ADDENDUM #1
TO THE
SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR
CROWN PARK IMPROVEMENTS
City Project No. P1007

May 3, 2024

IMPORTANT: *This page of the addendum must be signed and submitted with the proposal and acknowledged on the Bid Bond Acknowledgement form with the bid.*

TO ALL PLANHOLDERS:

The following changes, additions, deletions and/or clarifications are made a part of the contract documents and bid specifications for the construction of the *Crown Park Improvements,* City of Camas Project No. P1007 as fully and completely as if the same were set forth therein:

APPENDICES –
The following appendices have been added:
Crown Park Play Area
Crown Park Restroom Building
Crown Park Phase 1-CRS Rpt 5102
Soil Report
Crown Park Tree Data
Geotechnical Report

Receipt of this addendum is hereby acknowledged:

____
Authorized Signature

Crown Park Play Area
Quote / Worksheet # 2210-11375-1-5

To:
City of Camas | Camas Parks & Recreation Department
227 NE Lake Road Camas, WA 98607
Trang Lam | Parks & Recreation Director
tlam@cityofcamas.us | 360. 817. 7234

Owner:
City of Camas | Camas Parks & Recreation Department
227 NE Lake Road Camas, WA 98607
Trang Lam | Parks & Recreation Director
tlam@cityofcamas.us | 360. 817. 7234

Treehouse

Project Location:
Crown Park
120 NE 17th Ave
Camas, WA 98607

Ship To:
Crown Park
120 NE 17th Ave
Camas, WA 98607

Date	Lead Time	Terms	Quoted By
November 13, 2023	`28 weeks	*prices valid through 12/30/2023*	**Chris Donahue 253.691.6847**

Quantity	*Drawing / Model #*		*per unit*	*Total*
		PLAY EQUIPMENT		
	1167493-01-04	**2-5** Playground Equipment per itemized Quote Sheet #1167493-01-04 manufactured by Landscape Structures		$ [redacted]
	1167493-01-04	**5-12** Playground Equipment per itemized Quote Sheet #1167493-01-04 manufactured by Landscape Structures		$ [redacted]
				$ -
		SURFACING		
9,075	Square Feet	ForeverLawn Playground Grass Ultra 2" SafetyFoam Pro (Main Area - 8Ft CFH over CCR). 1" SafetyFoam Pro (Hillside Area - 4Ft CFH over Shotcrete/CCR) Envirofill Infill per product specifications. Composite edge nailer boards. Also, all associated and required items that accompany this (seaming tape, etc.). [redacted]	$ [redacted]	$ [redacted]
square footage based on material required				$ -
				$ -
		PLAYGROUND INSTALLATION		
		Not Included		$ -
		Playground Grass Installation **includes** **- Prevailing Wage** **- Certified Payroll**		$ -
				$ -
	Sourcewell Contract #010521-LSI [City of Camas ID# 106292] Pricing Discount			$ [redacted]

Issue Purchase Order to:
Landscape Structures, Inc.
attention: **Misty Link**
601 - 7th Street South
Delano, MN 55328-0198
mistylink@playlsi.com
763.972.5591

Send for processing to:
PlayCreation, Inc.
attention: **Chris Donahue**
2104 SW 152nd Street, ste 1
Burien, WA 98166
Chris@PlayCreation.com
206.932.6366

Sub Total	$
Freight	$
Tax 8.5%	$
Total	$

APPROVAL ______________________________ ______________________________
signature date PO#

Quote based on current pricing | Pricing Valid till 12-30-2023

PlayCAD Quote

Date: 10/27/2023
By: Conner Mullan

Rep Organization: PlayCreation, Inc.
Contact Person: Chris Donahue

Quote No: 1167493-01-04

Project Title: Crown Park Play Area

Location: Camas, WA

PlayBooster® and Weevos® (2-5 years)

PHASE-1 Direct Bury Aluminum			UNIT		TOTAL	
QTY	**NO.**	**DESCRIPTION**	**WEIGHT** (lb)	**PRICE** (US $)	**WEIGHT** (lb)	**PRICE** (2024)
PlayBooster®						
Climbers W/Permalene Handholds						
1	152907C	Deck Link w/Barriers Steel end panels 3 Steps			236.0	
Custom						
1	CP030193	48" DECK MOUNTAIN ABC CLIMBER W/HANDHOLDS DB like ABC climber, but with mountain shape steps and permalene handholds. 4 permalene colors for the mountains.			136.0	
1	CP007489	BELT BOPPITY BRIDGE® FROM WEEVOS TO PLAYBOOSTER® DB Extended Handrails			325.0	
3	CP021579	DIGIFUSE PINE TREE POST TOPPER Requires standard roof post, not included. Branch panels are 3 different sizes.	63.0		189.0	
Decks						
1	178710A	Hexagon Tenderdeck			285.0	
1	111228A	Square Tenderdeck			118.0	
1	185852A	Transfer Step w/2 Handloops DB			77.0	
Enclosures						
1	115223A	Bubble Panel Above Deck			38.0	
1	115253A	Hole Panel			30.0	
1	127678A	Match 4 Panel Above Deck			46.0	
Motion & More Fun						
1	120901A	Grab Bar			5.0	
Posts						
2	111404G	100"Alum Post DB	26.0		52.0	
2	111404D	124"Alum Post DB	30.0		60.0	
1	111404C	132"Alum Post DB			31.0	
3	111403D	158"Alum Post For Roof DB	36.0		108.0	
2	111404H	92"Alum Post DB	23.0		46.0	
Slides						
1	130798A	Double Swirl Slide 48"Dk DB			176.0	

PlayCAD Quote

Date: 10/27/2023 | Rep Organization: PlayCreation, Inc. | Quote No: 1167493-01-04

By: Conner Mullan | Contact Person: Chris Donahue

Project Title: Crown Park Play Area | Location: Camas, WA

<table>
<tr><th colspan="7">PlayBooster® and Weevos® (2-5 years)</th></tr>
<tr><th colspan="3">PHASE-1 Direct Bury Aluminum</th><th colspan="2">UNIT</th><th colspan="2">TOTAL</th></tr>
<tr><th>QTY</th><th>NO.</th><th>DESCRIPTION</th><th>WEIGHT (lb)</th><th>PRICE (US $)</th><th>WEIGHT (lb)</th><th>PRICE (2024)</th></tr>
<tr><td>1</td><td>122033D</td><td>SpyroSlide
56"w/Hanger Bracket DB¹</td><td></td><td></td><td>402.0</td><td></td></tr>
<tr><td colspan="7">Weevos®
Bridges</td></tr>
<tr><td>1</td><td>173575A</td><td>Swiggly Stix Bridge DB¹</td><td></td><td></td><td>126.0</td><td></td></tr>
<tr><td colspan="7">Climbers</td></tr>
<tr><td>1</td><td>173573A</td><td>Wee Planet Climber DB¹</td><td></td><td></td><td>130.0</td><td></td></tr>
<tr><td colspan="7">Mainstructures</td></tr>
<tr><td>1</td><td>164343A</td><td>Weevos 2 Arch Mainstructure DB Only¹</td><td></td><td></td><td>285.0</td><td></td></tr>
<tr><td colspan="7">Motion & More Fun</td></tr>
<tr><td>1</td><td>164173A</td><td>Twirly Bar DB</td><td></td><td></td><td>23.0</td><td></td></tr>
<tr><td colspan="7">Freestanding Play
Custom</td></tr>
<tr><td>1</td><td>CP001996</td><td>UPCHARGE FOR ADDITIONAL CLAMP
COLOR Per SS box</td><td></td><td></td><td>0.0</td><td></td></tr>
<tr><td colspan="7">Motion & More Fun</td></tr>
<tr><td>1</td><td>295696A</td><td>ReviRock Bouncer DB Only</td><td></td><td></td><td>333.0</td><td></td></tr>
<tr><td colspan="7">Sensory Play</td></tr>
<tr><td>1</td><td>228215A</td><td>Rhapsody Goblet Drum Junior DB</td><td></td><td></td><td>55.0</td><td></td></tr>
<tr><td>1</td><td>228217A</td><td>Rhapsody Kettle Drum Junior DB</td><td></td><td></td><td>62.0</td><td></td></tr>
<tr><td>1</td><td>250341C</td><td>Rhapsody Tongue Drum Junior w/o
Mallet DB</td><td></td><td></td><td>35.0</td><td></td></tr>
<tr><td colspan="7">Signs</td></tr>
<tr><td>1</td><td>182503A</td><td>Welcome Sign (LSI Provided)
Ages 2-5 years Direct Bury</td><td></td><td></td><td>24.0</td><td></td></tr>
<tr><td colspan="7">Swings</td></tr>
<tr><td>2</td><td>174018A</td><td>Belt Seat
ProGuard Chains for 8' Beam Height</td><td>8.0</td><td></td><td>16.0</td><td></td></tr>
<tr><td>1</td><td>237297A</td><td>Friendship Swing w/Single Post Frame
Additional Bay
52" Bury ProGuard Chains</td><td></td><td></td><td>252.0</td><td></td></tr>
<tr><td>2</td><td>176038A</td><td>Full Bucket Seat
ProGuard Chains for 8' Beam Height</td><td>14.0</td><td></td><td>28.0</td><td></td></tr>
<tr><td>1</td><td>177344A</td><td>Single Post Swing Frame
52" Bury 8' Beam Height Only</td><td></td><td></td><td>251.0</td><td></td></tr>
<tr><td>1</td><td>177345A</td><td>Single Post Swing Frame
52" Bury Additional Bay 8' Beam Height</td><td></td><td></td><td>148.0</td><td></td></tr>
</table>

PlayCAD Quote

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By: Conner Mullan

Rep Organization: PlayCreation, Inc.
Contact Person: Chris Donahue

Quote No: 1167493-01-04

Project Title: Crown Park Play Area

Location: Camas, WA

PlayBooster® and Weevos® (2-5 years)						
PHASE-1 Direct Bury Aluminum			UNIT		TOTAL	
QTY	NO.	DESCRIPTION	WEIGHT (lb)	PRICE (US $)	WEIGHT (lb)	PRICE (2024)
		Only				

PlayBooster® (5-12 years)						
PHASE-1 Direct Bury Mixed Material			UNIT		TOTAL	
QTY	NO.	DESCRIPTION	WEIGHT (lb)	PRICE (US $)	WEIGHT (lb)	PRICE (2024)
PlayBooster®						
Bridges & Ramps						
2	174815A	12' Ramp w/Guardrails and Curbs	638.0		1276.0	
1	120325A	Ramp Berm Exit Plate Concrete Wall			30.0	
1	171539A	Ramp Deck Extension DB 12"Dk			54.0	
Climbers Nature-Inspired						
1	172666B	Corkscrew Climber w/Recycled Wood-Grain Handholds 72"Dk DB			109.0	
1	169318E	Wood Plank Wiggle Ladder 64"Deck w/Recycled Wood-Grain Handholds DB			92.0	
Climbers W/Permalene Handholds						
1	152907D	Deck Link w/Barriers Steel end panels 4 Steps			296.0	
1	229832A	Dot-to-Dot Climber			204.0	
1	116249A	Vertical Ladder 24"Dk DB			40.0	
Custom						
1	CP029994	144" SLIDEWINDER2® W/ NO UPPER BARRIER DB Custom configuration: Entrance-STR-RH-STR-LH-STR-STR-STR-STR-Exit			340.0	
1	CP020857	149" OC SWIGGLE STIX BRIDGE DB ground level. Beam adjusted to fit along side a 12'5" ramp. (2) additional pods. Posts NOT included			160.0	
4	CP000270A	DTR PB 216" Steel Roof Post for 96" Deck 44" Bury	130.0		520.0	
1	CP014763A	DTR PB 42" OC Rocker Seat			16.0	

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Location: Camas, WA

PlayBooster® (5-12 years)						
PHASE-1 Direct Bury Mixed Material			UNIT		TOTAL	
QTY	NO.	DESCRIPTION	WEIGHT (lb)	PRICE (US $)	WEIGHT (lb)	PRICE (2024)
1	CP000334A	DTR PB Bee and Flower Pilot Panel			60.0	
1	CP000184A	DTR PB Bee Pipe Barrier Above Deck			92.0	
1	CP001203A	DTR PB Deck Extension for Sway Fun - Attaches to Standard Deck			41.0	
1	CP003636	TREEHOUSE ROOF FOR HEX DECK *NOTE: Requires 4-roof posts not included in price.			392.0	
Decks						
3	178710A	Hexagon Tenderdeck	285.0		855.0	
5	121948A	Kick Plate 8"Rise	13.0		65.0	
1	185852A	Transfer Step w/2 Handloops DB			77.0	
7	111231A	Triangular Tenderdeck	62.0		434.0	
3	119646A	Tri-Deck Extension	51.0		153.0	
Enclosures						
2	191031A	Accessible Panel Curb	5.0		10.0	
2	160694A	Barrier With Infill Panel	32.0		64.0	
1	135731A	Chimes Reach Panel Above Deck			31.0	
1	217909A	DigiFuse Barrier Panel Above Deck Camping-Sounds/Map - 000000004			41.0	
1	217911A	DigiFuse Periscope Panel Above Deck Animal Tracks-Black Bear/Tracks - 000000023			60.0	
3	127953A	Handhold Panel Set	24.0		72.0	
2	169319A	Recycled Wood-Grain Lumber Panel	85.0		170.0	
1	127440A	Trail Tracker Reach Panel Above Deck			19.0	
1	114649A	Zoo Infill Panel			31.0	
Motion & More Fun						
1	120901A	Grab Bar			5.0	
Overhead Events						
1	142890A	2"90* Horizontal Ladder DB			114.0	
1	141886A	Access/Landing Assembly Rails Barrier Left 24"Dk			34.0	

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Project Title: Crown Park Play Area Location: Camas, WA

PlayBooster® (5-12 years)						
PHASE-1 Direct Bury Mixed Material			**UNIT**		**TOTAL**	
QTY	**NO.**	**DESCRIPTION**	**WEIGHT** (lb)	**PRICE** (US $)	**WEIGHT** (lb)	**PRICE** (2024)
Posts						
2	111404G	100"Alum Post DB	26.0		52.0	
3	111404E	116"Alum Post DB	29.0		87.0	
1	111404D	124"Alum Post DB			30.0	
4	111403R	126"Steel Post For Roof DB	73.0		292.0	
1	111404C	132"Alum Post DB			31.0	
1	111404B	140"Alum Post DB			34.0	
2	111404A	148"Alum Post DB	36.0		72.0	
1	111404K	156"Alum Post DB			37.0	
1	111404L	164"Alum Post DB			38.0	
2	111404Z	182"Steel Post DB 44" Bury	105.0		210.0	
6	111404H	92"Alum Post DB	23.0		138.0	
Roofs						
4	178470A	Pine Tree Accent Topper	108.0		432.0	
Slides						
1	130390A	Double Swoosh Slide 64"Dk DB[1]			174.0	
1	124863D	SlideWinder2 56"Dk DB 2 Straight			192.0	
Freestanding Play						
Climbers						
1	173908A	Log Stepper 18"Height DB Only			244.0	
1	173907A	Log Stepper 8"Height DB Only			155.5	
Custom						
2	CP000182A	DTR IND Flower Stepper 8" Deck	22.0		44.0	
1	CP017238	ROPE PULL CLIMBER FOR 4' HILL. DB Approximately 14' 8" long in plan. Includes clamps, 1 PB Post and 5 roto knots.			97.0	
Motion & More Fun						
2	164075B	Double Bobble Rider DB	131.0		262.0	
1	170894A	Sway Fun Wheelchair Glider 12"Height[1]			1271.0	
1	249558A	We-Go-Round w/Nature DigiFuse Panels 2 Seats DB Only[1]			2107.0	
Signs						
1	182503C	Welcome Sign (LSI Provided)			24.0	

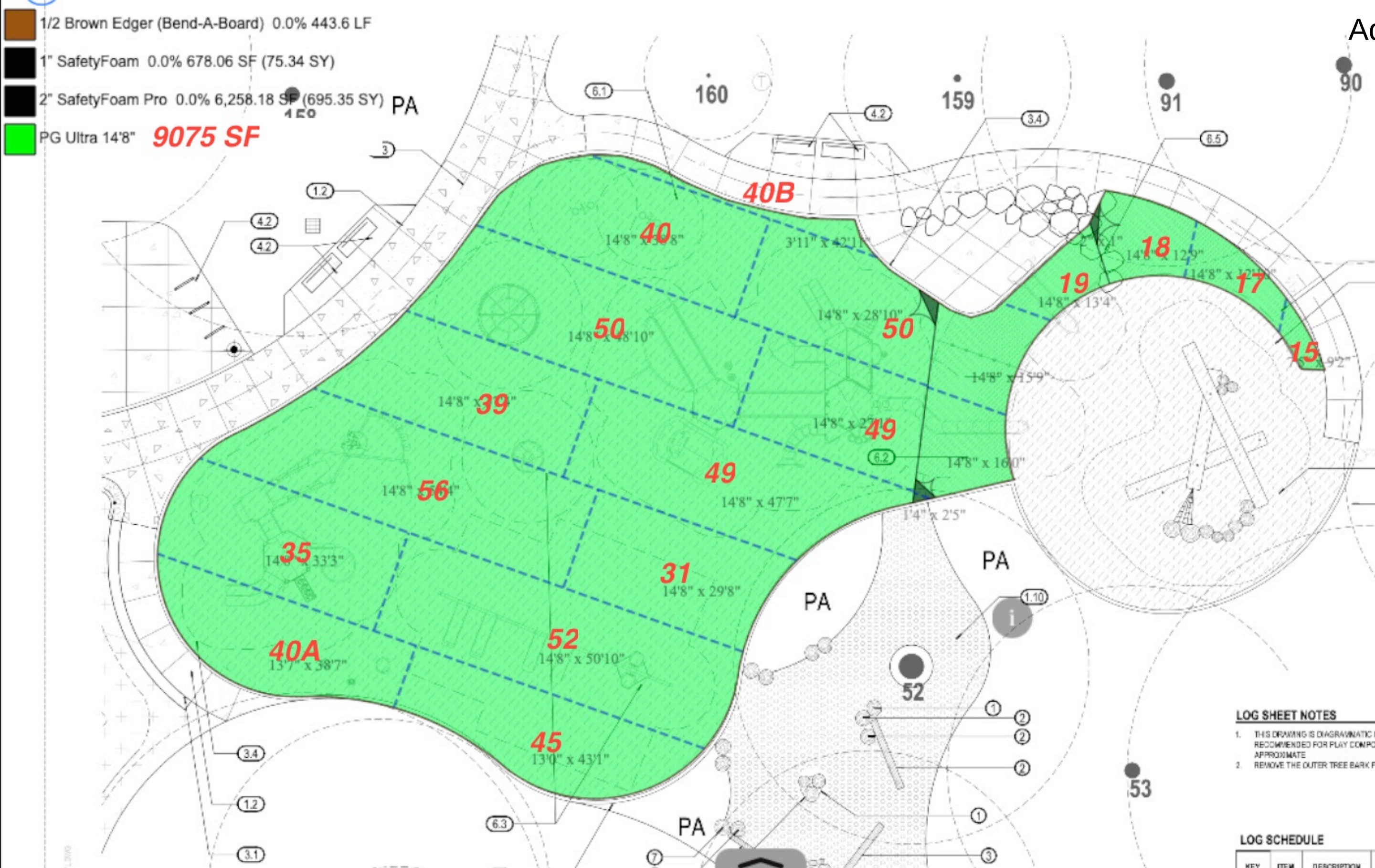
PlayCAD Quote

Date: 10/27/2023 Rep Organization: PlayCreation, Inc. Quote No: 1167493-01-04
By: Conner Mullan Contact Person: Chris Donahue

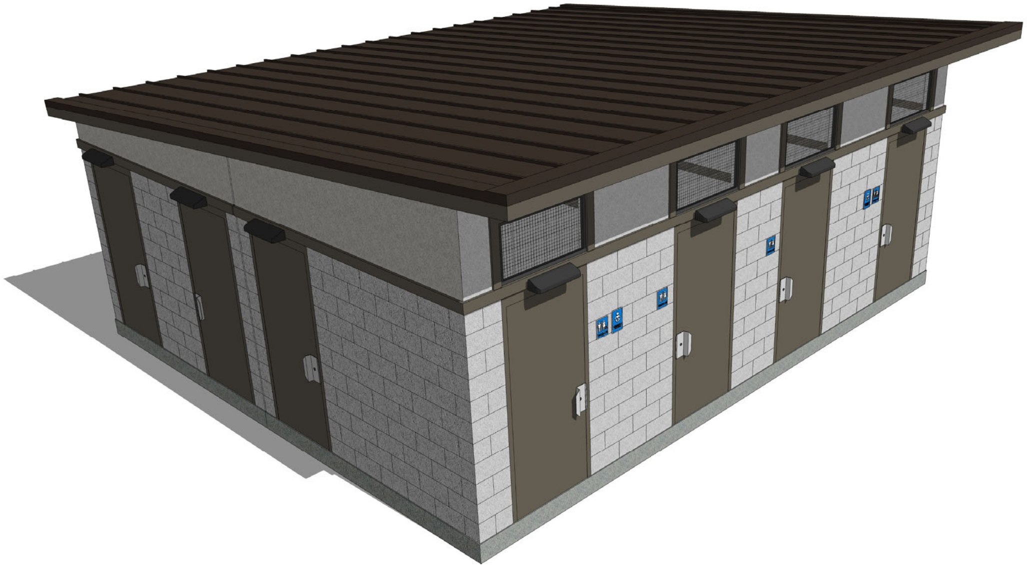
Project Title: Crown Park Play Area Location: Camas, WA

