method ASTM D1557 Method C (6-inch mold) and ASTM D2434 shall be used to determine the hydraulic conductivity of bioretention soil samples with a compaction rate of 85 percent. Sample preparation for the Proctor test (ASTM D1557 Method C) shall be amended in the following ways:

1) Maximum grain size within the sample shall be no more than 0.5 inches in size.

2) Snip larger organic particles (if present) into 0.5 inch long pieces.

3) When adding water to the sample during the Proctor test, allow the sample to pre-soak for at least 48 hours to allow the organics to fully saturate before compacting the sample. This pre-soak ensures the organics have been fully saturated at the time of the test.

ASTM D2434 shall be used and amended in the following ways:

1) Apparatus:

   a. 6-inch mold size shall be used for the test

   b. If using porous stone disks for the testing, the permeability of the stone disk shall be measured before and after the soil tests to ensure clogging or decreased permeability has not occurred during testing

   c. Use the confined testing method, with 5- to 10-pound force spring

   d. Use de-aired water.

2) Sample:

   a. Maximum grain size within the sample shall not be more than 0.5inch in size.

   b. Snip larger organic particles (if present) into 0.5inch long pieces.

   c. Pre-soak the sample for at least 48 hours prior to loading it into the mold. During the pre-soak, the moisture content shall be higher than optimum moisture but less than full saturation (i.e., there shall be no free water). This pre-soak ensures the organics have been fully saturated at the time of the test.

3) Preparation of Sample:

   a. Place soil in cylinder via a scoop.

b. Place soil in 1-inch lifts and compact using a 2-inch-diameter round tamper. Pre-weigh how much soil is necessary to fill 1-inch lift at 85 percent of maximum dry density, then tamp to 1-inch thickness. Once mold is full, verify that density is at 85 percent of maximum dry density (+ or – 0.5 percent). Apply vacuum (20 inches Hg) for 15 minutes before inundation.

c. Inundate sample slowly under a vacuum of 20 inches Hg over a period of 60 to 75 minutes.

d. Slowly remove vacuum (> 15 seconds).

e. Sample shall be soaked in the mold for 24 to 72 hours before starting test.

1) Procedure:

a. The permeability test shall be conducted over a range of hydraulic gradients between 0.1 and 2

b. Steady state flow rates shall be documented for four consecutive measurements before increasing the head

c. The permeability test shall be completed within 1 day (1-day test duration).

Appendix C
Recommended Source Control BMPs

S454 BMPs for Preventive Maintenance / Good Housekeeping

Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the drainage system and sewer system.

Applicable BMPs:

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to storm drains that discharge to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to a sanitary sewer where allowed by local sewer authority, or to other approved treatment.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging storm drains, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to sanitary sewer or for vactor truck transport to a waste water treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, storm drains, conveyance ditches, or receiving water. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that ground water has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids use containers, such as steel and plastic drums, that are rigid and

durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Refer to Ecology Requirements for Generators of Dangerous Wastes in I-2.15 Other Requirements for references to assist in handling potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other drainage areas, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to storm drains, surface water, or to the ground.

Recommended BMPs:

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's *Hazardous Waste & Toxics Reduction Program* at https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- Empty drip pans immediately after a spill or leak is collected in an uncovered area.
- Stencil warning signs at stormwater catch basins and drains, e.g., “Dump no waste – Drains to waterbody”.
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.

- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

S455 BMPs for Spill Prevention and Cleanup

Description of Pollutant Sources: Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

Applicable BMPs:

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations. Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, inlets/catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in

intercepting surface drainage to retain their diversion shape and capability.

- Use temporary erosion and sediment control measures or re-vegetate as necessary to prevent erosion during ditch reshaping.
- Do not leave ditch cleanings on the roadway surfaces. Sweep, collect, and dispose of dirt and debris remaining on the pavement at the completion of ditch cleaning operations as described below:
    - Consider screening roadside ditch cleanings, not contaminated by spills or other releases and not associated with a stormwater treatment system such as a bioswale, to remove litter. Separate screenings into soil and vegetative matter (leaves, grass, needles, branches, etc.) categories. Compost or dispose of the vegetative matter in a municipal waste landfill. Consult with the jurisdictional health department to discuss use or disposal options for the soil portion. For more information, see Appendix IV-B: Management of Street Waste Solids and Liquids.
    - Roadside ditch cleanings contaminated by spills or other releases known or suspected to contain dangerous waste must be handled following the Dangerous Waste Regulations (Chapter 173 303 WAC). If testing determines materials are not dangerous waste but contaminants are present, consult with the jurisdictional health department for disposal options.
- Examine culverts on a regular basis for scour or sedimentation at the inlet and outlet, and repair as necessary. Give priority to those culverts conveying perennial and/or salmon-bearing streams and culverts near streams in areas of high sediment load, such as those near subdivisions during construction. Maintain trash racks to avoid damage, blockage, or erosion of culverts.