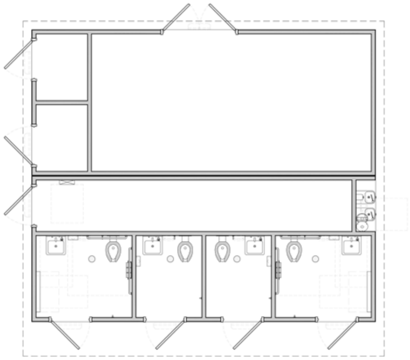
PlayBooster® (5-12 years)						
PHASE-1 Direct Bury Mixed Material			**UNIT**		**TOTAL**	
QTY	**NO.**	**DESCRIPTION**	**WEIGHT** (lb)	**PRICE** (US $)	**WEIGHT** (lb)	**PRICE** (2024)
		Ages 5-12 years Direct Bury				

SUMMARY		**CONCRETE** (cu-ft)	**FOOTINGS** (count)	**LABOR** (hours)	**WEIGHT** (lb)	**PRICE** (2024)
PlayBooster® and Weevos® (2-5 years) PHASE-1		133.7	47	67.5	4,128.0	
Total Safety Zone Area = 5096 sq. ft.						
PlayBooster® (5-12 years) PHASE-1		243.4	68	128.8	11,980.5	
Total Safety Zone Area = 5096 sq. ft.						
ALL PHASES	PlayBooster®	150.6	82	109.3	10,136.0	
	Weevos®	33.7	14	14.5	564.0	
	Freestanding Play	192.7	19	72.5	5,408.5	
	Total	377.1	115	196.3	16,108.5	

🟫 1/2 Brown Edger (Bend-A-Board) 0.0% 443.6 LF
■ 1" SafetyFoam 0.0% 678.06 SF (75.34 SY)
■ 2" SafetyFoam Pro 0.0% 6,258.18 SF (695.35 SY)
🟩 PG Ultra 14'8" 9075 SF
Ac
PA
160
159
91
90
40B
40
14'8" x 38'8"
3'11" x 42'11"
18
14'8" x 12'9"
19
14'8" x 13'4"
17
14'8" x 12'10"
15
9'2"
50
14'8" x 48'10"
50
14'8" x 28'10"
14'8" x 15'9"
39
14'8"
49
14'8" x 27'
49
14'8" x 47'7"
14'8" x 16'0"
56
14'8"
1'4" x 2'5"
35
14'8" x 33'3"
31
14'8" x 29'8"
40A
13'7" x 38'7"
52
14'8" x 50'10"
45
13'0" x 43'1"
PA
PA
PA
52
53
6.1
4.2
3.4
8.5
3
1.2
4.2
4.2
6.2
1.10
3.4
1.2
6.3
3.1
7
1
2
2
2
1
3
LOG SHEET NOTES
1. THIS DRAWING IS DIAGRAMMATIC
RECOMMENDED FOR PLAY COMPO
APPROXIMATE
2. REMOVE THE OUTER TREE BARK F
LOG SCHEDULE
KEY ITEM DESCRIPTION

PROJECT REF#: 11280-8/1/2023-3





FLOOR PLAN

SCALE: NOT TO SCALE

RESTROOM BUILDING
CAMAS, WASHINGTON

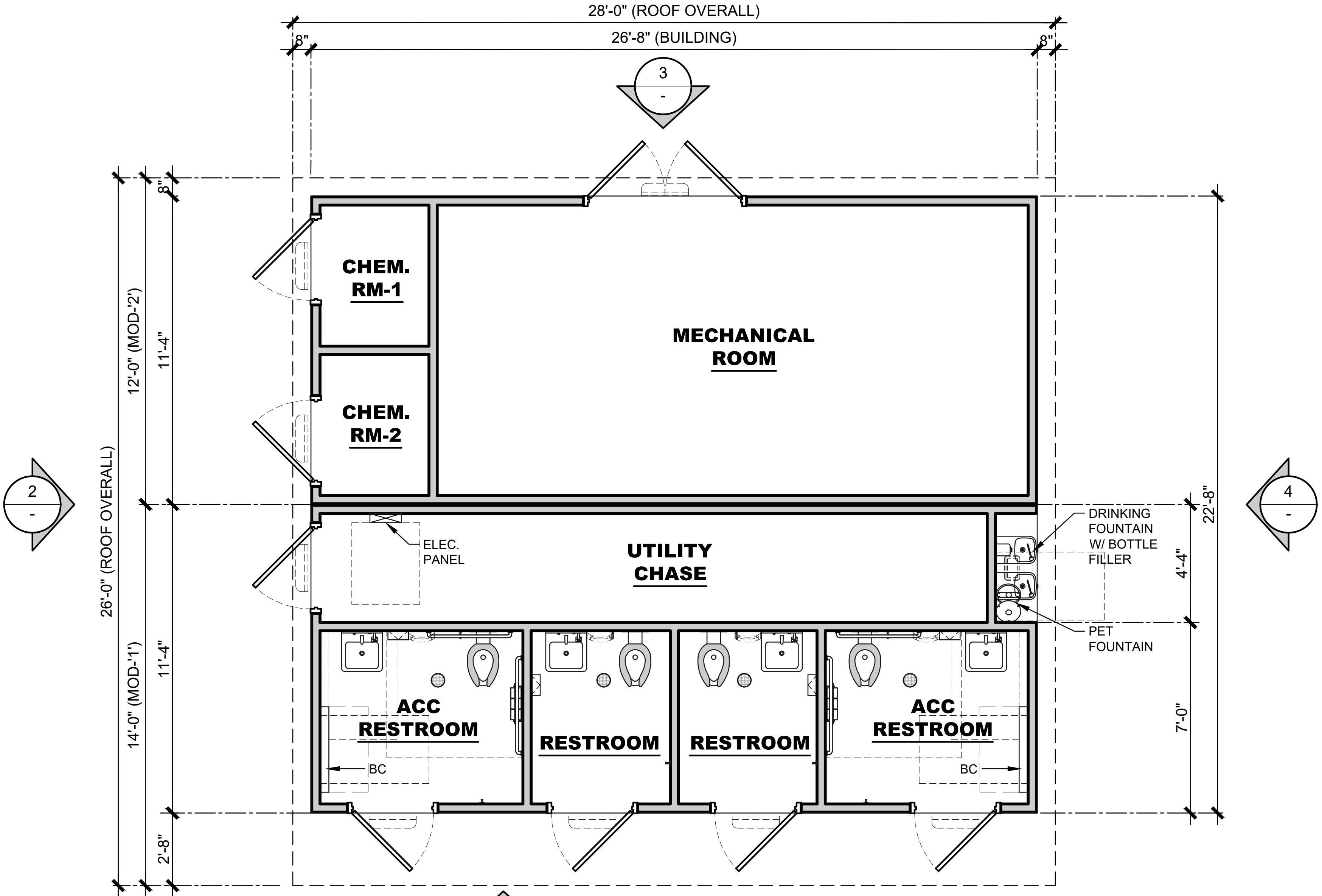
CROWN PARK

ARTIST IMPRESSION: 3D RENDERING ONLY FOR REPRESENTATION. COLORS AND MATERIALS ARE SUBJECT TO CHANGE

PUBLIC RESTROOM COMPANY
Building Better Places To Go.℠

www.PublicRestroomCompany.com
2587 BUSINESS PARKWAY
MINDEN NEVADA 89423
P: 888-888-2060 F: 888-888-1448

PROJECT REF#: 11280-8/1/2023-3



FLOOR PLAN

SCALE: 3/16"=1'0"

PUBLIC RESTROOM COMPANY
Building Better Places To Go.℠

BUILDING TYPE: **RESTROOM BUILDING**

PROJECT: **CROWN PARK**
CAMAS, WA

REVISION #
3

REVISION DATE: **8/1/2023**
DRAWN BY: EOR

PROJECT #:
11280

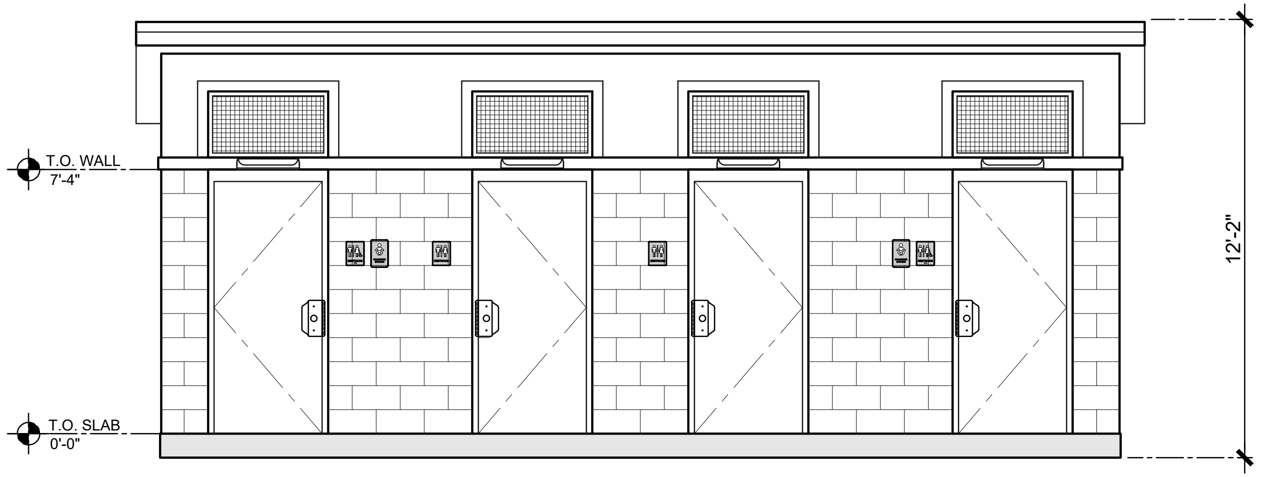
START DATE: **4/20/2022**
DRAWN BY: EOR

SHEET#
A-1

MAX. PERSON / HOUR:
180 M

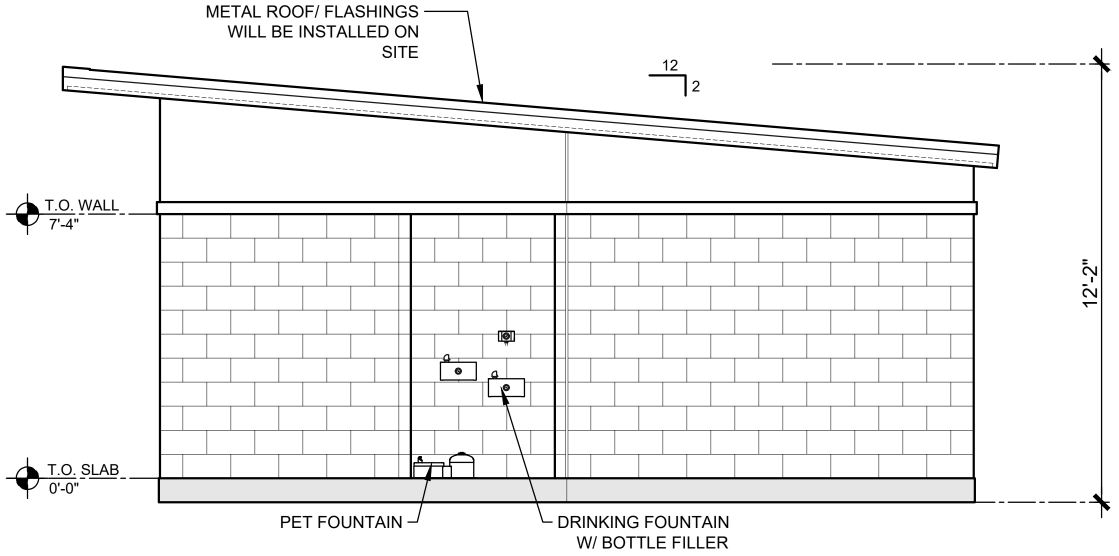
Ph: 888-888-2060 | Fax: 888-888-1448

~NOT FOR CONSTRUCTION ~ PRELIMINARY DESIGN DRAWING ONLY ~ DO NOT SCALE, DIMENSIONS PRESIDE



ELEVATION 1

SCALE: 3/16"=1'-0"



ELEVATION 2

SCALE: 3/16"=1'-0"

PUBLIC RESTROOM COMPANY
Building Better Places To Go.℠

BUILDING TYPE: **RESTROOM BUILDING**

PROJECT: **CROWN PARK**
CAMAS, WA

REVISION #
3

PROJECT #:
11280

REVISION DATE: **8/1/2023**
DRAWN BY: EOR

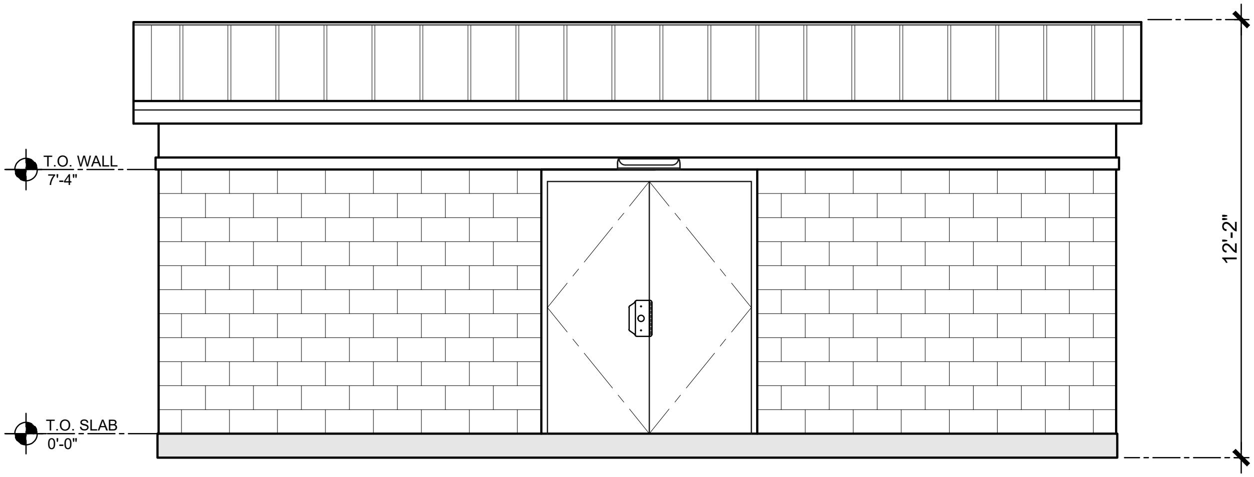
START DATE: **4/20/2022**
DRAWN BY: EOR

SHEET#
A-2

MAX. PERSON / HOUR:
180 M

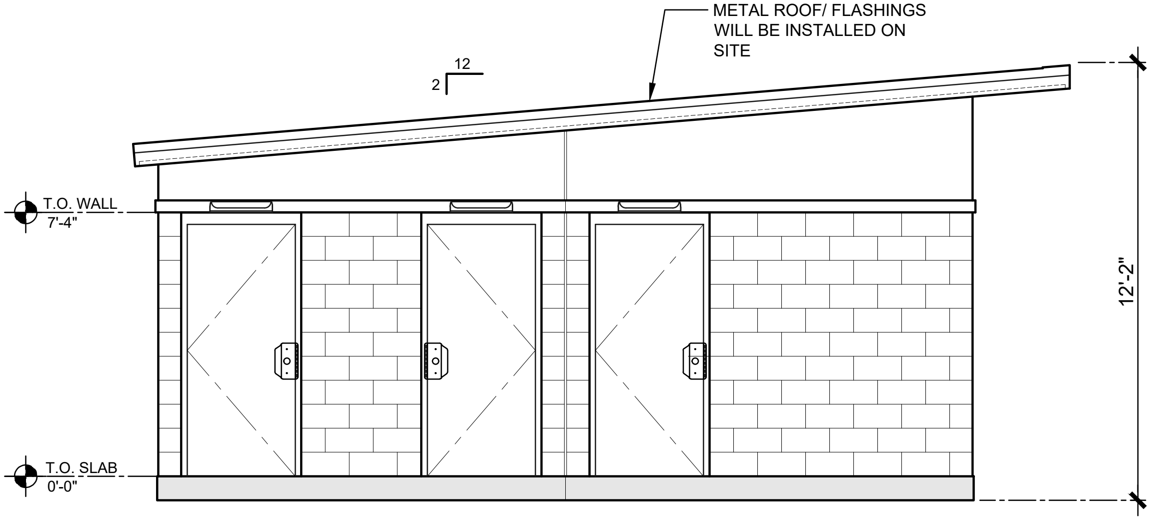
Ph: 888-888-2060 | Fax: 888-888-1448

~NOT FOR CONSTRUCTION ~ PRELIMINARY DESIGN DRAWING ONLY ~ DO NOT SCALE, DIMENSIONS PRESIDE



ELEVATION 3

SCALE: 3/16"=1'-0"



ELEVATION 4

SCALE: 3/16"=1'-0"

PUBLIC RESTROOM COMPANY
Building Better Places To Go.℠

BUILDING TYPE: **RESTROOM BUILDING**

PROJECT: **CROWN PARK**
CAMAS, WA

REVISION #
3

REVISION DATE: **8/1/2023**
DRAWN BY: EOR

PROJECT #:
11280

START DATE: **4/20/2022**
DRAWN BY: EOR

SHEET#
A-3

MAX. PERSON / HOUR:
180 M

Ph: 888-888-2060 | Fax: 888-888-1448

~NOT FOR CONSTRUCTION ~ PRELIMINARY DESIGN DRAWING ONLY ~ DO NOT SCALE, DIMENSIONS PRESIDE

SPECIFICATIONS

Project #: 11280
Project Name: Crown Park
Site Address: 120 Ne 17Th Ave.
City, State, Zip: Camas, WA 98607

Bldg Size: See Drawings
Type of Bldg: SP-044-DF-BF
Restroom/Mechanical Room

TYPE OF BUILDING

Construction Type

MVR WOOD	Wood Framed walls above cap beam, and wood framed rafters [ceiling & vents same as MVR]

FLOOR SYSTEM

ROOM/ITEM	FINISH
Entire Building	Exposed Concrete with Light Broom Finish with Integral Additive for Stain/Moisture Resistance

WALL SYSTEM

BUILDING WALLS HEIGHT

Building Walls Height	7'4"

EXTERIOR WALLS - CMU	BLOCK TYPE AND COLOR	ROWS
Split Face Exterior 4" CMU	Split Face Gray	All

CAP BEAM

Cap Beam	Cap Beam, Steel Tube, Painted

WALL FINISHES - EXTERIOR

TYPE	FINISH	HEIGHT
CMU	Paint over block filler	To Cap Beam
FRC Siding -Above- Cap Beam	FRC Stucco Pattern-James Hardie - Painted	Above Cap Beam
Alcove	Precision CMU Painted	To Cap Beam
Exterior Paint	PPG Exterior Gloss - Colors TBD by client	

WALL FINISHES - INTERIOR

ROOM	FINISH	HEIGHT
Restrooms Below Cap Beam	Block filler & paint	To Cap Beam
Restrooms - Above Cap Beam	Stucco Pattern FRC - Painted	Above Cap Beam
Mechanical - To Cap Beam	Block filler & paint	To Cap Beam
Mechanical - Above Cap Beam	Painted OSB	Above Cap Beam

ROOF SYSTEM

ITEM	DESCRIPTION		
Vertical Seam 24 ga	Metal Sales Vertical Seam 24 ga 12in. Panel Striations		
Entire Building Ceiling	(MVR) 5/16" Cement Board Stucco Pattern Over 5/8" OSB		
Insulation	Insulate, But Not To Code	R Value:	
Fascia	14/16 Ga Formed Galvanized Steel W/1" Return At Top (MVR)		
Vents SS Wire Mesh	Stainless Steel Wire Mesh - Provide Lexan Cover for Vents		

DOORS - HARDWARE

ITEM	DESCRIPTION
Hollow Metal Doors	Hollow Metal: Galvanized 14 GA. Door w/ 14 GA Frame Continuos Hinge
Fiber Glass	Fiberglass Door with Fiberglass Frame
Double Door (Storage Area)	Hollow Metal 14 GA Door &14 GA Frame w/ Continuous Hinge (Includes Threshold)
Deadbolt	SCHLAGE B600 series temporary large format core (std)

ITEM	DESCRIPTION	LOCATION
Pull Plates	Rockwood-VRT24 "Z" (Standard w/Anti-Microbial) (Std)	
Door Closer	LCN Closer, Model # 4211 Cush Arm (for Out Swing Door)	Restroom
Weather Strip	Pemko Perimeter Gasketing (3' x 7' Door) # 303-C-S-3684	All
Door Sweeps	Pemko Door Sweep 321SSN36"	All
Door Threshold (No Tile)	Threshold Fluted Saddle Mill Finish Alum, 4" Wide #270A36	All
Ives Crash Chain (Standard)	Ives Crash Chain, # CS11526D20, US26D, 20.5, Crash Stop	All but restroom
Magnetic Locks (SAM)	SAM Securitron System	Piezo Exit Switch SDC 4630 Series

RESTROOM ACCESSORIES

ITEM	MANUFACTURER/DESCRIPTION	FINISH
Signage	Door/Wall Signs	Polished Aluminum & Blue
Grab Bars	Grab Bars	Stainless Steel
Aluminum Louvers (Chase Std)	Louver Sunvent Industries Model #157	Polished Aluminum
3-roll Toilet Paper Holders	Royce Rolls TP-3	Stainless Steel
Baby Changing Station	Foundations Horizontal #5410339	Stainless Steel
Hand Dryer Std	Dyson Airblade V, Low Voltage 120V, Model # HU02,	Spray Nickel

ITEM	MANUFACTURER/DESCRIPTION
Utility Hook (Standard)	Utility Hook, Bright Finish
Soap Dispenser	PRC Proprietary Tank
W/Thru Wall Valve	Thru Wall Valve ASI #353

PLUMBING

FIXTURE/PART	DESCRIPTION
Toilets - Stainless Steel	Acorn # 1675 W-1-HET 1.28 GPF-FVBO-ADA-PFS-316SS
Lavs - Stainless Steel	Rear Connect Acorn # 1652LRB-1-DMS-03-M-316SS
Drinking Fountain	Wall Mounted Drinking Fountain, 14 Gauge, Type 304 Stainless Steel, Haws Model # 1109.14
Round Concrete Pet Fountain	Round Concrete Pet Fountain Murdock GUT19-FP Series
Bottle Filler	Wall Mounted Bottle Filler, Lead Free, Type 304 Stainless Steel, Haws Model # 1920
Lever (Std) - Toilet Flush Valve	Zurn W.C. Flush Valve 1.28 Ga Zurn # Z6143AV-HET-7L-BG
Metering Faucet	Single Hole Metering Faucet, Chicago Model # 333-E2805-665PSHABCP - Tempered
Floor Drains: W/Trap Primer	Floor Drain Zurn # ZN460-2NH-5B W/Strainer / With Trap Primer

PLUMBING GENERAL

FIXTURE/PART	DESCRIPTION	
Water Heater	Stiebel DHC-E8	1-2 lavatories
Tempered Water to Lavs	Thermostatic Mixing Valve, Acorn Model # ST70-12	
Valve Combo (PRV)	Valve Combo with Pressure Reducing Valve	
Water Line Material	Copper (Std)	
Bladder Tank	ProFlo PFXT5	
Hose Bibb- Interior	Acorn #8121-LF - in the Chase	
Hose Reel & Hose	Hose Reel With 5/8"x75' Garden Hose	

ELECTRICAL

ITEM	DESCRIPTION	
Electrical Panel	100 amp Single Phase - 120/240 v	20 Circuits
Breakers	Plug on (QOD)	

LIGHTING

ITEM	DESCRIPTION (W=WALL, C=CEILING)	
Lighting Control -Interior-	Light Fixture Integraded Occupancy Sensor (OCC)	
OCC Sensor Switch for St&CN	Occupancy Sensor Wall Switch with Dimming	
Interior Lights	W/C) Luminaire, Swoop Series SWP-610-OP-BRZ	15 Watts
Interior Lights	W/C) Luminaire, Swoop Series SWP1212-OP-BRZ-OCC	15 Watts
Lighting Control -Exterior-	Photo Cell Intermatic Photo Control #EK4336S	
Exterior Light	W) Luminaire, AEL-12 (Dark Sky Compliant) 20" long OCC	10 Watts
Chase Lights	C) Green AL-41L (small Chase) Waterproof	15 Watts
Storage Lights	C) Green AL-41L (small room) waterproof	15 Watts
Storage Lights	C) Green AL-42L 36W (large room) waterproof	30 Watts

RECEPTACLES/SWITCHES, HEATERS, FANS, HVAC, LIGHTED SIGNS

ITEM	DESCRIPTION	LOCATION
Receptacles	GFCI (Adjacent to Panel)	
Receptacles	GFCI	Chase
Switches By Pass	By Pass (To By Pass OCC Sensors)	Chase
J-box	Provide J-Box	For future Radiant Heater *to be on installed on site
Fan	Broan Model # L100MG 120 VAC with 6" Round Duct Connector #1106466	
Emergency Light	Lithonia ELM2L Led 2 Head Led Emergency Light (Mechanical Room)	

CULTURAL RESOURCES REPORT COVER SHEET

DAHP Project Number: 2024-01-00505

Authors: Nicholas Smits, Andrea Blaser, and Sean Boyd

Title of Report: Cultural Resource Survey for the Crown Park Improvements Phase I Project, Camas, Washington

Date of Report: January 10, 2024

County: Clark Section: 10 Township: 1 North Range: 3 East

Quad: *Camas, WA-OR*, 7.5-minute series, 2017 Acres: 7.26

PDF of report submitted (REQUIRED) ☒ Yes

Historic Property Inventory Forms to be Approved Online? ☐ Yes ☒ No

Archaeological Site(s)/Isolate(s) Found or Amended? ☐ Yes ☒ No

TCP(s) found? ☐ Yes ☒ No

Replace a draft? ☐ Yes ☒ No

Satisfy a DAHP Archaeological Excavation Permit requirement? ☐ Yes # ☒ No

Were Human Remains Found? ☐ Yes DAHP Case # ☒ No

DAHP Archaeological Site #:

CULTURAL RESOURCE SURVEY FOR THE CROWN PARK IMPROVEMENTS PHASE I PROJECT, CAMAS, WASHINGTON

City of Camas Project No. PNR23002

RCO Project No. 22-1468

Prepared for City of Camas
Camas, Washington

January 10, 2024

REPORT NO. 5102

Archaeological Investigations Northwest, Inc.

3510 NE 122nd Ave. • Portland, OR • 97230

Phone 503 761-6605 • Fax 503 761-6620

CULTURAL RESOURCE SURVEY FOR THE CROWN PARK IMPROVEMENTS PHASE I PROJECT, CAMAS, WASHINGTON

PROJECT:	Improvements to Crown Park
TYPE:	Cultural resource survey
LOCATION:	Section 11, Township 1 North, Range 3 East, Willamette Meridian
USGS QUAD:	*Camas, WA-OR,* 7.5-minute series, 2017
CITY:	Camas
COUNTY:	Clark
PROJECT AREA:	7.26 acres
AREA SURVEYED:	7.26 acres
FINDINGS:	Previous archaeological and historic resource studies were completed for Crown Park in 2018. At that time, Crown Park was determined to be eligible for listing in the National Register of Historic Places. Adverse effects to the park, including demolition of the Camas Municipal Swimming Pool in 2019, were mitigated through consultation with the Washington State Department of Archaeology and Historic Preservation. No other historic buildings or structures are within the Phase I Improvements project area at Crown Park. One lithic flake (isolate 45CL1363) was previously recorded in the northeast corner of Crown Park, outside of the Phase I Improvements area. As a result of this 2023 updated cultural resource survey, no additional archaeological materials were identified at Crown Park. No archaeological resources have been identified within the Phase I area.
PREPARERS:	Nicholas Smits, M.A., R.P.A., Senior Archaeologist Andrea Blaser, M.S., Senior Architectural Historian/Historian Sean Boyd, M.A., R.P.A., Supervising Archaeologist

INTRODUCTION AND PROJECT DESCRIPTION

The City of Camas (City) proposes improvements to Crown Park in Camas, Washington (Figures 1 and 2). Crown Park is in a residential area on the north side of downtown Camas and encompasses 7.26 acres of land that was donated to the city by the Crown Zellerbach Corporation in 1934. In 2018, the City adopted a master plan for the park. New improvements and amenities planned for Crown Park include play structures, restrooms, an interactive water play feature, amphitheater seating, a multipurpose sports court, open lawn areas, benches and picnic tables, paved paths and Americans with Disabilities Act (ADA) accessible ramps, landscaping improvements, and new utility lines and connections for water, electrical, sewer, and stormwater (Figure 3). Ground disturbance during construction is expected to be less than 50 centimeters (cm) (20 inches [in]) deep for most of the project but may extend as deep as 1.8 meters (m) (6.0 feet [ft]) below existing grade in specific areas of the park (for example, during trenching for deeper utilities and construction of stormwater bioswales). Most of the improvements at Crown Park will be funded through the City.

Within Crown Park, Phase I improvements are planned within approximately one acre in the northwestern portion of the park (Figure 4). Phase I improvements at Crown Park are partially funded by a grant from the Washington State Recreation and Conservation Office (RCO, and as such are subject to review for cultural resources under Governor's Executive Order (GEO) 21-02. Phase I improvements will include new play structures with inclusive play opportunities, an interactive water play feature, restrooms, benches, drinking fountains, picnic tables, landscaping improvements, lighting, and new utilities. The estimated maximum depth of ground disturbance for Phase I improvements is approximately 1.8 m (6 ft) below existing grade.

In 2018, Archaeological Investigations Northwest, Inc. (AINW), conducted an archaeological predetermination and historic resource documentation of Crown Park to assist the City with its master planning efforts prior to demolition of the Camas Municipal Swimming Pool (Blaser and Smits 2018; Fortin and Smits 2018). The aging pool at Crown Park closed in 2017 following an audit and an inspection by the Clark County Health Department. As a result of the 2018 cultural resource studies, Crown Park was determined to be eligible for listing in the National Register of Historic Places (NRHP), and the pool contributed to the historical significance of the park. The pool was demolished in 2019. Adverse effects to the park were mitigated by the City following measures supported by the Washington State Department of Archaeology and Historic Preservation (DAHP). (The proposed Phase I Improvements project funded by a grant from RCO largely overlaps the area where the pool had been located.) Also as a result of the 2018 archaeological study, a single lithic flake was identified in a shovel test excavated in the northeast corner of the park, outside of the Phase I Improvements area. The flake was recorded as an archaeological isolate (45CL1363).

In 2023, the City contracted AINW to conduct an updated cultural resource survey for the Crown Park Phase I Improvements project as required by RCO to meet review for cultural resources under GEO 21-02. The methods and results of AINW's updated survey are the subject of this report. AINW's work was directed by staff meeting the Professional Qualifications Standards of the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation. If future work at Crown Park involves federal funding or permitting, AINW's survey was done to standards that would meet review under Section 106 of the National Historic Preservation Act (NHPA), as amended, and its implementing regulations (36 CFR 800). AINW's work in 2018 and 2023 was also done to assist the City with meeting its responsibilities under the City's archaeological ordinance (Camas Municipal Code, Chapter 16.31.110-130).

AINW's updated cultural resource survey of Crown Park includes the Phase I Improvements project funded by RCO and the rest of Crown Park in its entirety. The Phase I Improvements project area under RCO's jurisdiction for GEO 21-02 review is shown in Figure 4. AINW's survey of the entire park, including the Phase I Improvements project area, consisted of a records search and literature review, a pedestrian survey of the park, and archaeological shovel testing to look for evidence of buried archaeological resources. Shovel testing was focused in areas of the park where ground disturbance is expected to extend below a depth of approximately 1 m (3.3 ft) below existing grade (Figures 5 and 6). Shovel testing was also conducted near the previously identified isolate (45CL1363) to confirm that it is an isolated flake. No additional archaeological materials or historic resources were identified as a result of the 2023 survey. No archaeological resources or historic buildings or structures are within the Phase I project area. No additional work is recommended.

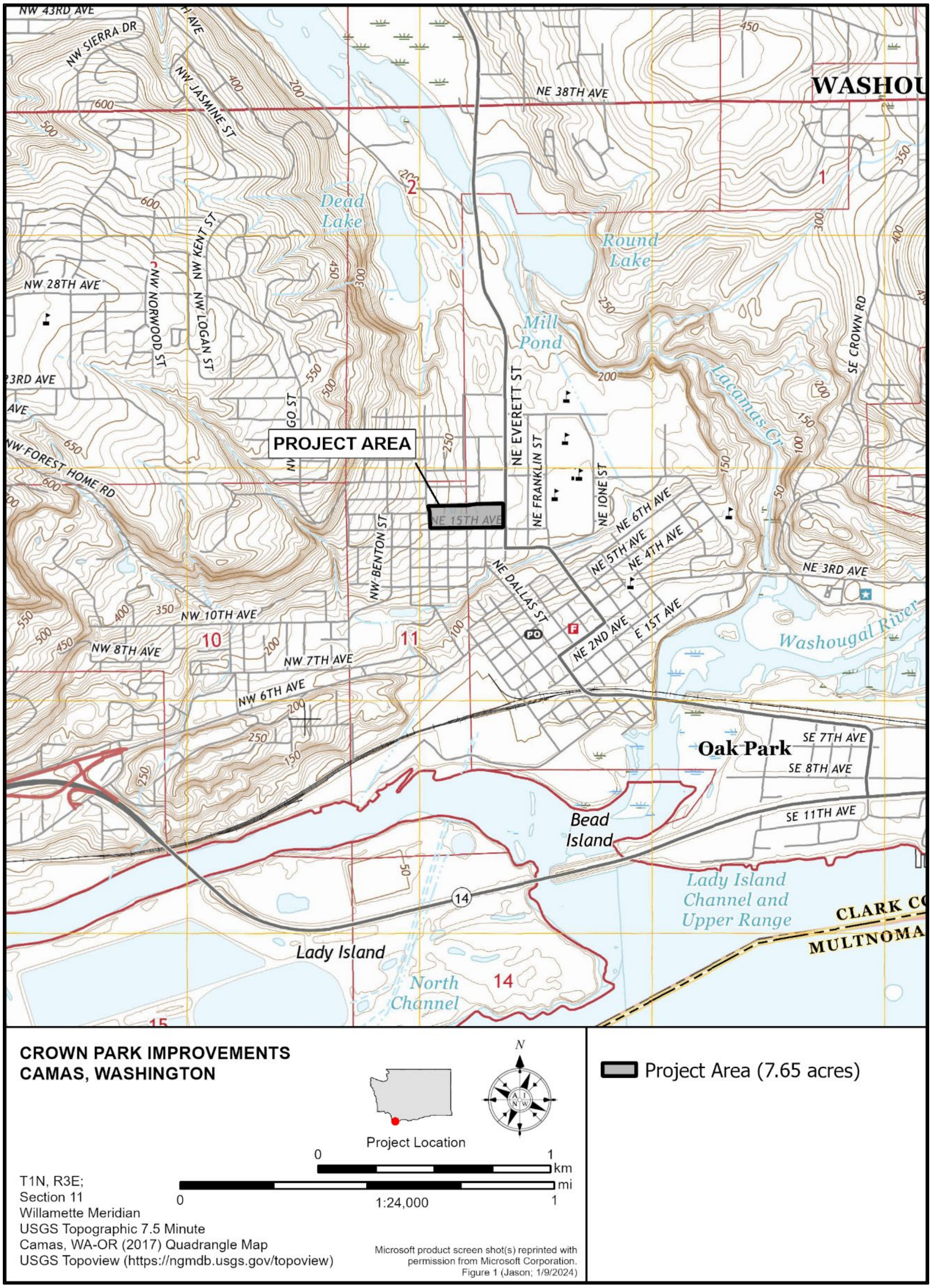


Figure 1. Crown Park is in Camas, Washington.

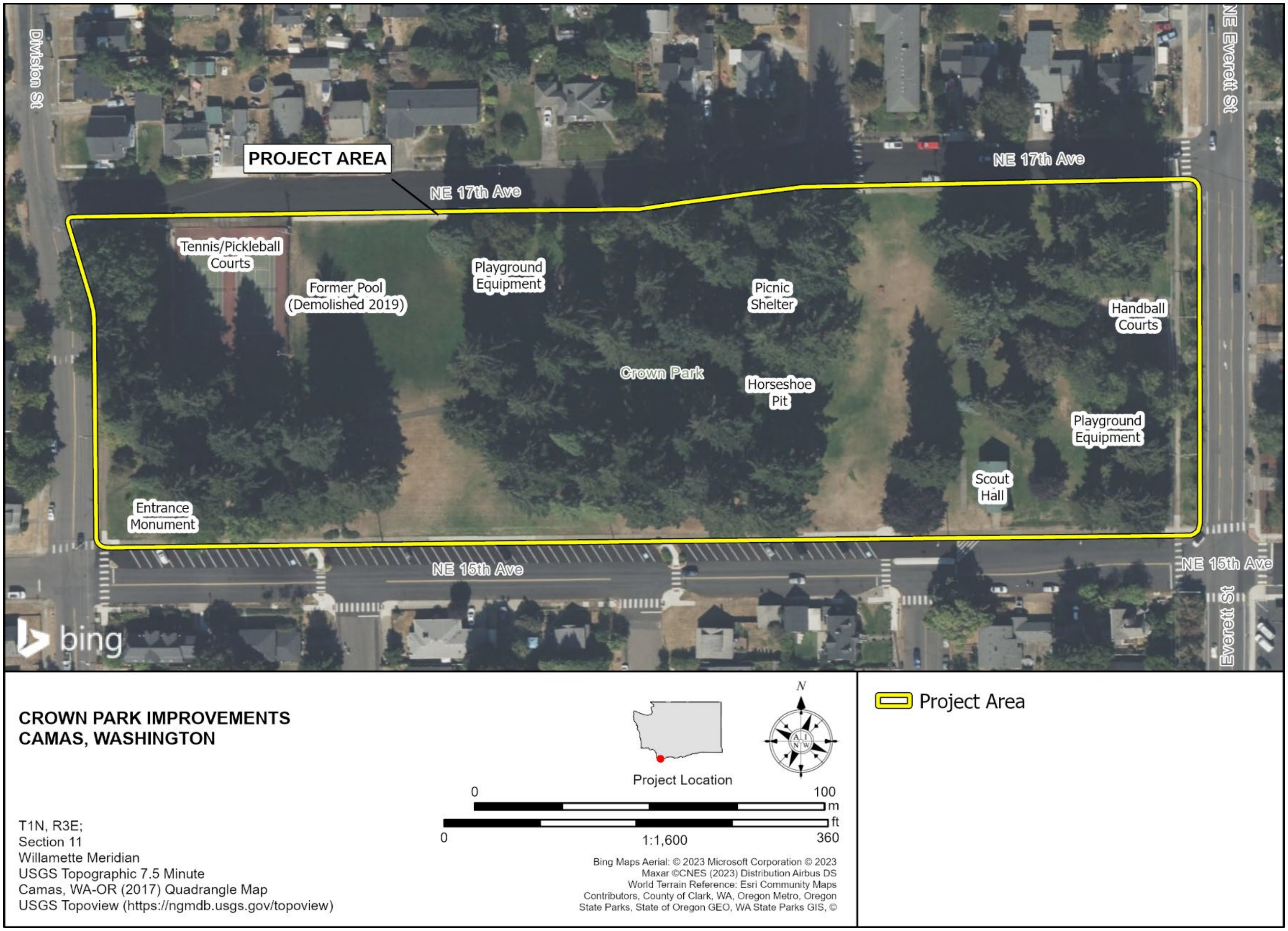


Figure 2. Aerial photograph of Crown Park showing existing conditions as of 2023.

Figure 3. Conceptual plan of proposed improvements to Crown Park.

Figure 4. Crown Park Phase I Improvements receiving funding through RCO.