Recommended Treatment BMPs:

Install biofiltration swales and filter strips (see V-7 Biofiltration BMPs) to treat roadside runoff wherever practicable and use engineered topsoils wherever necessary to maintain adequate vegetation. These systems can improve infiltration and stormwater pollutant control upstream of roadside ditches.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in Volume V. Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and other pollutants from stormwater collection, conveyance, and treatment systems to maintain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in Appendix V-A: BMP Maintenance Tables in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT's *Catch Basin Type 1L* (WSDOT, 2011)) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Properly dispose of all solids, polluted material, and stagnant water collected through system cleaning. Do not decant water back into the drainage system from eductor trucks or vacuum equipment since there may be residual contaminants in the cleaning equipment. Do not jet material downstream into the public drainage system.
- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catch basin.
- Post warning signs; “Dump No Waste - Drains to Ground Water,” “Streams,” “Lakes,” or emboss on or adjacent to all storm drain inlets where possible.
- Disposal of sediments and liquids from the catch basins must comply with Appendix IV-B: Management of Street Waste Solids and Liquids.

S421 BMPs for Parking and Storage of Vehicles and Equipment

Description of Pollutant Sources: Public and commercial parking lots such as retail store, fleet vehicle (including rent-a-car lots and car dealerships), equipment sale and rental parking lots, and

can cause air pollution include grain dust, sawdust, coal, gravel, crushed rock, cement, and boiler fly ash. Air emissions can contaminate stormwater. The objective of this BMP is to reduce the stormwater pollutants caused by dust generation and control.

Pollutant Control Approach: Prevent dust generation and emissions where feasible, regularly clean-up dust that can contaminate stormwater, and convey dust contaminated stormwater to proper treatment.

Applicable BMPs:

- Clean, as needed, powder material handling equipment and vehicles.
- Regularly sweep dust accumulation areas that can contaminate stormwater. Conduct sweeping using vacuum filter equipment to minimize dust generation and to ensure optimal dust removal.
- Use dust filtration/collection systems such as baghouse filters, cyclone separators, etc. to control vented dust emissions that could contaminate stormwater. Control of zinc dusts in rubber production is one example.
- Maintain on-site controls to prevent vehicle track-out.
- Maintain dust collection devices on a regular basis.

Recommended BMPs:

- In manufacturing operations, train employees to handle powders carefully to prevent generation of dust.
- Use water spray to flush dust accumulations to sanitary sewers where allowed by the local sewer authority or to other appropriate treatment system.
- Use approved dust suppressants such as those listed in *Methods for Dust Control* (Ecology, 2016b). Application of some products may not be appropriate in close proximity to receiving waters or conveyances close to receiving waters. For more information check with Ecology or the local jurisdiction.

Recommended Treatment BMPs

Install sedimentation basins, wet ponds, wet vaults, catch basin filters, vegetated filter strips, or equivalent sediment removal BMPs.

S411 BMPs for Landscaping and Lawn / Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation planting, and vegetation removal. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; and residential lawn/plant care. Proper management of vegetation can minimize excess nutrients and pesticides.

Pollutant Control Approach: Maintain appropriate vegetation to control erosion and the discharge of stormwater pollutants. Prevent debris contamination of stormwater. Where practicable, grow plant species appropriate for the site, or adjust the soil properties of the site to grow desired plant species.

Applicable BMPs:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Select the right plants for the planting location based on proposed use, available maintenance,soil conditions, sun exposure, water availability, height, sight factors, and space available.
- Ensure that plants selected for planting are not on the noxious weed list. For example, butterfly bush often gets planted as an ornamental but is actually on the noxious weed list.

  The Washington State Noxious Weed List can be found at the following webpage:

  https://www.nwcb.wa.gov/printable-noxious-weed-list
- Do not dispose of collected vegetation into waterways or storm sewer systems.
- Do not blow vegetation or other debris into the drainage system.
- Dispose of collected vegetation such as grass clippings, leaves, sticks by composting or recycling.
- Remove, bag, and dispose of class A & B noxious weeds in the garbage immediately.
- Do not compost noxious weeds as it may lead to spreading through seed or fragment if the composting process is not hot enough.
- Use manual and/or mechanical methods of vegetation removal (pincer-type weeding tools, flame weeders, or hot water weeders as appropriate) rather than applying herbicides, where practical.
- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium.
    - Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for the climate and soil type.
    - Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects.

        - The fungus causes no known adverse effects to the host plant or to humans.
        - Tall fescues and rye grasses do not repel root-feeding lawn pests such as Crane Fly larvae.
        - Tall fescues and rye grasses are toxic to ruminants such as cattle and sheep
    - Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur.
    - Local agricultural or gardening resources such as Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs, to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: BMP C120: Temporary and Permanent Seeding, BMP C121: Mulching, BMP C123: Plastic Covering, and BMP C124: Sodding.
- Adjusting the soil properties of the subject site can assist in selection of desired plant species. Consult a soil restoration specialist for site-specific conditions.