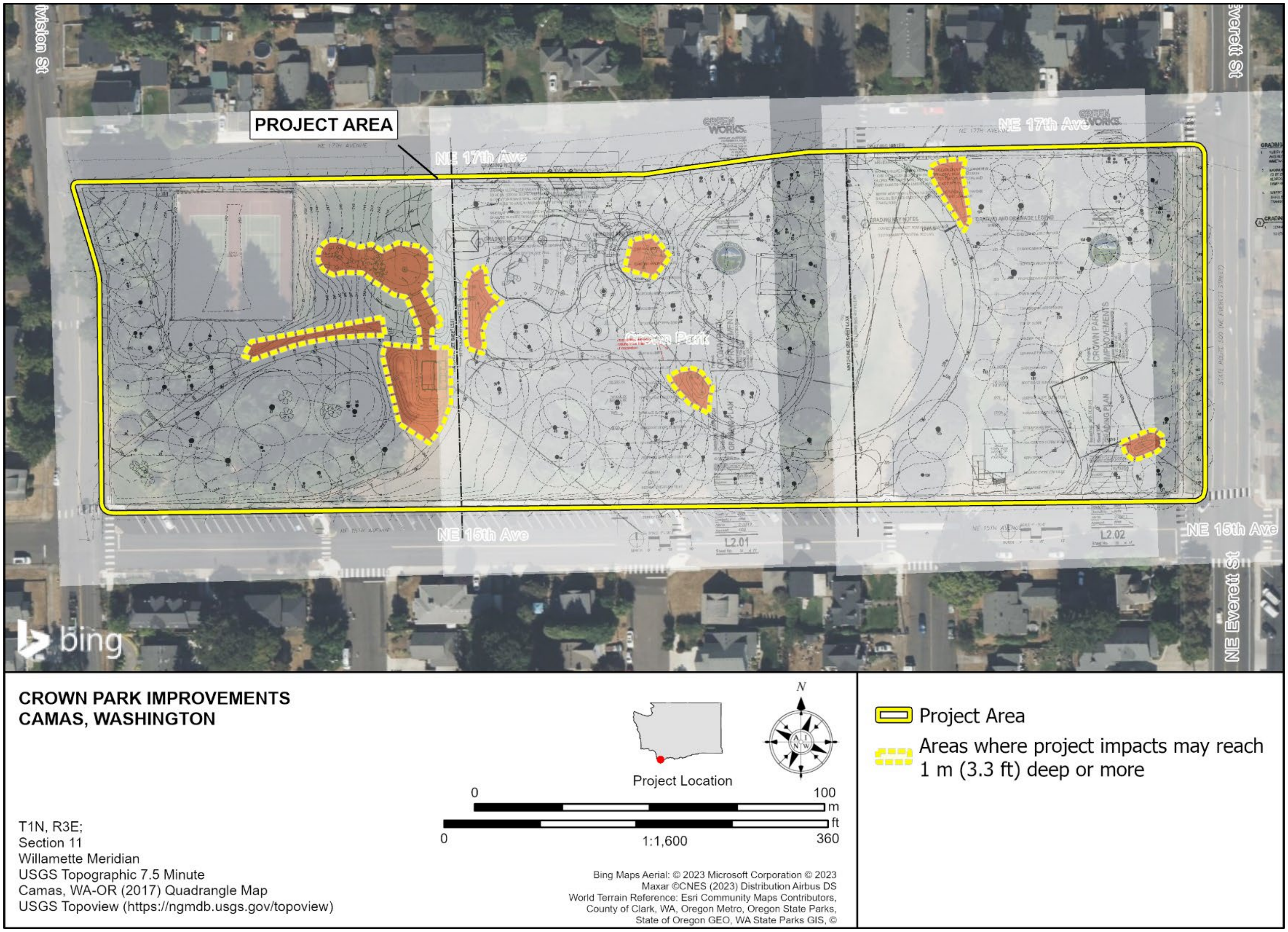


Figure 5. Plan for Crown Park showing areas where planned project impacts may reach a depth of 1 m (3.3 ft) or more below surface. Archaeological shovel testing in 2023 targeted these areas where deeper disturbance is planned to occur.

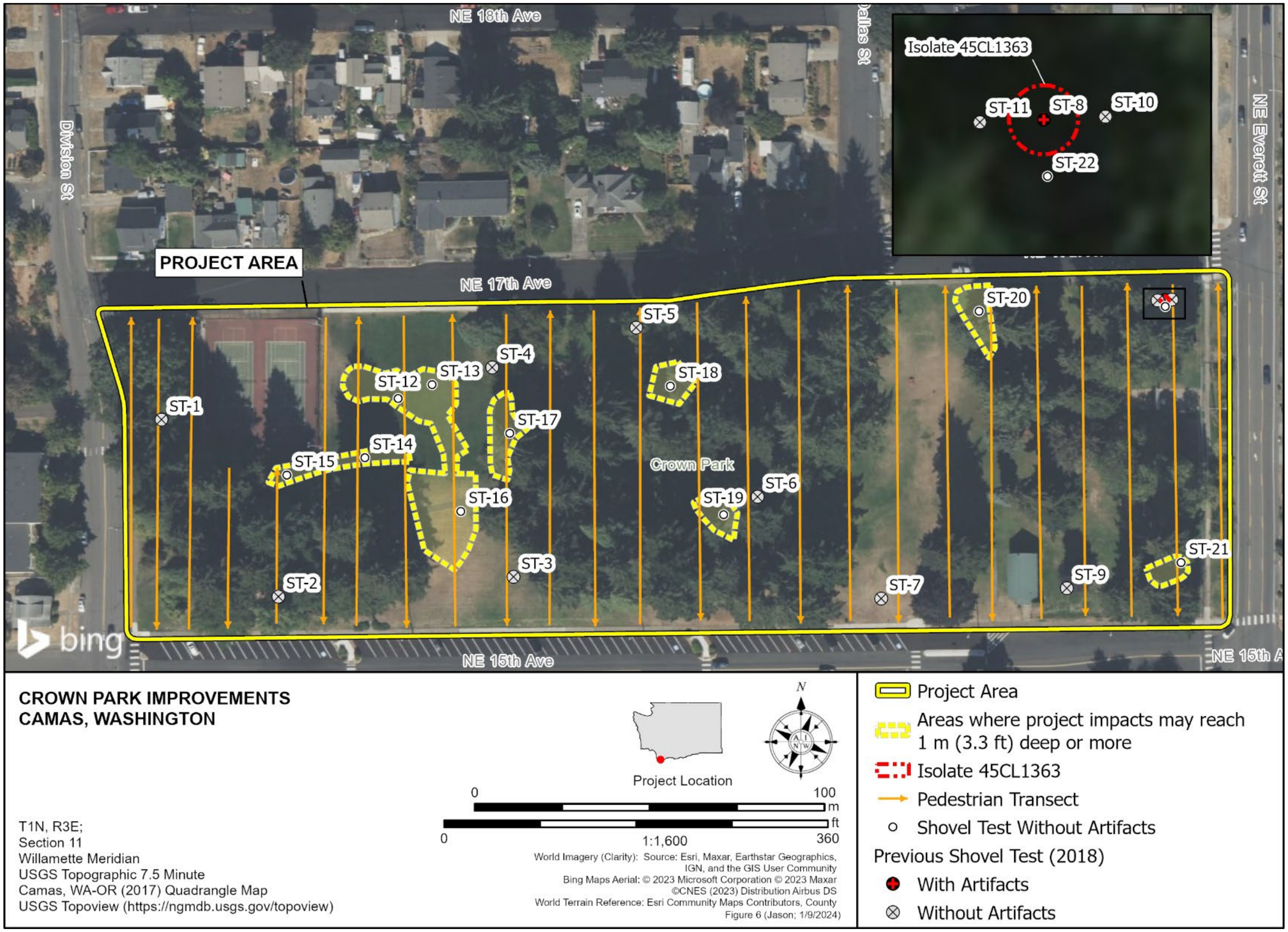


Figure 6. Aerial photograph showing the results of previous shovel tests (ST-1 through ST-11) excavated in 2018 and shovel tests ST-12 through ST-22 excavated in 2023 for the current study. Shovel tests excavated in 2023 targeted areas of Crown Park where deeper project impacts are planned during construction.

LOCATION AND ENVIRONMENTAL SETTING

Crown Park is in an established residential neighborhood on the north side of downtown Camas in Section 11 of Township 1 North, Range 3 East, Willamette Meridian (Figures 1 and 2; Photos 1 and 2). The park's address is 120 NE 17th Avenue in Camas. It is bounded on the west by NE Division Street, on the east by NE Everett Street, on the north by NE 17th Avenue, and on the south by NE 15th Avenue.

The 7.26-acre park is on a southeast-facing terrace near the base of Prune Hill, a 229-m (750-ft) high point located approximately 2.0 kilometers (km) (1.25 miles [mi]) west of the park. The park is approximately 1.0 km (0.6 mi) south of Fallen Leaf and Round Lakes near the southern end of Lacamas Lake, 1.1 km (0.7 mi) west of Lacamas Creek, and 1.0 km (0.6 mi) north of the mouth of the Washougal River on the Columbia River. Elevations within the park range from approximately 66 m (218 ft) above mean sea level in the southeast corner of the park to 81 m (265 ft) above mean sea level in the northwest corner of the park.

The project lies at the border between two physiographic and geologic provinces, the Willamette Valley to the south and the Puget Trough to the north, separated by the Columbia River. The topography of the project vicinity was formed in part by the catastrophic Missoula (or Bretz) Floods, the last of which occurred approximately 13,000 years ago (Allen et al. 2009; O'Connor et al. 2020). The flood waters flowed down the Columbia River Valley, scouring the volcanic hills and depositing thick layers of unconsolidated gravels, sands, and silts in the Portland Basin. These Pleistocene deposits are overlain by recent alluvium. The Vader silt loam soil series is mapped for this location (United States Department of Agriculture, Natural Resources Conservation Service [USDA-NRCS] 2003). Vader series soils are very deep and well-drained, formed in residuum and colluvium from fine sandstone and ash.

Camas is within the *Tsuga heterophylla* vegetation zone, characterized by western hemlock, Douglas-fir, and western redcedar trees (Franklin and Dyrness 1973). Hardwood species include red alder, bigleaf maple, black cottonwood, and Oregon ash. Native vegetation in Crown Park and surrounding areas was cleared in the past for development of the park and residential neighborhoods. Within the park are open grassy lawn areas and stands of mature trees that include Douglas-fir, western redcedar, giant sequoia, zelkova, blue spruce, several types of maple trees, and ornamental shrubs (Photo 2).

A basalt entrance monument in the southwest corner of Crown Park states that the park was donated to the citizens of Camas in 1934 by the Crown Willamette Paper Company, a division of Crown Zellerbach Corporation (Figure 2; Photo 3). In the northwest corner of the park are tennis courts that are also used for pickleball. In the central portion of the park are a picnic shelter, horseshoe pits, and open spaces (Photo 4). At the eastern end of the park are swings and other playground equipment (Photo 5), and in the southeastern corner of the park is Scout Hall, which is used for youth and community activities (Photo 6). A playground area is also in the north-central portion of the park (Photo 7). Paved pedestrian paths and picnic tables are present throughout the park.

Photo 1. Overview of the Phase I Improvements area in the northwestern portion of Crown Park where a swimming pool was located prior to demolition in 2019. Note the tennis courts to the left. Shovel test ST-12 is in progress in the upper right of the photo. The view is toward the north.

Photo 2. Overview of mature trees and grass lawn in the central portion of Crown Park. The view is towards the south.

Photo 3. Basalt entrance monument in the southwest corner of Crown Park. The view is towards the northeast.

Photo 4. Horseshoe pits and picnic shelter in the central portion of Crown Park. The view is towards the northwest.

Photo 5. Playground equipment in the southeastern corner of Crown Park. The view is towards the south.

Photo 6. Scout Hall in the southeastern portion of Crown Park. The view is looking northeast from NE 15th Avenue.

Photo 7. Playground area in the north-central portion of Crown Park. The view is looking southeast from NE 17th Avenue.

CULTURAL CONTEXT

Pre-Contact Archaeology

The project area is on ancestral lands of Native Americans who have lived in this area since time immemorial. Archaeological evidence of human occupation in the Pacific Northwest spans at least 14,500 years. Before about 11,000 years before present [BP]), archaeological evidence suggests people lived in small, highly mobile hunter-gatherer groups and relied on seasonally available plant resources and procurement of large animals. Sites dating to this period are often identified through the presence of fluted Clovis or non-fluted Western Stemmed projectile points (Ames and Maschner 1999). One of the oldest known archaeological sites in the region is at Paisley Caves (35KL3400) in central Oregon, where direct evidence of humans and extinct megafauna dates to approximately 14,500 years BP (Jenkins et al. 2013). At the Cooper's Ferry site (10IH73) in western Idaho, archaeological evidence suggests initial occupation of the site approximately 16,000 years BP (Davis et al. 2022). Some of the oldest known archaeological sites in western Washington include the Ayer Pond site (45SJ454) on Orcas Island (Kenady et al. 2011), the Manis Mastodon site (45CA218) on the Olympic Peninsula (Waters et al. 2011), and the Bear Creek site (45KI839) in Redmond (Kopperl et al. 2015).

Archaeological evidence of people who lived between approximately 11,000 and 5500 years BP appears to indicate an increase in resource intensification and changes in social organization. People used broad-spectrum foraging strategies that targeted land-based resources associated with oak woodlands and prairies. Lithic technology typically involved dart-sized projectile points including Windust stemmed points, Cascade points, and Cold Springs side-notched points. As climatic conditions at the end of the period resulted in stabilized river gradients and flows, hunting and gathering shifted to more extensive use of riverine resources (Ames and Maschner 1999). In Clark County, older sites tend to be found in uplands at higher elevations such as terraces well above floodplains. Excavations at Sunset Ridge (45CL96) in Washougal (Ozbun and Reese 2003; Ozbun et al. 2016), Morasch Terrace (45CL428) in

Camas (Woodward and Associates 1996), and sites at Gee Creek (45CL631, 45CL632, and 45CL810) southeast of Ridgefield (Punke et al. 2009), are older than 5500 years BP.

Archaeological evidence from the Pacific Period (5550 to 200 years BP) suggests the emergence of important social, economic, and subsistence changes during this time, including population growth, development of storage-based economies, heavy reliance on salmon fishing, increased sedentism, the emergence of elites, and expansion of extensive trade networks. People during this time developed increasingly specialized subsistence strategies focused on seasonally abundant foods to be preserved and stored for use during the winter months. Intensification of salmon fishing coincided with the appearance of girdled and perforated net sinkers and fish weirs in the archaeological record. Other technological changes included the adoption of the bow and arrow, as evidenced by the presence of smaller projectile points (Ames and Maschner 1999). Pacific Period sites are often located along major waterways. Several large village sites dating to later periods have been well studied, including the Cathlapotle site (45CL1) near Ridgefield, Washington; the Meier site (35CO5) near Scappoose, Oregon (Ames et al. 1992, 1999); and the Sunken Village site (35MU4) on Sauvie Island in Oregon (Croes et al. 2007). Repeated flooding of waterways and rising Holocene sea levels have removed, deeply buried, or severely eroded many low-lying archaeological sites within the Portland Basin (Ames 1994; Pettigrew 1990).

Native Peoples - Ethnography

The project is within lands traditionally inhabited and visited by Chinookan-speaking peoples and Cowlitz peoples. Chinookan-speaking peoples lived along the Columbia River and its major tributaries and focused their subsistence on fish and other riverine resources, while the Salish-speaking Cowlitz lived in inland areas and focused their subsistence more heavily on hunting and gathering supplemented by fishing (Dupres 2014:15; Ellis 2013:42-62; French and French 1998:362; Hajda 1990:503-507, 516; Ray 1966; Silverstein 1990:533, 536-537). Abundant resources throughout this region supported large populations of people living in villages along the Columbia River and its major tributaries.

Chinookan-speaking peoples occupied both sides of the Columbia River from the mouth of the river at the Pacific Ocean to present-day The Dalles (Silverstein 1990). The project is located near the interface between the Chinookan-speaking Cascade and Multnomah groups. The Multnomah occupied villages along the Columbia River between Deer Island and Government Island. The Cascades inhabited areas along the Columbia River between the Washougal River and the Wind River (French and French 1998:362).

Chinookan-speaking and Cowlitz cultural groups lived in winter villages consisting of multiple houses constructed of upright cedar planks. People spent much of the rest of the year at specific resource locations (e.g., salmon fisheries or berry and root patches), where they lived in temporary structures. Waterways provided for food, travel, and trade. Fish were a primary source of food; five species of salmon, sturgeon, steelhead trout, suckers, eulachon, and lampreys were eaten fresh and smoke-dried for storage and winter consumption. Marine mammals (seals and sea lions) in the Columbia River and terrestrial mammals were hunted for food, skins, and bone and antler for tool and utensil production. People planned their seasonal rounds to coincide with the times and places where specific plant and animal resources would become available for harvesting. A wide variety of roots, bulbs, shoots, berries, nuts, and other plant resources were harvested and comprised an important part of peoples' diet (French and French 1998:364). Roots (including wapato, camas, and bracken fern) and berries (including salmonberry, cranberry, strawberry, and huckleberry) were eaten fresh or prepared for storage to trade or consume during the winter (Ray 1938:43-46; Silverstein 1990:536-537).

Native people living near the Columbia River were among the first to be influenced by contact with non-Native people in the late eighteenth and early nineteenth centuries. Chinookan-speaking groups traded extensively with incoming Europeans and Americans, especially after the 1825 establishment of Fort Vancouver. By the early 1830s, diseases introduced by incoming Europeans and Americans had decimated the area's Native populations. Treaties signed in 1855 established the Grand Ronde, Warm Springs, and Yakama reservations, though many Native people did not relocate to reservations (French and French 1998; Silverstein 1990). The Cowlitz reservation was officially established in 2015 following formal recognition of the Tribe by the United States government in 2000.

Historical Context

Intensive non-Native settlement of the Camas-Washougal area began in the mid-1840s and 1850s. After the U.S. Congress passed the Donation Land Act in 1850, several claims were filed for lands along the north bank of the Columbia River where many people were already living. The eastern half of what is now Crown Park was within Hamilton J. G. Maxon's Donation Land Claim, for which a patent was issued on February 25, 1864 (Bureau of Land Management [BLM] 2023a). The western half of the park is on land that was claimed as bounty land by Ellen Scott and conveyed to Terrel M. Coffee on July 15, 1865 (BLM 2023b). An 1856 General Land Office (GLO) map of Township 1 North, Range 3 East, does not depict development within or near the project (GLO 1856). The nearest structures that appear on the 1856 map consist of three mills and two homesteads shown along Lacamas Creek to the north and east of the project (GLO 1856). An 1863 GLO map shows the eastern portion of the project area on Maxon's claim (No. 47) (GLO 1863).

Camas, originally LaCamas, was platted on Maxon's Donation Land Claim in 1883. Camas was established in association with the LaCamas Colony Company, which was organized by Henry Pittock to build a mill and town site to produce paper for his newspaper, *The Oregonian* (Jollota 2007:27). Camas was incorporated in 1906. Pittock's Columbia River Paper Company merged with the Crown Paper Company to become Crown Columbia Paper Company, which later merged with Willamette Paper to form Crown Willamette Paper Company in 1914, by which time it was the second largest paper manufacturer in the world (Caldbick 2010). A 1915 map of Clark County shows the former LaCamas Colony Company lands as being owned by Pittock & Leadbetter, a holding company formed by Pittock and his son-in-law Frederick Leadbetter (Clarke Title Abstractors, Inc. 1915). In 1928, Crown Willamette Paper Company merged yet again to form Crown Zellerbach Corporation (*The Oregonian* 1985).

In 1933, when local firefighters expressed an interest in creating a public park in a residential area of Camas a few blocks west of the city's schools, the proposed park land was then owned and managed by Crown Zellerbach Corporation's Crown Willamette Paper Company division (*Camas-Washougal Post-Record* 1938). A fire house was at the southwest corner of this land, at the intersection of Division Street and NW 15th Avenue (Sanborn Map & Publishing Company 1922). The company agreed to donate the requested 7.26 acres to the city in 1934, and Crown Park was eventually dedicated on July 25, 1941 (*The Morning Oregonian* 1934; *The Oregonian* 1941).

Leading up to Crown Park's official dedication on July 25, 1941, the fire house at the intersection of Division Street and NW 15th Avenue was removed, and several play structures were installed at the east and west ends of the park (Sanborn Map & Publishing Company 1922, 1943; *The Oregonian* 1941; U.S. Geological Survey [USGS] 1934). Tennis courts were constructed at the northwest corner of the park circa 1938, and a circular wading pool (now infilled and used as a base for a merry-go-round) and swings were built near the east end of the park (*Camas-Washougal Post-Record* 1938; Jollota 2007:85). A horseshoe pit and a baseball/softball field were likely added circa 1940 (*Camas-Washougal Post-Record* 1941). Although the fire house had been removed, firefighters left their mark by constructing a decorative fireplace in the park "near the end of NE Birch St." that was made of individually selected pieces of stone, petrified wood, and shell (*Camas-Washougal Post-Record* 1938). This fireplace was later removed and is no longer extant. A stone entrance marker was installed in the southwest corner of the park and was unveiled by the Paper Festival Queen during the July 25, 1941, dedication ceremony (*The Oregonian* 1941).

There is evidence to indicate that Scout Hall, a circa 1905 community building situated near the southeast corner of Crown Park, was moved to this location in 1934, the same year that Crown Zellerbach Corporation donated the park land to the City of Camas (*Camas-Washougal Post-Record* 1993; Post Publications 1976; Sanborn Map & Publishing Company 1922, 1943; USGS 1934). Over the years, competing narratives have emerged to explain this building's history. For instance, a plaque at the building's south façade entry claims that it was built in 1882 as the first school in Camas, and that the Columbia River Paper Company gave permission to the Boy Scouts to move the building to its current location in 1907. However, a review of historical records supports the findings of local historian Curtis Hughey (2016), who asserts that Scout Hall was built as an annex at Camas' 1886 public school at NE Garfield Street and NE 14th Avenue, and that it was later moved to Crown Park to make way for a bus barn (*Camas-Washougal Post-Record* 1993; Post Publications 1976; Sanborn Map & Publishing Company 1922, 1943; USGS 1934).

The former Camas Municipal Swimming Pool at Crown Park was constructed in 1954 by the local Lions Club, which donated it to the City (*Camas-Washougal Post-Record* 1997; Capell 2018; *The Oregonian* 1954). The pool featured a separate wading area at its south end for smaller children, and in 1956 an intermediate "junior pool" was added adjacent to the wading pool (City of Camas 1955; *The Sunday Oregonian* 1956). Several other structures and features of the park were likely added during this 1950s period, including courts for handball, shuffleboard, and badminton, a sandbox, and a picnic shelter/outdoor kitchen (City of Camas 1955). A former wading pool at the east end of the park was also infilled during this period (circa 1954), and a merry-go-round was installed on the resulting circular slab of concrete.

Beginning in the 1970s and continuing into the modern era, most new additions to the park have been limited to new playground equipment and benches. A small basketball court was added just east of the swimming pool circa 1976 and was removed when the pool was demolished in 2019. The park's tennis courts were updated circa 1970 and circa 2015, and the picnic shelter/outdoor kitchen was rebuilt circa 1987.

Today, Crown Park continues to be one of Camas' most popular parks, hosting a variety of community events throughout the year, including summer camps and festivals, movies in the park, Halloween activities, and Easter egg hunts.

PREVIOUS CULTURAL RESOUCE STUDIES

AINW conducted a literature search and records review using DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) and AINW's library to determine if archaeological and historic resources have been identified in and near the park and to identify previous cultural resource surveys that have been conducted in the area.

In 2018, Crown Park was the subject of an archaeological predetermination and historic resource documentation completed to support the City's master plan, which included removal of the pool (Blaser and Smits 2018; Fortin and Smits 2018). Fieldwork for the 2018 archaeological predetermination consisted of a pedestrian survey and excavation of 11 shovel tests throughout the park to look for evidence of archaeological deposits. Figure 6 shows the locations of the 11 shovel tests (ST-1 through ST-11) excavated in 2018. As a result of the 2018 shovel testing, one isolated cryptocrystalline silicate (CCS) flake was identified in shovel test ST-8 in the northeastern corner of the park. (Lithic flakes are byproducts of stone tool manufacture.) The flake was found in the shovel test at a depth between 10 and 20 cm (4 to 8 in) below the surface in a previously disturbed context. Two additional shovel tests, ST-10 and ST-11, were excavated as radials approximately 2.0 m (6.6 ft) to the east and west of shovel test ST-8 to look for additional artifacts. No additional artifacts were identified, and the flake was recorded as an isolated find, 45CL1363.

Also in 2018, AINW completed intensive documentation of Crown Park as a historic resource (Blaser and Smits 2018). As a result of the work, Crown Park was recommended to be eligible for listing in the NRHP, and DAHP concurred. The park is associated with significant patterns of events relating to Crown Zellerbach Corporation's divestment of lands for public use, and with the development of public recreation infrastructure in the city of Camas (Criterion A). Before its demolition in 2019, the Camas Municipal Swimming Pool was found to contribute to the significance of the park. Adverse effects to the park, including demolition of the pool in 2019, were mitigated by the City following measures supported by DAHP. The proposed Phase I Improvements project funded by a grant from RCO largely overlaps the area where the pool had been located.

A second building within the boundary of the park, Scout Hall, also contributes to the historical significance of Crown Park and meets minimum eligibility criteria as an individual historic property. This building was likely constructed circa 1905 to serve as an annex for an 1886 school formerly located approximately 290 m (950 ft) east of Crown Park, near modern-day Liberty Middle School (Hughey 2016:5). When Scout Hall was moved to its current location circa 1934, its historical integrity was diminished (Sanborn Map & Publishing Company 1922, 1943; USGS 1934). Modifications made to the siding, windows, and porch of the building since it was moved to Crown Park circa 1934 diminish its integrity of materials, workmanship, and feeling, while the building's move to Crown Park has diminished its integrity of location and setting. However, Scout Hall has a significant association with the development of Camas' first school campus (at the intersection of NE Garfield Street and NE 14th Avenue to the east of the park); this association is widely recognized throughout the community, and Scout Hall is the only building with such an association that is known to remain extant. Thus, this building meets special requirements for moved buildings that are eligible for listing in the NRHP (Criterion Consideration B). Because the building does not retain integrity, particularly integrity of location and setting, changes to the building's setting at Crown Park would not pose an adverse effect on Scout Hall. Scout Hall is outside of the Phase I project area.

At least 25 additional cultural resource studies have been conducted within 0.8 km (0.5 mi) of Crown Park according to records available on WISAARD. Four archaeological resources have been identified within 0.8 km (0.5 mi) of the park.

- Multicomponent site 45CL1220 consisted of 11 CCS and obsidian flakes and a scatter of historic-period domestic and architectural debris found on the ground surface and in shovel tests (Dubois et al. 2016). Historic-period artifacts from the site date between the late 1800s and about 1930. The recorded site location is approximately 0.8 km (0.5 mi) north of Crown Park. The site has not been evaluated for NRHP eligibility.

- Site 45CL1221 consisted of two CCS flakes found in shovel tests excavated in Fallen Leaf Park approximately 0.5 km (0.3 mi) north of Crown Park (Dubois et al. 2016). The site was recommended to be not eligible for listing in the NRHP.

- Site 45CL845 was recorded as pre-contact isolate consisting of one CCS flake found in a shovel test excavated during an archaeological survey of land around Fallen Leaf Lake (Buchanan and Reese 2009). The location of the isolated flake was approximately 0.8 km (0.5 mi) north of Crown Park.

- Site 45CL1172, located near downtown Camas approximately 0.4 km (0.25 mi) to the south of Crown Park, consisted of historic structural features and architectural refuse representing the remnants of a former residence and garage dating circa 1936 to 1940s (Colón and Gall 2016). The site was determined to be not eligible for listing in the NRHP.

In addition to these sites, numerous pre-contact archaeological sites have been recorded to the southeast along the Washougal and Columbia Rivers and to the north near Lacamas and Round Lakes. Pre-contact sites are also common on the terraces and hills overlooking these bodies of water. Historic-period archaeological sites in the area generally date from the mid-nineteenth through the mid-twentieth centuries and represent early settlement, industrial development, and residential and commercial expansion in Camas.

FIELD METHODS AND RESULTS

AINW's cultural resource survey fieldwork was conducted on October 18, 19, 23, and 24, 2023, by AINW Staff Archaeologist Isaac Schwartz, B.A., AINW Crew Leader/Staff Archaeologist Lea Loiselle, B.A., AINW Supervising Archaeologist Sean Boyd, M.A., R.P.A., and AINW Senior Archaeologist Nicholas Smits, M.A., R.P.A. The 7.26-acre park was surveyed in its entirety, including the Phase I Improvements area.

Surface Inspection

Crown Park was surveyed using pedestrian survey transects oriented north-south and spaced 15 m (50 ft) apart (Figure 6). More closely spaced, meandering transects were adopted in areas closest to existing playground equipment and around other existing park amenities, and around Scout Hall. Mineral soil visibility was generally poor and limited by areas of pavement and vegetation that included grass lawn areas, trees, and ornamental shrubs throughout most of the park. No evidence of archaeological materials was identified on the ground surface during the pedestrian survey. The Phase I Improvements project area encompasses approximately one acre where the former swimming pool was located; the pool had been built into a hillside, and this area currently consists of a grassy east-facing hillside and grassy leveled area on the east side of the tennis courts at Crown Park (Photos 1 and 8).

Shovel Testing

AINW excavated 11 shovel tests (ST-12 through ST-22) in October 2023 to look for evidence of buried archaeological deposits at Crown Park and to supplement the previous shovel testing that was completed in 2018 (Fortin and Smits 2018). Ten of the 11 shovel tests (ST-12 through ST-21) excavated in 2023 were focused in areas where proposed ground disturbance during project construction is expected to be 1 m (3.3 ft) deep or more. These areas where deeper construction impacts are expected are shown on Figures 5 and 6. One additional shovel test, ST-22, was excavated approximately 3 m (10 ft) south of ST-8, where the isolated flake had been identified and recorded as 45CL1363 in 2018, to confirm that the flake was an isolated find (Figure 6). No archaeological materials were observed in any of the shovel tests excavated in 2023.

Photo 8. Shovel test ST-12 in progress in the Phase I Improvements area where the former swimming pool had been built into the hillside prior to its demolition in 2019. The view is towards the south.

Table 1 lists the results of shovel testing and the depth to which the shovel tests were excavated. The shovel tests measured 30 cm (12 in) in diameter and were excavated with shovels to a depth of at least 50 cm (20 in) below the surface. A 15-cm (6-in) diameter bucket-type auger was used to extend excavation in all the shovel tests to look for evidence of deeply buried archaeological deposits. All 11 shovel tests were terminated at varying depths due to impasses (for example, rocks or large roots) that precluded deeper excavation using hand tools. Sediments from the shovel tests were manually screened through nested 6.4- and 3.2-millimeter (¼- and ⅛-in) mesh hardware cloth. The shovel tests were backfilled upon completion. Shovel test locations were mapped using a Trimble Geo R1 Global Positioning System unit. No archaeological materials were identified in the shovel tests.

Soils encountered in the shovel tests were generally consistent with the description of Vader soils mapped for the project area (USDA-NRCS 2003) (Photo 9). The soils consisted of dark brown silty loam exhibiting a blocky to subangular ped structure in the upper 20 to 30 cm (8 to 12 in) of excavation, underlain by dark yellowish brown sandy loam with a blocky to subangular structure and concretions throughout that persisted as deep as 145 cm (57 in) below the surface (as observed in shovel test ST-14). Clear evidence of previous disturbance was observed in shovel tests ST-12 and ST-13, which were excavated in the Phase I Improvements area where the pool had been located prior to its demolition in 2019 (Figure 6). In shovel tests ST-12 and ST-13, the soil consisted of redeposited, mottled dark brown silty loam in the upper 30 to 45 cm (12 to 18 in), below which depth there was a sudden transition to a grayish-brown gravelly loam. Modern and non-diagnostic pieces of plastic, colorless glass, and concrete chunks were observed throughout shovel tests ST-12 and ST-13, which is indicative of recent disturbance in this area from demolition of the pool. No evidence of an archaeological site was identified in any of the shovel tests.

TABLE 1
RESULTS OF SHOVEL TESTS

Shovel Test No.	Depth of Excavation (cm)	Archaeological Materials
ST-12	100	None
ST-13	60	None
ST-14	145	None
ST-15	100	None
ST-16	100	None
ST-17	102	None
ST-18	100	None
ST-19	112	None
ST-20	131	None
ST-21	72	None
ST-22	103	None

Photo 9. Shovel test ST-18 upon termination at a depth of 100 cm (39 in) below the surface.

SUMMARY AND RECOMMENDATIONS

AINW has completed an updated cultural resource survey for the City's proposed improvements to Crown Park, including the Phase I Improvements project funded by RCO. AINW's 2023 study supplements the results of a previous archaeological study and historic resource documentation completed for Crown Park in 2018. This updated cultural resource survey for the park includes the Crown Park Phase I Improvements project to meet review for cultural resources under Governor's Executive Order (GEO) 21-02 for that area. If future work at Crown Park involves federal funding or permitting, AINW's survey was done to standards that would meet review under Section 106 of the NHPA. AINW's work in 2018 and 2023 was also done to assist the City with meeting its responsibilities under the City's archaeological ordinance.

AINW's cultural resource survey of Crown Park, including the Phase I Improvements area, consisted of a records search and literature review, a pedestrian survey of the park, and archaeological shovel testing to look for evidence of buried archaeological resources. Shovel testing was focused in areas of the park where ground disturbance is expected to extend below a depth of approximately 1 m (3.3 ft) below existing grade. Shovel testing was also conducted near the previously identified isolate (45CL1363) to confirm that it is an isolated flake. No additional archaeological materials or historic resources were identified as a result of the 2023 survey. No archaeological resources or historic buildings or structures are within the Phase I project area. No additional work is recommended.

Should unanticipated archaeological or historic resources be encountered during construction, all ground-disturbing activity near the find should be halted, and DAHP should be promptly notified to ensure compliance with relevant state and federal laws and regulations. Should evidence of human burials be encountered, all ground-disturbing activity in the vicinity should be halted immediately, and DAHP, the Camas Police Department, the Clark County Medical Examiner, and the appropriate Tribes should be notified.

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A & L Western Laboratories, Inc.

1311 Woodland Avenue, Modesto CA 95351 209-529-4080
10220 SW Nimbus Avenue Bldg. K-9, Portland OR 97223 503-968-9225

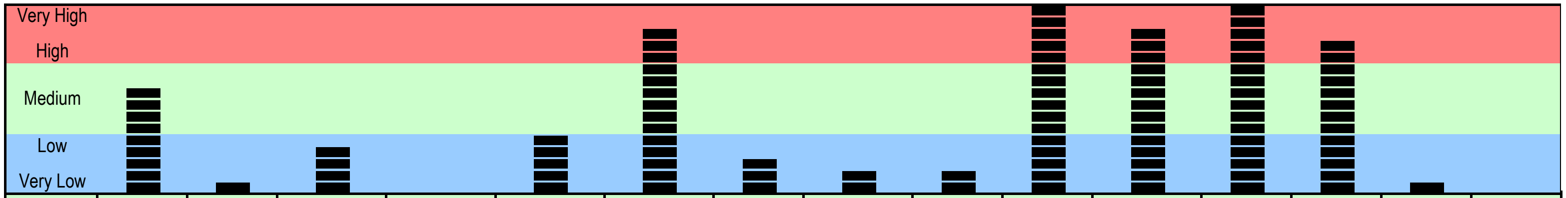
REPORT NUMBER: 75368
CLIENT NO: 12508
SUBMITTED BY: JIGISHA MODI

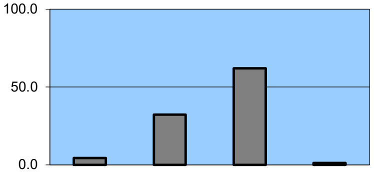
SEND TO: GREENWORKS PC
110 SE MAIN ST SUITE 100
PORTLAND OR 97214

SUBMITTED DATE: 1/25/2024
GROWER: CAMAS CROWN PARK
P.O. No:
LOCATION:
COC No:

Graphical Soil Analysis Report

DATE OF REPORT: 01/31/24
LAB NO: S75368-01
SAMPLE ID: TP1
PAGE: 1





Analyte	Loss On Ignition OM %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray* ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	4.6	2	22	32	373	823	2640	56	4	18	37	152	3	<0.1	

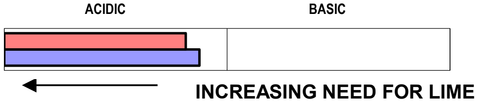
Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
4.5	32.2	62.0	1.2

0.1
ECe
dS/m

21.3
CEC
meq/100g

L
Lime Presence

5.7
pH



Buffer pH: 6.1

Soil Fertility Guidelines

CROP: ORNAMENTALS
RATE:** lb/1000 sq ft
NOTES:

Dolomite (70 score)	Lime (70 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	70	90		1.2	2.0								*	

COMMENTS

MAGNESIUM: If levels are very high (generally, they increase with depth), one may encounter drainage problems and potassium uptake may be hindered. Extra calcium may provide some benefit.
QUICK CONVERSION: Divide fertilizer grade on the bag by 10, IF applying 10 lb/1,000 sq ft. (e.g. 10 lb of a "triple 15" fertilizer would provide 1.5 lb each of nitrogen, phosphate and potash).
AVOID unnecessary pruning of mature trees, shrubs and vines by restricting nitrogen applications to less than about 1.5 lb/1000 sq ft per season. Avoid applying late, prior to winter freezes.
TABLETS, SPIKES OR "PAKS" are a convenient way of supplying controlled-release fertilizers and micronutrients to individual plants. Follow label directions carefully, according to plant size.
PREPLANT FERTILIZATION must be conducted with caution if salt damage is to be avoided. Young roots should not be in direct contact with high rates of soluble fertilizer.
GENERAL LANDSCAPE: It is best to start fertilizing in early spring as soon as new growth begins to develop. Apply according to growth habit, avoiding applications during winter months.
MICRONUTRIENTS: Where levels appear to be high, avoid any further applications for the time being. Very high (VH) levels may not necessarily be toxic, but avoid. Maintain correct soil pH.
Please call if you have any questions.

A & L Western Laboratories, Inc.

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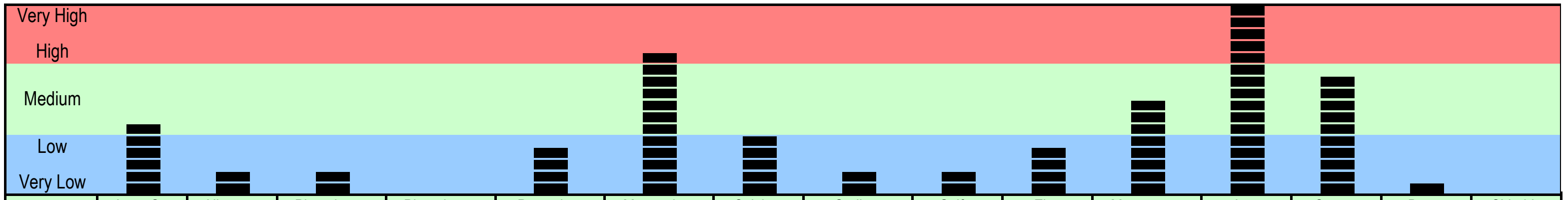
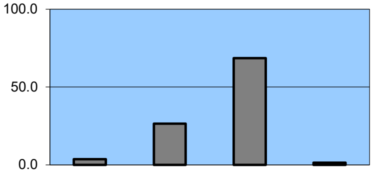
Graphical Soil Analysis Report

DATE OF REPORT: 01/31/24 **LAB NO:** S75368-02 **SAMPLE ID:** TP2 **PAGE:** 2





Analyte	Loss On Ignition OM %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray* ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	4.0	7	16	16	167	371	1600	39	5	2	18	284	2	<0.1	

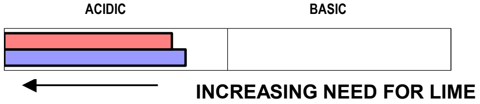
Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
3.7	26.4	68.5	1.4

ECe dS/m: 0.2

CEC meq/100g: 11.7

Lime Presence: L

pH: 5.3



Buffer pH: 5.7

Soil Fertility Guidelines

CROP: LANDSCAPE **RATE:**** lb/1000 sq ft **NOTES:**

Dolomite (70 score)	Lime (70 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	140	45		3.0	2.5	1.0		0.6					*	

COMMENTS

MAGNESIUM: If levels are very high (generally, they increase with depth), one may encounter drainage problems and potassium uptake may be hindered. Extra calcium may provide some benefit.
QUICK CONVERSION: Divide fertilizer grade on the bag by 10, IF applying 10 lb/1,000 sq ft. (e.g. 10 lb of a "triple 15" fertilizer would provide 1.5 lb each of nitrogen, phosphate and potash).
PRIOR TO PLANTING: Spread the above requirements per 1,000 sq ft and mix into the top 6-8 inches of soil. Initially, limit nitrogen to 1.5 lb/1,000 sq ft or 25-30 ppm NO3-N to avoid salt damage.
SPLIT extra nitrogen as necessary over the active growing season. Adjust rate according to local conditions and requirements. Allow for adequate establishment first (up to 30 days).
MAINTENANCE: Split the above amount over the year at a time according to local conditions and requirements. Choose a source that best fits this combination and avoid applications in winter.
MICRONUTRIENTS: Where levels appear to be high, avoid any further applications for the time being. Very high (VH) levels may not necessarily be toxic, but avoid. Maintain correct soil pH.
* BORON may not necessarily be deficient in the soil, and it is hard to correct an excessive application. Therefore, apply boron only if confirmed deficient through a leaf analysis.
Please call if you have any questions.