Recommended Additional BMPs:

- Conduct mulch-mowing whenever practicable.
- Use native plants in landscaping. Native plants do not require extensive fertilizer or pesticide applications. Native plants may also require less watering.
- Use mulch or other erosion control measures on soils exposed for more than one week during the dry season (May 1 to September 30) or two days during the rainy season (October 1 to April 30).
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Apply an annual topdressing application of 3/8" compost. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can:
    - Substantially improve the permeability of the soil.
    - Increase the disease and drought resistance of the vegetation.
    - Reduces the demand for fertilizers and pesticides.
- Disinfect gardening tools after pruning diseased plants to prevent the spread of disease.
- Prune trees and shrubs in a manner appropriate for each species.
- If specific plants have a high mortality rate, assess the cause and replace with another more appropriate species.
- When working around and below mature trees, follow the most current American National Standards Institute (ANSI) ANSI A300 standards (see

http://www.tcia.org/TCIA/BUSINESS/ANSI_A300_Standards_/TCIA/BUSINESS/A300_Standards/A300_Standards.aspx?hkey=202ff566-4364-4686-b7c1-2a365af59669) and International Society of Arboriculture BMPs to the extent practicable (e.g., take care to minimize any damage to tree roots and avoid compaction of soil).

- Monitor tree support systems (stakes, guys, etc.).
    - Repair and adjust as needed to provide support and prevent tree damage.
    - Remove tree supports after one growing season or maximum of 1 year.
    - Backfill stake holes after removal.
- When continued, regular pruning (more than one time during the growing season) is required to maintain visual sight lines for safety or clearance along a walk or drive, consider relocating the plant to a more appropriate location.
- Make reasonable attempts to remove and dispose of class C noxious weeds.
- Re-seed bare turf areas until the vegetation fully covers the ground surface.
- Watch for and respond to new occurrences of especially aggressive weeds such as Himalayan blackberry, Japanese knotweed, morning glory, English ivy, and reed canary grass to avoid invasions.
- Plant and protect trees per BMP T5.16: Tree Retention and Tree Planting.
- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾-inch deep.
- Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing the turf.
    - Mowing is a stress-creating activity for turfgrass.
    - Grass decreases its productivity when mowed too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation to remain healthy.

Additional BMP Information:

- King County's *Best Management Practices for Golf Course Development and Operation* (King County, 1993) has additional BMPs for Turfgrass Maintenance and Operation.
- King County, Seattle Public Utilities, and the Saving Water Partnership have created the following natural lawn and garden care resources that include guidance on building healthy soil with compost and mulch, selecting appropriate plants, watering, using alternatives to pesticides, and implementing natural lawn care techniques.

    - *Natural Yard Care - Five steps to make your piece of the planet a healthier place to live* (King County and SPU, 2008)
    - *The Natural Lawn & Garden Series: Smart Watering* (Saving Water Partnership, 2006)
    - *Natural Lawn Care for Western Washington* (Saving Water Partnership, 2007)
    - *The Natural Lawn & Garden Series: Growing Healthy Soil; Choosing the Right Plants; and Natural Pest, Weed and Disease Control* (Saving Water Partnership, 2012)
- The International Society of Arboriculture (ISA) is a group that promotes the professional practice of arboriculture and fosters a greater worldwide awareness of the benefits of trees through research, technology, and education. ISA standards used for managing trees, shrubs, and other woody plants are the American National Standards Institute (ANSI) A300 standards. The ANSI A300 standards are voluntary industry consensus standards developed by the Tree Care Industry Association (TCIA) and written by the Accredited Standards Committee (ASC). The ANSI standards can be found on the ISA website: www.isa-arbor.com/education/publications/index.aspx
- Washington State University's *Gardening in Washington State* website at http://gardening.wsu.edu contains Washington State specific information about vegetation management based on the type of landscape.
- See the *Pacific Northwest Plant Disease Management Handbook* (Pscheidt and Ocamb, 2016) for information on disease recognition and for additional resources.

S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites

Description of Pollutant Sources: Industrial activities on soil areas; exposed and disturbed soils; steep grading; etc. can be sources of sediments that can contaminate stormwater runoff.

Pollutant Control Approach: Limit the exposure of erodible soil, stabilize, or cover erodible soil where necessary to prevent erosion, and/or provide treatment for stormwater contaminated with TSS caused by eroded soil.

Applicable BMPs:

- Limit the exposure of erodible soil.
- Stabilize entrances/exits to prevent track-out. See BMP C105: Stabilized Construction Access.
- Stabilize or cover erodible soil to prevent erosion. Cover practice options include:
    - Use vegetative cover such as grass, trees, shrubs, on erodible soil areas.
    - Cover exposed areas with mats such as clear plastic, jute, synthetic fiber. See BMP C122: Nets and Blankets and BMP C123: Plastic Covering.