A & L Western Laboratories, Inc.
1311 Woodland Avenue, Modesto CA 95351 209-529-4080
10220 SW Nimbus Avenue Bldg. K-9, Portland OR 97223 503-968-9225

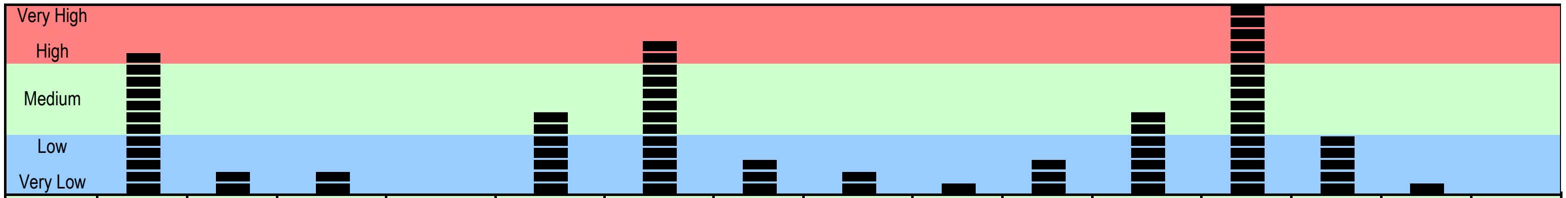
REPORT NUMBER: 75368
CLIENT NO: 12508
SUBMITTED BY: JIGISHA MODI

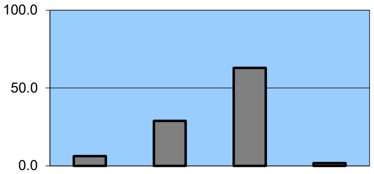
SEND TO: GREENWORKS PC
110 SE MAIN ST SUITE 100
PORTLAND OR 97214

SUBMITTED DATE: 1/25/2024
GROWER: CAMAS CROWN PARK
P.O. No:
LOCATION:
COC No:

Graphical Soil Analysis Report

DATE OF REPORT: 01/31/24 **LAB NO:** S75368-03 **SAMPLE ID:** TP3 **PAGE:** 3

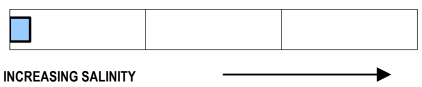




Analyte	Loss On Ignition OM %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray* ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	6.5	10	11	9	271	390	1410	47	2	1	17	153	1	<0.1	

Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
6.2	29.0	62.9	1.8

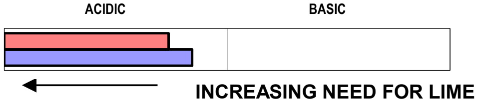
0.1
ECe
dS/m



11.2
CEC
meq/100g

L
Lime Presence

5.2
pH



Buffer pH: 5.9

Soil Fertility Guidelines

CROP: TURF **RATE:**** lb/1000 sq ft **NOTES:**

Dolomite (70 score)	Lime (70 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	110	45		2.6	3.5	1.0							*	

COMMENTS

MAGNESIUM: If levels are very high (generally, they increase with depth), one may encounter drainage problems and potassium uptake may be hindered. Extra calcium may provide some benefit.
NITROGEN: The above requirements may need to be adjusted according to local conditions. Follow label instructions as controlled-release fertilizers may be applied less frequently.
NITROGEN: Recommendation is only a guideline. Use local conditions and plant N for the right rate and time of application. Allow also for nitrate in your water (ppm NO3 X 0.61= lb N/ac-ft water).
POTASH: Optimum wear tolerance may be achieved by applying up to 8 lb potash/1000 sq ft per year. The above guidelines may need to be modified if tissue analyses indicate so.
MAINTENANCE: Split the above amount over the year at a time according to local conditions and requirements. Choose a source that best fits this combination and avoid applications in winter.
MICRONUTRIENTS: Where levels appear to be high, avoid any further applications for the time being. Very high (VH) levels may not necessarily be toxic, but avoid. Maintain correct soil pH.
* BORON may not necessarily be deficient in the soil, and it is hard to correct an excessive application. Therefore, apply boron only if confirmed deficient through a leaf analysis.
Please call if you have any questions.

A & L Western Laboratories, Inc.

1311 Woodland Avenue, Modesto CA 95351 209-529-4080
10220 SW Nimbus Avenue Bldg. K-9, Portland OR 97223 503-968-9225

REPORT NUMBER: 75368

CLIENT:

SUBMITTED BY: JIGISHA MODI

GROWER: CAMAS CROWN PARK

SEND TO: GREENWORKS PC
110 SE MAIN ST SUITE 100
PORTLAND OR 97214

SUBMITTED DATE: 1/25/2024

DATE OF REPORT: 1/31/2024

SOIL PHYSICAL CHARACTERISTICS

PAGE: 4

Sample ID	Lab Number	% Sand	% Silt	% Clay	Soil Texture	Available Water Holding Capacity inches H2O / ft. of soil
TP1	S75368-01	40	26.3	33.8	Clay Loam	2.04-2.52□
TP2	S75368-02	62.5	18.8	18.8	Sandy Loam	1.20-1.56
TP3	S75368-03	38.8	33.8	27.5	Loam	1.68-2.16□

NOTES:

EXPLANATION OF SOIL ANALYSIS REPORT

ORGANIC MATTER:
Percent organic matter is determined by combustion on a dried, screened sample. Total organic content may be higher than reported if a portion of un-decomposed organic matter is excluded during screening. Ground samples are passed through a 2 mm screen.
Estimated Nitrogen Release (ENR) from the organic matter during the growing season is based on soil texture and environmental conditions, and can therefore be only an estimate.

PHOSPHORUS:
A & L Western Agricultural Laboratories routinely run two extractions for phosphorus.
Weak Bray (P1) for acidic soils: A level above 30 ppm P is desired for top production in most crops. This extraction procedure is unreliable in calcareous soils (where free lime is present).
Olsen (sodium bicarbonate) for calcareous soils: A level above 15 ppm P is desired for top production in most crops.

POTASSIUM, MAGNESIUM, CALCIUM, SODIUM:
The above four elements are referred to as cations and together with any free hydrogen ions, determine what is referred to as the computed Cation Exchange Capacity (CEC). Excessive levels of calcium and sodium will cause CEC to be over-estimated. See across.

HYDROGEN:
Hydrogen ions are measured in meq/100g soil and are computed according to soil pH. This column will be empty if soil pH is 7.0 and above. View with caution if soil pH is less than 5.0, as the computed CEC may be over-estimated.

pH:
This is measured in terms of either soil pH or a buffer index.
Soil pH: This is measured off a saturated paste using de-ionized water. It is a measure of active acidity or alkalinity. Mineral soils should have a pH of 6.0 to 7.0 for most crops, while a pH of 5.5 to 6.0 is adequate for organic soils (over 20% organic matter).
Buffer Index: This is a measure of both active and reserve acidity, and is measured off a Sikora buffer solution that mimics that of Shoemaker-McLean-Pratt. This may also be computed on a standard soil test, depending on soil pH and CEC.
Lime requirement depends on the quality *(lime score)* of the liming material used, and is a function of the total neutralizing value or calcium carbonate equivalent (cce), degree of fineness or particle size (ff), and the moisture factor (mf).
For example:
Common agricultural lime may contain a lime score of 70.

cce x ff x mf = lime score
90 x 0.85 x 0.90 = 70

The following table is a general guideline for use of such a material. For other liming materials, divide 70 by the known lime score, then multiply by the rates in the table.

Tons/acre agricultural lime (70-score) per 6-inch depth Adapted from "Methods of Soil Analysis" Part 2, ASA Publication, but using the Sikora buffer method.

Buffer index	To pH 6.5	To pH 6.0	To pH 5.5
7.0	none	none	none
6.9	0.5	none	none
6.8	1.0	0.5	none
6.7	1.5	1.0	none
6.6	2.0	1.5	1.0
6.5	3.0	2.0	1.5
6.4	3.5	2.5	2.0
6.3	4.0	3.0	2.5
6.2	4.5	3.5	3.0
6.1	5.0	4.0	3.5
6.0	6.0	4.5	4.0
5.9	6.5	5.0	4.5
5.8	7.0	6.0	4.5
5.7	8.0	6.5	5.0
5.6	9.0	7.5	5.5
5.5	9.5	7.5	6.0

Example: If the buffer index reads 6.6 then one would require about 2.0 tons/ac to raise soil pH to 6.5, 1.5 tons/ac to raise it to 6.0, and 1.0 ton/ac to raise it to 5.5.

CATION EXCHANGE CAPACITY (CEC):
This is a measure of the capacity of the soil to hold exchangeable cations. These include potassium (K), magnesium (Mg), calcium (Ca), sodium (Na), and hydrogen (H).
CEC is measured in terms of milliequivalents per 100 grams of soil (meq/100g). It depends largely on the amount of clay and organic matter present. The larger this value, the more cations the soil is able to hold against leaching.

PERCENT CATION SATURATION:
This is computed after converting the exchangeable cations in ppm to meq/100g soil. A well-balanced soil may contain 2-5% K, 10-20% Mg, 60-70% Ca, less than 5% Na, and less than 15% H.

NITRATE-NITROGEN and SULFATE-SULFUR:
Only these readily available forms of nitrogen and sulfur are provided on the standard soil report. Extra testing may be requested for other forms such as total levels or organic and ammonium-nitrogen.

MICRONUTRIENTS (Zn, Mn, Fe, Cu, B):
Always refer to a plant analysis to confirm micronutrient status.

EXCESS LIME:
This is a visual rating of free lime present by use of the "fizz" test using dilute acid. "H" may be associated with poor growth in calcareous soils.

SOLUBLE SALTS (mmhos/cm):
Reporting units are equivalent to dS/m shown on other reports. Soluble salts are measured off a saturated paste extract, and their interpretation is crop-dependent.

Revised 05/12

EXPLANATION OF SOIL FERTILITY GUIDELINES

CROP

Crops are listed in the same order as they appear on the information sheet or cover letter, submitted with soil samples. If you do not specify a desired yield goal, one will be selected on the basis of the information supplied.

SOIL AMENDMENTS

DOLOMITIC AND CALCITIC LIME:
Limestone recommendations are based on the Sikora buffer index which mimics the SMP buffer index.
Normally, they will be sufficient to raise the soil pH to 6.5. Comments will stipulate otherwise, when dealing with organic soils or acid-loving crops.
Limestone recommendations will be based on a six-inch depth of soil. If lime is to be incorporated to a greater depth, rates can be increased accordingly. However, adequate incorporation is essential to avoid localized high pH zones.
If the magnesium saturation of the soil is less than 15%, dolomitic limestone will generally be recommended. If it is greater than 15%, calcitic limestone will generally be recommended.

GYPSUM AND ELEMENTAL SULFUR:
Gypsum may be recommended if soils contain more than 5% sodium saturation or more than 25% magnesium saturation.
Elemental sulfur or acids will be recommended if free lime is present or if the soil pH is considered too high.
Note that gypsum DOES NOT effectively reduce soil pH.

FERTILIZER RECOMMENDATIONS

Fertilizer recommendations are designed to provide sufficient nutrients for the crop to be grown at the desired yield level and to build toward a balanced cation exchange capacity. However, if a soil is severely deficient of nutrients, it may be economically impractical to raise levels sufficiently in one year.
If soil nutrient levels are excessive, comments will indicate this.

NITROGEN:
Time of application and type of nitrogen fertilizer are two primary considerations in best management practices (BMP’s).
Timing of applications should coincide with greatest crop demand, unless slow-release fertilizers are employed.
Nitrate-nitrogen is immediately available to the crop, but is also subject to leaching.
Ammonium-nitrogen is less subject to leaching, and may be considered in the fertilizer program.
Urea-nitrogen is subject to leaching until bacterial conversion into the ammonium form takes place.
Specially coated slow-release forms of urea are also available.

PHOSPHATE:
Phosphate fertilization is essential for vigorous root development and early crop establishment.
Phosphate recommendations based on soil tests may sometimes seem excessive. Phosphate reserves from a greater depth may prove to be adequate, particularly in tree and vine crops. A foliar analysis is always recommended to confirm overall phosphate status.

POTASH:
Potash recommendations are based on both the parts per million of potassium existing in the soil and the percent potassium saturation. Sandy soils tend to hold less potassium and a higher cation saturation percentage may be advised.
In order to avoid damage, normally no more than 20 to 40 lb of potash per acre should be banded close to seed. Further quantities may be broadcast or water-run.

MAGNESIUM:
Low levels of soil magnesium may be corrected by either adding dolomitic limestone where soil pH is also low, or by adding neutral salts such as magnesium sulfate (Epsom salt) and sulfate of potash magnesia where soil pH is acceptable.
Dolomitic limestone may contain 10 to 12% Mg.
Magnesium sulfate contains 10% Mg.
Sulfate of potash magnesia contains 11% Mg.

SULFATE-SULFUR:
Sulfur is absorbed by plant roots in a sulfate form (SO_4).
Note that if elemental sulfur or gypsum is recommended, there is no need to add further sulfur.
Elemental sulfur will slowly convert to sulfuric acid (H_2SO_4) through microbial action.
Gypsum ($Ca\ SO_{4.}2H_2O$) contains up to 18% sulfate-sulfur.

MICRONUTRIENTS:
(Zn, Mn, Fe, Cu, B)
Recommendations for micronutrients are given in the elemental form and on a broadcast basis.
Banded applications: divide the rate by a factor of 2 to 3.
Chelated materials: follow label directions.
In many cases, the most efficient application of micronutrients is through microirrigation or foliar sprays.
Always confirm micronutrient deficiencies through tissue analysis, particularly when considering boron applications.

HOME GARDENS, TURF, AND ORNAMENTALS

Recommendations may be converted into pounds per thousand square feet when dealing with smaller areas.

lb/ac ÷ 44 = approximately lb/1000 sq ft
(43,560 sq ft/ac)

For additional information, refer to the A & L Agronomy Handbook

Revised 05/12

SOIL ANALYSIS

General Guidelines for Interpreting Soil Analysis Ratings

Comments: Note that the cations potassium, magnesium, calcium and sodium are rated according to what percentage of the total cation exchange capacity they take.
A clay soil may have 4,000 ppm calcium whereas a sandy soil may have only 400 ppm and both may be rated as "medium" in terms of their percent cation saturation.

These ratings are not crop-specific. However, when soil fertility guidelines are requested, specific crop requirements and tolerances are taken into account.

Analyte	Description	Units	VLow	Low	Medium	High	VHigh
OM	Organic Matter	percent	0.3	2.2	3.7	5.2	15.0
pH	Soil pH	pH	5.0	6.0	7.5	8.5	10.0
P1	Weak Bray-phosphorus	ppm	8.0	17.0	26.0	39.0	90.0
HCO_3-P	$NaHCO_3$-phosphorus	ppm	3.0	7.0	13.0	22.0	50.0
K	Potassium	% Cation Sat.	0.6	2.0	5.0	10.0	15.0
Mg	Magnesium	% Cation Sat.	5.0	10.0	20.0	25.0	35.0
Ca	Calcium	% Cation Sat.	35.0	60.0	70.0	75.0	85.0
Na	Sodium	% Cation Sat.	1.0	3.0	5.0	10.0	30.0
NO_3-N	Nitrate-Nitrogen	ppm	4.0	12.0	25.0	40.0	65.0
S	Sulfate-Sulfur	ppm	3.0	10.0	25.0	35.0	60.0
Zn	Zinc	ppm	0.5	1.0	3.0	6.0	9.0
Mn	Manganese	ppm	1.0	2.0	12.0	30.0	40.0
Fe	Iron	ppm	5.0	10.0	16.0	25.0	35.0
Cu	Copper	ppm	0.3	0.8	1.2	2.5	5.0
B	Boron	ppm	0.3	0.5	1.2	2.0	5.0
Ex. Lime	Excess Lime	percent	1.0	2.0	3.0	4.0	7.0
SS (ECe)	Soluble Salts	mmhos/cm	0.3	0.7	2.0	4.0	6.0
Cl	Chloride	ppm	70.0	170.0	350.0	900.0	999.9
Mo	Molybdenum	ppm	0.05	0.1	0.2	0.4	1.0

Example: Organic matter = "Medium" between 2.3% and 3.7% (inclusive of numbers)

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The Soil Experts.

02/02

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
13	D	Shrub		15						Omit
23	D	Shrub		10						Omit
69	E	Omit		24					Codominant stems of #68	Omit
107	D	No tree		16						Omit
121	E	Omit		20					Codominant stem of #120	Omit
1	D	English holly	*Ilex aquifolium*	18	8	8	G	yes	Diameter measured near base, multiple leaders, some trunk decay, a little top dieback	
2	E	juniper	*Juniperus* spp.	19	12	12	G	yes	Diameter measured near base, codominant leaders, forked tops, included bark	
3	D	red oak	*Quercus rubra*	39	40	40	E	yes	Dead and broken branches, hangers	
4	D	red oak	*Quercus rubra*	32	28	28	G	yes	Moderate crown structure	
5	D	red oak	*Quercus rubra*	20	20	20	F	yes	Poor crown structure	
6	D	sweetgum	*Liquidambar styraciflua*	15	22	22	F	yes	Moderate crown structure, forked leaders	
7	E	Douglas-fir	*Pseudotsuga menziesii*	43	26	26	G	yes	Burl on west face of lower trunk	
8	E	Douglas-fir	*Pseudotsuga menziesii*	41	28	28	G	yes	Pitch flow upper trunk north face warrants aerial inspection & pitch flow lower trunk southeast face warrants advanced assessment	
9	E	Douglas-fir	*Pseudotsuga menziesii*	31	20	20	F	yes	Between two more dominant firs	
10	E	Douglas-fir	*Pseudotsuga menziesii*	40	20	20	G	yes	Active pitch seam 0-20’ east face, older pitch seam south face, warrants advanced assessment	
11	E	Douglas-fir	*Pseudotsuga menziesii*	39	28	28	G	yes	Old broken top, multiple leaders	
12	E	western redcedar	*Thuja plicata*	29	19	19	G	yes	Moderate structure, forked leaders	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
14	E	Douglas-fir	*Pseudotsuga menziesii*	44	26	26	G	yes	Old broken top, multiple leaders, some crown decay	
15	E	Douglas-fir	*Pseudotsuga menziesii*	33	26	26	G	yes		
16	E	Douglas-fir	*Pseudotsuga menziesii*	37	22	22	G	yes	Pitch seams lower trunk two sides, warrants advanced assessment	
17	E	giant sequoia	*Sequoiadendron giganteum*	47	22	22	G	yes	Some crown asymmetry	
18	D	deciduous	unknown	15	28	28	F	yes	Crown asymmetry, dead and broken branches, crown decay	
19	E	Douglas-fir	*Pseudotsuga menziesii*	45	32	32	G	yes	Pitch seams on west face	
20	D	dogwood	*Cornus* spp.	10	12	12	G	yes	Codominant stems, measured diameter below split	
21	E	giant sequoia	*Sequoiadendron giganteum*	54	22	22	G	yes	Some crown asymmetry	
22	D	gingko	*Ginkgo biloba*	11,12	18	18	G	yes	Fruiting	
24	E	Douglas-fir	*Pseudotsuga menziesii*	57	36	36	E	yes	Probably has old broken top, few dead and broken branches	
25	D	red maple	*Acer rubrum*	19	30	30	G	yes	Moderate structure, self-correcting but moderate lean to parking and utility lines	
26	E	Douglas-fir	*Pseudotsuga menziesii*	33	26	26	G	yes	Some twig dieback, pitch seams two sides	
27	E	Douglas-fir	*Pseudotsuga menziesii*	59	36	36	G	yes	Codominant leaders with a “V” shaped attachment, pitch seams three sides	
28	D	tuliptree	*Liriodendron tulipifera*	27	18	18	G	yes	Moderate crown structure, broken branches	
29	D	paper birch	*Betula papyrifera*	23	26	26	G	yes	Moderate crown structure, dead and broken branches, crown decay	
30	E	Douglas-fir	*Pseudotsuga menziesii*	39	20	20	G	yes	Old basal wound west face	
31	E	Douglas-fir	*Pseudotsuga menziesii*	47	26	26	G	yes	Pitch seam southeast face, crown asymmetry, dead branch over path	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
32	E	Douglas-fir	*Pseudotsuga menziesii*	54	28	28	E	yes	Some crown asymmetry, few dead branches	
33	E	Douglas-fir	*Pseudotsuga menziesii*	50	30	30	E	yes		
34	E	Douglas-fir	*Pseudotsuga menziesii*	35	30	30	G	yes		
35	E	Douglas-fir	*Pseudotsuga menziesii*	37	26	26	G	yes	Codominant leaders	
36	E	Douglas-fir	*Pseudotsuga menziesii*	25	22	22	F	yes	Relatively poor Ht:Dia, history of lateral branch failure	
37	E	Douglas-fir	*Pseudotsuga menziesii*	45	26	26	E	yes	Some crown asymmetry	
38	E	Douglas-fir	*Pseudotsuga menziesii*	41	34	34	G	yes	One sided crown to west, natural self-correcting lean	
39	E	Douglas-fir	*Pseudotsuga menziesii*	47	34	34	G	yes	Pitch seams, moderate crown structure	
40	E	Douglas-fir	*Pseudotsuga menziesii*	39	22	22	G	yes	Crown asymmetry, sweep	
41	E	Douglas-fir	*Pseudotsuga menziesii*	47	22	22	F	yes	Reduced vigor, twig dieback, thin crown	
42	E	Douglas-fir	*Pseudotsuga menziesii*	35	24	24	F	yes	Poor structure, dead branches	
43	E	Douglas-fir	*Pseudotsuga menziesii*	45	32	32	E	yes	One-sided crown to west	
44	E	Douglas-fir	*Pseudotsuga menziesii*	44	30	30	E	yes	Some crown asymmetry	
45	E	Douglas-fir	*Pseudotsuga menziesii*	44	28	28	E	yes	Some crown asymmetry	
46	E	deodar cedar	*Cedrus deodara*	19	22	22	G	yes	One-sided crown to south	
47	E	deodar cedar	*Cedrus deodara*	17	22	22	G	yes	One-sided crown to south	
48	E	Douglas-fir	*Pseudotsuga menziesii*	38	22	22	G	yes	Old pitch seams south face, dead and broken branches, hangers	
49	E	giant sequoia	*Sequoiadendron giganteum*	56	25	25	G	yes		
50	E	Austrian pine	*Pinus nigra*	10	10	10	F	no	Poor structure	
51	E	Douglas-fir	*Pseudotsuga menziesii*	40	25	25	E	yes		
52	E	Douglas-fir	*Pseudotsuga menziesii*	42	28	28	E	yes		
53	E	Atlas cedar	*Cedrus atlantica*	26	22	22	G	yes	Moderate crown structure	
54	E	Douglas-fir	*Pseudotsuga menziesii*	53	35	35	G	yes	Some crown asymmetry	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
55	E	Douglas-fir	*Pseudotsuga menziesii*	35	25	25	H	yes	20+ P. pini conks - remove tree or advanced assessment	
56	E	Douglas-fir	*Pseudotsuga menziesii*	26	24	24	F	yes	Poor structure	
57	E	Douglas-fir	*Pseudotsuga menziesii*	47	26	26	E	yes	Few dead branches, minor twig dieback	
58	E	Douglas-fir	*Pseudotsuga menziesii*	33	20	20	G	yes	Crown asymmetry	
59	E	Douglas-fir	*Pseudotsuga menziesii*	46	22	22	E	yes	Minor crown asymmetry	
60	E	Douglas-fir	*Pseudotsuga menziesii*	46	26	26	E	yes	Minor crown asymmetry	
61	E	Douglas-fir	*Pseudotsuga menziesii*	38	22	22	G	yes	Dead branch over path, trunk swelling, one-sided crown to south, upper trunk sweep	
62	E	Douglas-fir	*Pseudotsuga menziesii*	35	22	22	F	yes	Crooked top, broken leader	
63	E	Douglas-fir	*Pseudotsuga menziesii*	38	22	22	G	yes	One-sided crown to south	
64	E	Douglas-fir	*Pseudotsuga menziesii*	31	24	24	F	yes	Poor structure, thin crown, dead and broken branches, trunk wound south face, lean is natural	
65	E	Douglas-fir	*Pseudotsuga menziesii*	39	24	24	G	yes	Some crown asymmetry, somewhat reduced vigor	
66	E	Douglas-fir	*Pseudotsuga menziesii*	38	22	22	G	yes	Forked leaders, trunk sweep, minor twig dieback	
67	E	Douglas-fir	*Pseudotsuga menziesii*	30	22	22	G	yes	Dead and broken branches	
68	E	Douglas-fir	*Pseudotsuga menziesii*	31,41	32	32	G	yes	31” codominant stem has broken top, minor twig dieback	
70	E	Douglas-fir	*Pseudotsuga menziesii*	29	16	16	F	yes	Intermediate crown class	
71	E	Douglas-fir	*Pseudotsuga menziesii*	49	28	28	E	yes	Some crown asymmetry, pitch seam northeast face	
72	E	Douglas-fir	*Pseudotsuga menziesii*	30	18	18	G	yes	Crown asymmetry, dead and broken branches	
73	E	Douglas-fir	*Pseudotsuga menziesii*	49	30	30	E	yes		

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
74	E	Douglas-fir	*Pseudotsuga menziesii*	39	25	25	G	yes	Some crown asymmetry	
75	E	Douglas-fir	*Pseudotsuga menziesii*	27	22	22	F	yes	Poor top structure, old wound at ~4' from codom stem failure or removal, intermediate crown class	
76	E	Douglas-fir	*Pseudotsuga menziesii*	39	28	28	G	yes	Few dead and broken branches, some twig dieback	
77	E	Douglas-fir	*Pseudotsuga menziesii*	35	26	26	G	yes	Dead and broken branches, some crown asymmetry	
78	E	Douglas-fir	*Pseudotsuga menziesii*	59	55	55	G	yes	One-sided crown to east, over-extended laterals, some history of large branch failure	
79	E	Douglas-fir	*Pseudotsuga menziesii*	33	25	25	G	yes	One-sided crown to west, dead and broken branches	
80	E	Douglas-fir	*Pseudotsuga menziesii*	32	22	22	F	yes	Few dead branches, crown asymmetry	
81	E	Douglas-fir	*Pseudotsuga menziesii*	38	22	22	F	yes	Twig dieback, reduced vigor, crown asymmetry	
82	E	Douglas-fir	*Pseudotsuga menziesii*	43	28	28	G	yes	Dead and broken branches	
83	E	Douglas-fir	*Pseudotsuga menziesii*	22	20	20	F	yes	Broken top, overtopped by adjacent firs	
84	E	Douglas-fir	*Pseudotsuga menziesii*	25	14	14	F	yes	High live crown, thin crown	
85	E	Douglas-fir	*Pseudotsuga menziesii*	31	14	14	F	yes	High live crown, thin crown, pitch seams	
86	E	Douglas-fir	*Pseudotsuga menziesii*	32	16	16	F	yes	Pitch seams, crown asymmetry	
87	E	Douglas-fir	*Pseudotsuga menziesii*	33	18	18	F	yes	Dead and broken branches, high live crown	
88	E	Douglas-fir	*Pseudotsuga menziesii*	39	24	24	G	yes	Dead and broken branches, crown asymmetry	
89	E	Douglas-fir	*Pseudotsuga menziesii*	43	26	26	E	yes		
90	D	deciduous	unknown	27	26	26	G	yes	Moderate structure, dead and broken branches	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
91	D	deciduous	unknown	27	24	24	G	yes	Moderate structure	
92	E	Douglas-fir	*Pseudotsuga menziesii*	36	26	26	E	yes	Some crown asymmetry	
93	E	Douglas-fir	*Pseudotsuga menziesii*	23	31	31	F	yes	Broken top with new leader, over-extended laterals, one-sided to north	
94	E	Douglas-fir	*Pseudotsuga menziesii*	27	20	20	F	yes	Broken top with forked leaders, one-sided to north	
95	E	Douglas-fir	*Pseudotsuga menziesii*	20	16	16	Dy	yes	Dead top	
96	E	Douglas-fir	*Pseudotsuga menziesii*	34	24	24	F	yes	Moderate structure	
97	E	Douglas-fir	*Pseudotsuga menziesii*	20	16	16	F	yes	Intermediate crown class	
98	E	Douglas-fir	*Pseudotsuga menziesii*	33	22	22	G	yes	Dead and broken branches, crown asymmetry	
99	E	Douglas-fir	*Pseudotsuga menziesii*	27	22	22	F	yes	Broken top	
100	E	Douglas-fir	*Pseudotsuga menziesii*	40	22	22	E	yes	Dead and broken branches	
101	E	Douglas-fir	*Pseudotsuga menziesii*	50	28	28	E	yes	Pitch flow upper trunk west face, some crown asymmetry	
102	E	Douglas-fir	*Pseudotsuga menziesii*	44	28	28	F	yes	Pitch seam north face, dead and broken branches, relatively thin crown	
103	E	Douglas-fir	*Pseudotsuga menziesii*	36	24	24	G	yes	Pitch seam east face, crown asymmetry	
104	D	European mountain ash	*Sorbus aucuparia*	10	12	12	G	yes	Codominant stems	
105	D	European mountain ash	*Sorbus aucuparia*	10	14	14	G	yes	Some basal decay east face	
106	E	grand fir	*Abies grandis*	12	6	6	Dy	yes	Not sustainable	
108	E	Douglas-fir	*Pseudotsuga menziesii*	31	26	26	G	yes	One-sided crown to west, pitch seam north face	
109	E	Douglas-fir	*Pseudotsuga menziesii*	24	20	20	G	yes	8+ P. pini conks, reduced vigor, codom/intermediate crown class	
110	E	Douglas-fir	*Pseudotsuga menziesii*	31	22	22	G	yes	Crown asymmetry, some twig dieback	
111	E	Douglas-fir	*Pseudotsuga menziesii*	41	26	26	E	yes	Some crown asymmetry	
112	E	Douglas-fir	*Pseudotsuga menziesii*	23	16	16	F	yes	Overtopped by dominant fir	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
113	E	Douglas-fir	*Pseudotsuga menziesii*	42	24	24	E	yes	Crown asymmetry	
114	E	Douglas-fir	*Pseudotsuga menziesii*	29	20	20	G	yes	1 P. pini conks northeast face ~10’	
115	E	Douglas-fir	*Pseudotsuga menziesii*	34	18	18	G	yes		
116	E	Douglas-fir	*Pseudotsuga menziesii*	35	16	16	G	yes		
117	E	Douglas-fir	*Pseudotsuga menziesii*	27	12	12	F	yes	Relatively poor Ht:Dia, thin crown, dead and broken branches	
118	E	Douglas-fir	*Pseudotsuga menziesii*	47	22	22	G	yes	Pitch seams, dead branches, one-sided crown to south	
119	E	Douglas-fir	*Pseudotsuga menziesii*	30	18	18	F	yes	Broken top, one-sided crown to southeast	
120	E	Douglas-fir	*Pseudotsuga menziesii*	28,49	28	28	F	yes	Ruled vigor, twig dieback, 49” stem with 3+ P. pini conks & 28” stem with 7+ P. pini conks, overtopped by 49” stem	
122	E	Douglas-fir	*Pseudotsuga menziesii*	40	24	24	G	yes	Self-correcting lean, some crown asymmetry	
123	E	Douglas-fir	*Pseudotsuga menziesii*	57	30	30	E	yes	Pitch seam east face	
124	E	Douglas-fir	*Pseudotsuga menziesii*	55	34	34	E	yes		
125	E	Douglas-fir	*Pseudotsuga menziesii*	37	24	24	E	yes		
126	E	redwood	*Sequoia sempervirens*	66	36	36	E	yes	Few broken branches	
127	E	blue spruce	*Picea pungens*	21	18	18	F	yes	Poor structure, twig and branch dieback	
128	D	beech	*Fagus* spp.	28	32	32	E	yes	Codominant leaders	
129	D	Norway maple	*Acer platanoides*	27	32	32	G	yes	Few dead and broken branches, some crown decay	
130	D	London planetree	*Platanus × acerifolia*	33	34	34	G	yes	Hollow with decay northwest face at 6’	
131	E	Douglas-fir	*Pseudotsuga menziesii*	52	26	26	E	yes	Few dead and broken branches, hangers	
132	E	blue spruce	*Picea pungens*	16	10	10	G	yes		
133	E	Douglas-fir	*Pseudotsuga menziesii*	53	28	28	G	yes	Codominant stems	
134	D	Norway maple	*Acer platanoides*	33	28	28	E	yes	Some crown decay	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
135	D	Norway maple	*Acer platanoides*	14	18	18	G	yes		
136	E	Douglas-fir	*Pseudotsuga menziesii*	45	22	22	E	yes		
137	E	Douglas-fir	*Pseudotsuga menziesii*	37	18	18	F	yes	Codominant stems with included bark, one stem has broken top, reduced vigor, in playground	
138	E	Douglas-fir	*Pseudotsuga menziesii*	41	24	24	E	yes		
139	E	Douglas-fir	*Pseudotsuga menziesii*	29	20	20	F	yes	Poor upper trunk structure	
140	E	Douglas-fir	*Pseudotsuga menziesii*	37	24	24	G	yes	Crown asymmetry	
141	E	Douglas-fir	*Pseudotsuga menziesii*	42	22	22	G	yes	Some twig dieback	
142	D	cherry	*Prunus* spp.	2	5	5	G	no		
143	D	cherry	*Prunus* spp.	12	14	14	G	yes		
144	D	cherry	*Prunus* spp.	3	5	5	G	no		
145	D	cherry	*Prunus* spp.	2x7,10	18	18	G	yes		
146	D	cherry	*Prunus* spp.	3x4,5	12	12	G	yes		
147	D	cherry	*Prunus* spp.	2	5	5	F	no	Basal wound, poor structure	
148	D	cherry	*Prunus* spp.	3	5	5	G	no		
149	D	cherry	*Prunus* spp.	6,2x8,9	15	15	F	yes	Dead branches, crown decay	
150	D	cherry	*Prunus* spp.	2	5	5	G	no		
151	D	cherry	*Prunus* spp.	3	5	5	G	no		
152	D	cherry	*Prunus* spp.	2x7,9	15	15	G	yes	Some basal decay	
153	D	cherry	*Prunus* spp.	14	12	12	F	yes	Dead branches, crown decay	
154	D	cherry	*Prunus* spp.	11	7	7	P	yes	Heavily pruned, small live crown, trunk decay	
155	D	cherry	*Prunus* spp.	11	10	10	F	yes	Poor structure, leans to street, old basal wound	
156	D	cherry	*Prunus* spp.	3,5,6	14	14	F	yes	Moderate structure, branch decay	
157	E	giant sequoia	*Sequoiadendron giganteum*	56	25	25	E	yes	Minor crown asymmetry	
158	D	zelkova	*Zelkova serrata*	18,25	36	36	G	yes	Broken branches, crown decay	

No.	Variety	Common Name	Species Name	DBH[1]	C-Rad[2]	RPZ[3]	Cond[4]	Sig[5]	Comments	Treatment
159	D	maple	*Acer* spp.	9	12	12	G	yes		

[1] **DBH** is tree diameter measured at breast height, 4.5-feet above the ground level measured from the uphill side (in inches). Trees with multiple stems splitting below DBH are reported individually and separated by a comma or noted as quantity x size, except where Comments indicate otherwise.

[2] **C-Rad** is the average crown radius measured (in feet).

[3] **RPZ** identifies the arborist recommended root protection zone radius in feet, which generally coincides with tree driplines except where alternative tree protection measures will provide for allowable encroachment into driplines.

[4] **Cond** is an arborist assigned rating to generally describe the condition of individual trees as follows- **De**ad; **Dy**ing; **Di**seased; **H**azardous; **P**oor; **F**air; **G**ood; or **E**xcellent condition.

[5] **Sig** identifies "Significant Trees" defined by the City as evergreen trees ≥ 8" DBH and deciduous trees, other than red alder or cottonwood, ≥ 12" DBH.

Geotechnical Investigation Crown Park Improvements

Camas, Washington

July 5, 2022

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1 INTRODUCTION

At your request, GRI completed a geotechnical investigation for proposed improvements at Crown Park in Camas, Washington. The general location of the project is shown on the Vicinity Map, Figure 1. The investigation was conducted to evaluate subsurface conditions at the site and develop recommendations for design and construction of the proposed improvements. The investigation included subsurface explorations, field-infiltration testing, laboratory testing, and engineering analyses. This report describes the work accomplished and provides our conclusions and recommendations for design and construction of the proposed improvements.

2 PROJECT DESCRIPTION

We understand the proposed improvements at Crown Park will include a new restroom building(s), picnic shelter, water feature with play area, playground, basketball court, stormwater facilities, and other associated improvements. The location of the planned improvements are shown on the Site Plan, Figure 2.

Based on review of the conceptual site plan and our discussions with you, we understand the dimensions of the planned restroom building and picnic shelter are about 11 feet by 30 feet and 20 feet by 30 feet, respectively. The foundation loads for these structures are not known at this time; however, it is anticipated the structures will be relatively lightly loaded and founded on spread footings or concrete mat foundations with a thickened edge

The water feature and wet play area will have a footprint of about 4,000 square feet to 5,000 square feet. We anticipate the improvements may require some shallow embedment on the order of 5 feet or less. The structural loads are unknown at this time, but we assume the structures will be relatively light and supported on spread foundations of mats.

We understand the planned stormwater facilities would consist of shallow swales or trenches with maximum embedded depths less than about 5 feet. Other project improvements will include portland cement concrete (PCC) sidewalks and an at-grade basketball court. The maximum height of cuts and fills will be less than about 5 feet. Excavations for installation of utilities will be a maximum depth of about 5 feet.

3 SITE DESCRIPTION

3.1 Topography and Surface Conditions

Crown Park is bordered to the west by Division Street, the north by 17th Avenue, the east by NE Everett Street, and the south by NE 15th Street. Site grades in the project area typically slope down from the west to east, from about elevation 250 feet to about 220 feet. The ground surface of the park is typically covered by grass with asphalt surfaced walkways. Mature trees are scattered throughout the park. An existing play area, surfaced with wood chips, is located in the north-center portion of the park. A swimming pool area with multiple pools and buildings was previously located in the northwest area of the park. The pools and associated buildings have been demolished and removed from the site.

All elevations in this report refer to the National Geodetic Vertical Datum of 1929 (NGVD 29).

3.2 Geology

Camas is located in the Portland Basin geomorphic province of southern Washington. The oldest rocks in the project area are Paleogene-age (about 27 million years old) basalt and andesitic volcanic rocks mapped as the Basaltic Andesite of Elkhorn Mountain (Evarts and O'Connor, 2008). Overlying these units are late Pliocene- and Pleistocene-age (about 3.5 to 1 million years old) sedimentary rocks consisting of conglomerate and sandstone. These sedimentary rocks, referred to as the Troutdale Formation, are the result of deposition of ancestral Columbia River sediments. The upper surface of these sedimentary rock units are commonly decomposed into hard residual soil.

4 SUBSURFACE CONDITIONS

4.1 General

Subsurface materials and conditions at the site were investigated on April 7 and 8, 2022, with six test pits, designated TP-1 through TP-6. The test pits were excavated to depths of about 2.5 feet to 5 feet at the approximate locations shown on Figure 2. Details of the subsurface explorations and laboratory testing programs completed for this investigation are provided in Appendix A. Logs of the test pits are provided on Figures 1A through 3A. The terms and symbols used to describe the soils encountered in the test pits are defined in Tables 1A and 2A and the attached legend.

4.2 Soils

For the purpose of discussion, the soils disclosed by our investigation have been grouped into the following units based on their physical characteristics and engineering properties:

a. FILL
b. SILT and SAND (Residual Soil)
c. SANDSTONE (Troutdale Formation)

The following paragraphs provide a description of the soil units and a discussion of the groundwater conditions at the site.

a. FILL

Sandy gravel fill was encountered in test pit TP-1 to a depth of about 2.5 feet. The gravel is angular to subrounded and the sand is fine to coarse grained. The sandy gravel contains some silt. Based on observations while excavating the test pit, the relative density of the sandy gravel fill is estimated to be loose to medium dense. The fill encountered in TP-1 contains rope and wire debris. A 4-inch-thick, heavily rooted zone was observed at the ground surface of TP-1.

Silt fill was encountered at the location of TP-2 to a depth of about 1 foot. The silt is dark brown, and contains a trace of clay, some subrounded gravel, and fine- to coarse-grained sand content ranging from some sand to sandy. Based on observations while excavating the test pit, the relative consistency of the silt fill is estimated to be medium stiff. The fill encountered in TP-2 contains concrete and wood fragments. A 3-inch-thick, heavily rooted zone was observed at the ground surface of TP-2.

Silty sand trench backfill was encountered at the location of TP-3 to a depth of about 1.5 feet. The silty sand is brown and rust, fine to coarse grained, and contains gravel to cobble sized pieces of extremely soft to very soft (R0 to R1) sandstone. An irrigation pipe was encountered during advancement of the test pit at 1 foot. The test pit was terminated at a depth of 2.5 feet due to the irrigation line.

b. SILT and SAND (Residual Soil)

Red-brown silt was encountered below the fill in test pit TP-2 and at the ground surface in test pits TP-4 through TP-6. The silt extends to depths varying from 2 feet to 4 feet below the existing site grade. Red-brown silty sand was encountered in test pit TP-5 below the silt at a depth of 2 feet. The silt contains clay and fine- to coarse-grained sand content ranging from a trace of clay to some clay and some sand to sandy. The silty sand is fine to coarse grained. Rock structure in the silt and silty sand increases with depth and the silt and sand contain gravel to boulder sized pieces of decomposed sandstone. Based on observations while excavating the test pits and results of Torvane shear strength testing, the relative consistency of the silt is estimated to be soft to medium stiff and the relative density of the silty sand is estimated to be medium dense to dense. A 3- to 6-inch-thick, heavily rooted zone was observed at the ground surface of each test pit.

c. SANDSTONE (Troutdale Formation)

Sandstone was encountered below the fill, silt and silty sand in test pits TP-1, TP-2, and TP-4 through TP-6 at depths ranging from about 2 feet to 4 feet. The sandstone is brown and rust-colored, predominantly decomposed to moderately weathered, and extremely soft to soft (R0 to R2). Test pits TP-1, TP-2, and TP-4 through TP-6 were terminated in the sandstone at depths ranging from 3 feet to 5 feet due to practical refusal of the excavator.

4.3 Groundwater

Light seepage from perched groundwater was observed on the sidewall of test pit TP-2 at a depth of about 1 foot. Groundwater was not encountered in any of the other explorations. It should be anticipated that localized perched groundwater will approach the ground surface during periods of heavy or prolonged rainfall.

5 INFILTRATION TESTING

Three falling-head infiltration tests were conducted in general conformance with the *2016 Camas Stormwater Design Standards Manual,* which references the Southwest Washington American Society of Civil Engineers (SWWASCE) Infiltration Standards. Single-ring encased falling-head tests were completed in TP-2 and TP-4 at depths of 3 feet. The encased falling head tests were completed through a 6-inch-diameter polyvinyl chloride casing embedded about 6 inches into the soil. The infiltration test locations were presoaked in general accordance with the SWWWASCE *Infiltration Standards*. After the presoak period, the infiltration test proceeded by adjusting the water level inside the pipe to 1 foot to 2 feet above the soil at the base of the pipe. The change in water level was measured at 10-minute intervals for one hour. Two and three consecutive trials were conducted in TP-2 and TP-4respectively. After completion of the infiltration tests, a sample was collected from the bottom of each test pit for characterization and the test pit was advanced to practical refusal in the sandstone.

Cobble to boulder sized pieces of sandstone encountered at the planned test depth of 3 feet at the location of test pit TP-5 prohibited embedment of the 6-inch-diameter pipe.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

The subsurface explorations indicate the site is mantled with fill, silt, and silty sand underlain by sandstone at depths of about 2 feet to 4 feet. Perched groundwater was observed in one excavation at a depth of about 1 foot and it should be anticipated that localized perched groundwater on the sandstone will approach the ground surface, especially during periods of heavy or prolonged rainfall. In our opinion, the subsurface conditions at the site are generally suitable for support of the planned improvements.

The primary geotechnical considerations include the moisture-sensitive silty surface soils and the presence of shallow sandstone. Our conclusions and recommendations for design and construction of the planned improvements are provided below.

6.2 Site Preparation and Grading

The ground surface within the limits of the proposed structures should be stripped of vegetation, surface organics, and loose or soft surficial soils. We anticipate stripping to a depth of about 3 inches to 6 inches will be required in the grass-covered area of the park.

In our opinion, spoil materials should be removed from the site or stockpiled on site for use as fill in landscaped areas. Upon completion of site stripping, the resulting subgrade should be observed by the geotechnical engineer. Any soft areas or areas of undocumented or unsuitable fill material should be overexcavated to firm undisturbed soil and backfilled with structural fill. Undocumented fill was encountered in the test pits in the area of the pre-existing pool facility that was demolished. In this regard, some overexcavation of unsuitable fill should be anticipated.

The near-surface soils are silty and moisture sensitive. During wet-weather or wet-ground conditions, silty soils are easily disturbed, rutted, and weakened by construction activities. For this reason, we recommend that, if possible, all earthwork activities be accomplished during the dry summer and early fall months. If the subgrade is disturbed during construction, soft, disturbed soils should be overexcavated to firm soil and backfilled with structural fill.

During wet-weather or wet-ground conditions, it should be anticipated that haul roads or granular work pads constructed with imported granular fill will be necessary to provide access and protect the silty subgrade from damage due to construction traffic. In our opinion, a 12-inch-thick granular work pad should be sufficient to prevent disturbance of the silty subgrade by lighter construction equipment and limited traffic by dump trucks. A granular work pad on the order of 18 inches to 24 inches thick is typically required to protect fine-grained subgrade soils from disturbance by repetitive heavy construction loads. The use of woven geotextile fabric over the subgrade may reduce the need for maintenance of work pads and haul roads.

Temporary construction slopes should be cut not steeper than 1H:1V (Horizontal to Vertical). Permanent cut and fill slopes should be not steeper than 2H:1V. The ground surface should be sloped to drain away from structures.

The site is underlain by essentially impermeable sandstone at shallow depths of 2 feet to 4 feet. Perched groundwater conditions during wet weather may approach the ground surface and result in wet soft surficial conditions. These conditions may be improved by subdrainage systems such as French drains, drainage blankets, and subdrains (possibly placed in utility trenches) to collect and remove water. Additional subdrainage recommendations for specific areas can be provided if this is considered.

6.3 Sandstone Excavation

The explorations encountered residual soil consisting of silt and silty sand underlain by extremely soft to soft (R0 to R2) sandstone at depths of about 2 feet to 4 feet. The sandstone was evaluated in the test pits to depths ranging from about 6-inches to 2 feet and the test pits were terminated due to refusal of the tracked excavator on sandstone. It should be anticipated that the sandstone may become less weathered and harder with depth. Based on our experience with similar projects and materials, we anticipate it will be difficult to excavate more than about 1 foot into the sandstone using a large hydraulic excavator equipped with a rock bucket with carbide teeth. Therefore, depending on the necessary depth of excavations, it should be anticipated that sandstone excavation techniques, such as percussion and chipping methods, may be required, particularly in small work areas and areas where tight control of the excavation limits is required. We anticipate that relatively hard and/or massive sandstone encountered at the site can be excavated using a hydraulic percussion hammer, which is commonly attached to a large track-mounted excavator. However, the rate of excavation in sandstone can be slow and highly variable even when using a percussion hammer especially for deeper excavations.

6.4 Structural Fill

In our opinion, on-site soils that are free of organics or other deleterious materials or debris and sandstone or rock fragments greater than 6 inches in diameter are suitable for use in structural fills. As noted above, the near-surface soils at the site consist of silty sand and silt, which are moisture sensitive and can typically only be placed and adequately compacted during the dry summer and early fall months. For construction during the wet winter and spring months, fills should be constructed using imported granular material consisting of sand, gravel, or fragmented rock with a maximum particle size of about 3 inches and not more than 7% passing the No. 200 sieve (washed analysis).

In general, approved on-site, organic-free, fine-grained, silty soils used to construct structural fills within building and pavement areas should be placed in 9-inch-thick lifts (loose) and compacted using medium-size (48-inch-diameter), segmented-pad rollers to at least 95% of the maximum dry density as determined by ASTM D 698. Pieces of sandstone or rock, concrete, etc., larger than about 6 inches, should be removed from the fill prior to compaction. Fill placed in landscaped areas should be compacted to a minimum of about 90% of the maximum dry density as determined by ASTM D 698. In our opinion, the moisture content of fine-grained soils at the time of compaction should be controlled to within 3% of optimum. Some aeration and drying of the on-site fine-grained soils may be required to achieve the recommended compaction criteria. All structural fills should extend a minimum horizontal distance of 5 feet beyond the limit of building and pavement areas.

Imported granular material used to construct structural fills or work pads during wet weather can consist of relatively clean granular material, such as sand, sand and gravel, or crushed rock with a maximum size of about 4 inches and with not more than about 7% passing the No. 200 sieve (washed analysis). The first lift of granular fill material placed over the silt subgrade should be in the range of 12 inches to 18 inches thick (loose). Subsequent lifts should be placed 12 inches thick (loose). All lifts should be compacted to at least 95% of the maximum dry density as determined by ASTM D 698 using a medium-weight (48-inch-diameter drum), smooth, steel-wheeled, vibratory roller. Generally, a minimum of four passes with the roller are required to achieve compaction.

Backfill placed in utility trench excavations should consist of sand, sand and gravel, or crushed rock with a maximum size of up to 1½ inches and not more than 7% passing the No. 200 sieve (washed analysis). The granular backfill should be compacted to at least 95% of the maximum dry density as determined by ASTM D698. Flooding or jetting the backfilled trenches with water to achieve the recommended compaction should not be permitted.

6.5 Utility Excavation

We anticipate new utilities will be installed for the project. In our opinion, the presence of sandstone will be an important consideration for the installation of new utilities at the site.

The method of excavation and design of trench support and dewatering are the responsibility of the contractor and are subject to applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards. The means, methods, and sequencing of construction operations and site safety are also the responsibility of the contractor. The information provided below is for the use of our client and should not be interpreted to suggest we are assuming responsibility for the contractor's actions or site safety.

All utility excavations should be properly sloped or shored to conform to applicable local, state, or federal regulations. According to current OSHA regulations, the near-surface fill, silt, and sand at the site would be classified as Type C soil. In our opinion, temporary excavation slopes should be no steeper than 1H:1V. Temporary excavation slopes may encounter perched groundwater depending on the time of year and weather. Groundwater, if encountered, may result in sloughing or caving sidewalls. The use of flatter excavation slopes or slope stabilization may be needed to prevent sloughing or caving sidewalls. If significant seepage or running-soil conditions are encountered, it may be necessary to place a blanket of clean, granular fill material against the face of the slope to control these conditions. We anticipate control of light to moderate groundwater seepage in the utility excavations can be accomplished by pumping from sumps within the excavations.

Excavation into the sandstone, encountered in the test pits at depths of about 2 feet to 4 feet, will be difficult, as discussed in the Sandstone Excavation section.

All backfill placed in utility trench excavations within the limits of new buildings, pavements, and other improved areas should consist of granular structural fill, as discussed in this report.

6.6 Seismic Design Considerations

Based on our review of the current International Building Code, we recommend using Site Class C to evaluate the seismic design of the improvements. The seismic design methodology uses two spectral response coefficients, S_S and S_1, corresponding to periods of 0.2 second and 1.0 second, to develop the design earthquake spectrum. The S_S and S_1 coefficients based on the soil conditions at the site are 0.814 g and 0.352 g, respectively.

Based on our review of the subsurface conditions disclosed by the test pit excavations, the groundwater conditions, and the anticipated ground motions, it is our opinion the risk of liquefaction, lateral spreading, and seismic-related slope instability at the site is low. The risk of tsunami and seiches at the site is absent. The U.S. Geological Survey (USGS) considers the Lacamas Lake Fault, located approximately 1 km from the site; the closest mapped crustal fault considered a hazard to the site. In our opinion, the potential for fault rupture or displacement at the site is low unless occurring on a previously unknown or unmapped fault.

6.7 Foundation Support

In our opinion, foundation support for the restroom building, picnic shelter, water feature, and playground equipment can be provided by conventional spread footings established in the silt or silty sand or sandstone. The width of footings should not be less than 16 inches and 24 inches for wall and column footings, respectively. The footings for the playground equipment should have a minimum width of 12 inches. All footings should be established at a minimum depth of 18 inches below the lowest adjacent finished grade. Soft, loose, or otherwise unsuitable soils, including undocumented fill, if encountered at footing depth, should be overexcavated to firm undisturbed subgrade material and replaced with granular structural fill. Excavations for all footings should be made using a smooth-edged bucket and observed by the geotechnical engineer.

As previously mentioned, a swimming pool area with multiple pools and buildings was previously located in the north-center area of the park, in the approximate location shown on Figure 2. The pools and associated buildings have been demolished and removed from the site. Test pits TP-1 and TP-2 disclosed up to 2.5 feet of undocumented fill placed at the ground surface. We recommend all the undocumented fill encountered in the footprint of foundations in this area be excavated and replaced with granular material as described in the Structural Fill section above.

We recommend a minimum-3-inch-thick layer of compacted crushed surfacing meeting the requirements of Subsection 9-03.9(3) of the Washington State Department of Transportation (WSDOT) *Standard Specifications* be placed on the subgrade to minimize subgrade disturbance during construction of the forms. If excavations extend into the sandstone, any loose fragments should be removed, and a leveling course of crushed surfacing should be used to backfill to subgrade as described above.

Footings and concrete mat foundations with a thickened edge established in accordance with the above criteria can be designed to impose an allowable bearing pressure of up to 1,500 pounds per square foot (psf). This value applies to the total of dead load plus frequently and/or permanently applied live loads and can be increased by one-third for the total of all loads: dead, live, and wind or seismic. We estimate the settlement of spread footings will be less than 1 inch. Settlement in the middle of mat foundations will be less than about 1 inch. Settlement at the edges of the mat foundation could range from about ½ to ⅔ of the settlement in the middle of the mat, depending on the relative stiffness of the mat and the actual distribution of loading. The allowable bearing pressure of the sandstone is significantly higher and can be provided if requested. However, we anticipate the bearing pressure for the lightly loaded structures will be less than about 1,500 psf.

Horizontal shear forces can be resisted partially or completely by frictional forces developed between the base of spread footings and the underlying soil and by soil passive resistance. The total frictional resistance between the footing and the soil is the normal force times the coefficient of friction between the soil and the base of the footing. We recommend an ultimate value of 0.35 for the coefficient of friction; the normal force is the sum of the vertical forces (dead load plus real live load). If additional lateral resistance is required, passive earth pressures against embedded footings can be computed based on an equivalent fluid having a unit weight of 225 pounds per cubic foot. This design passive earth pressure will be applicable only if the footing is cast neat against undisturbed soil or if backfill for the footings is placed as granular structural fill. This value also assumes the ground surface in front of the foundation is horizontal, i.e., does not slope downward away from the toe of the footing.

6.8 Slab-on-Grade Floor Support

To provide uniform floor support, we recommend placing a minimum-8-inch-thick granular base course beneath the floor slab. Crushed rock meeting the requirements of Subsection 9-03.9(3) Crushed Surfacing of the WSDOT *Standard Specifications* would be suitable for this purpose. The base course should be installed in a single lift and compacted until well keyed by at least four passes with a vibratory roller. Prior to placing the granular base course, the subgrade should be evaluated by a geotechnical engineer. Loose, sandy subgrade, if present, should be compacted by four passes with a vibratory roller or plate compactor. If soft, silty subgrade is present, the soft areas should be overexcavated to firm soil and replaced with structural fill.

6.9 Pavement Design

We understand the planned walkways through the park will be paved with PCC and support pedestrians, bikes, and occasional pickup-truck traffic for maintenance, and the basketball court will be surfaced with AC or PCC pavement. Based on our experience with similar projects and the subgrade soil conditions, we recommend the pathways be surfaced with a 4-inch thickness of PCC pavement. All surfaces should be underlain by a minimum-6-inch crushed-rock base (CRB). Crushed rock meeting the requirements of Subsection 9-03.9(3) of the WSDOT *Standard Specifications* would be suitable for this purpose. The PCC pavement, CRB, and construction practices should conform to the requirements of the 2021 WSDOT *Standard Specifications*. This pavement section assumes the subgrade and structural fill needed to establish site grades has been prepared in accordance with the recommendations in this report.

The recommended pavement section should be considered the minimum thicknesses for PCC and CRB, and it should be assumed some maintenance will be required over the life of the pavement (15 years to 20 years). The thicknesses are based on the assumption that pavement construction will be accomplished during the dry season and after construction of other improvements has been completed. If wet-weather pavement construction is considered, it will likely be necessary to increase the thickness of CRB to protect the fine-grained subgrade from disturbance during construction. In addition, if construction of pavement occurs during wet weather conditions, we recommend placement of a woven geotextile fabric over silt subgrade prior to placement of the CRB. The indicated pavement section is not intended to support extensive construction traffic, such as dump trucks and concrete trucks. Pavements of this thickness subjected to construction traffic will likely require repair.

Prior to placing crushed rock or CRB materials, the subgrade should be evaluated by a member of GRI's geotechnical engineering staff. Any soft areas identified should be overexcavated to firm ground and backfilled with compacted structural fill.

6.10 Stormwater Infiltration

As discussed previously, two encased falling-head infiltration tests were completed in test pits TP-2 and TP-4 at depths of 3 feet. The results of this testing and the soils encountered at the test depths and the calculated soil coefficient of permeability are summarized in Table 6-1.

Table 6-1: SUMMARY OF INFILTRATION TEST RESULTS

Test Pit Designation	Test Depth, ft	Soil Type	Calculated Soil Coefficient of Permeability, in./hr
TP-2	3	SILT, some fine-grained sand, trace to some clay	0.18
TP-4	3	Decomposed SANDSTONE	0.12

As previously stated, the test casing was not able to be embedded at the location of test pit TP-5 due to the presence of cobble to boulder-sized pieces of sandstone. Based on the soils encountered, we anticipate the infiltration rate at the location of TP-5 will be similar to the rates provided above. The decomposed sandstone becomes less weathered, harder, and impermeable with depth.

Based on the fine-grained soil at the ground surface underlain by relatively shallow sandstone, and the results of the infiltration test, it is our opinion that on-site disposal of stormwater is not feasible at the site, and the approach for handling of on-site stormwater will likely be limited to detention and treatment

7 DESIGN REVIEW AND CONSTRUCTION SERVICES

We welcome the opportunity to review and discuss construction plans and specifications for this project as they are being developed. In addition, GRI should be retained to review all geotechnical-related portions of the plans and specifications to evaluate whether they are in conformance with the recommendations provided in our report. To observe compliance with the intent of our recommendations, the design concepts, and the plans and specifications, it is our opinion all construction operations dealing with earthwork, foundations, and infiltration facilities should be observed by a GRI representative. Our construction-phase services will allow for timely design changes if site conditions are encountered that are different from those described in our report. If we do not have the opportunity to confirm our interpretations, assumptions, and analyses during construction, we cannot be responsible for the application of our recommendations to subsurface conditions different from those described in this report.

8 LIMITATIONS

This report has been prepared to aid the project team in the design of this project. The scope is limited to the specific project and location described within this report and our description of the project represents our understanding of the significant aspects of the project relevant to earthwork and design and construction of the improvements. In the event that any changes in the design and location of the project elements as outlined in this report are planned, we should be given the opportunity to review the changes and modify or reaffirm the conclusions and recommendations of this report in writing.

The conclusions and recommendations in this report are based on the data obtained from the subsurface explorations completed at the locations shown on Figure 2 and other sources of information discussed in this report. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is acknowledged that variations in subsurface conditions may exist between exploration locations. This report does not reflect variations that may occur between these explorations. The nature and extent of variation may not become evident until construction. If, during construction, subsurface conditions differ from those encountered in the explorations, we should be advised at once so we can observe and review these conditions and reconsider our recommendations where necessary.

Please contact the undersigned if you have any questions regarding this report.

Submitted for GRI,

MATTHEW S. SHANAHAN
44077

Issued: 11/2007 Renews: 04/2024

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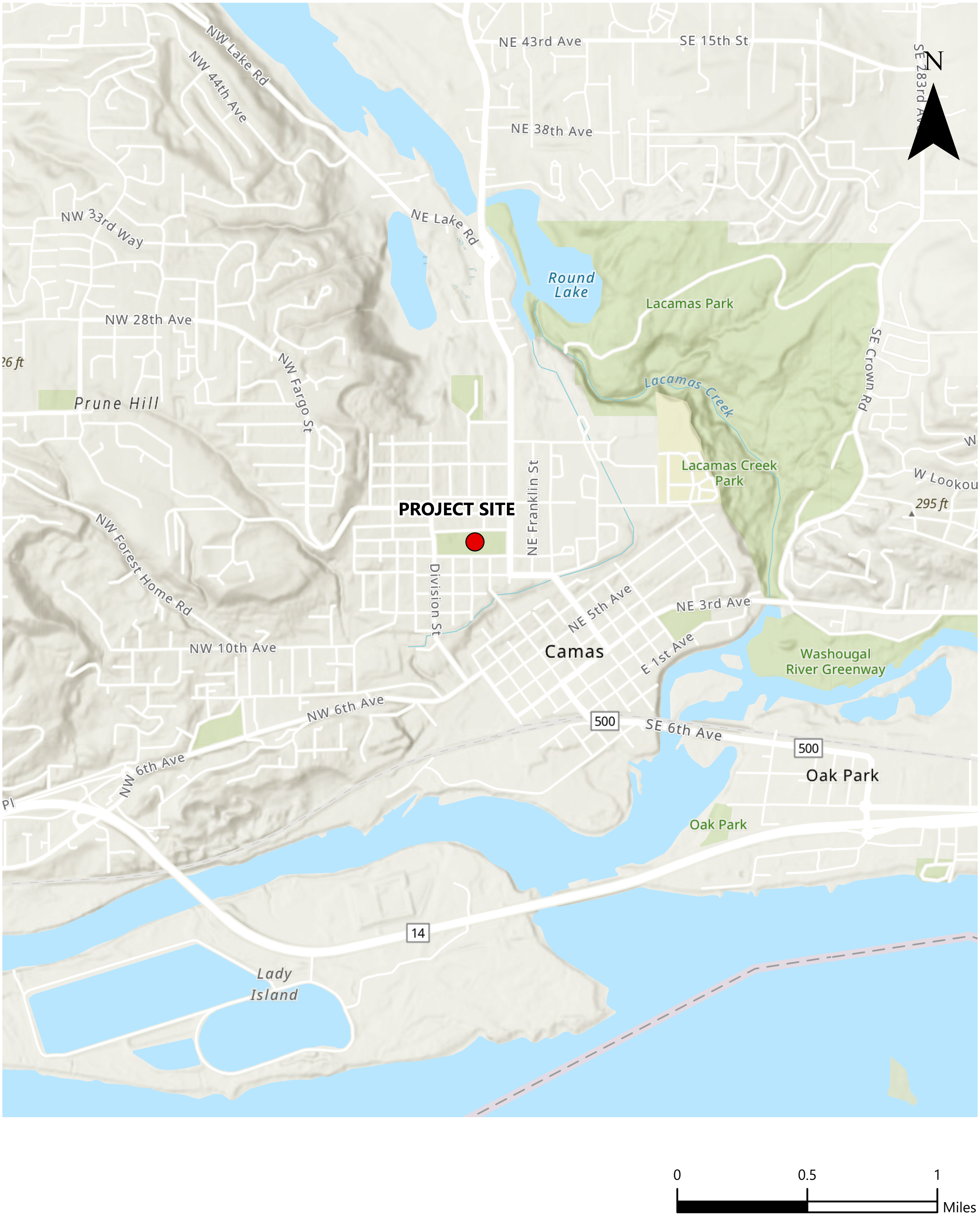
This document has been submitted electronically.

9 REFERENCES

Camas Stormwater Design Standards Manual, November 22, 2016.

Evarts, R. C., 2008, Geologic map of the Camas quadrangle, Clark County, Washington, U.S. Geological Survey, Scientific Investigations Map 3017, scale 1:24,000.

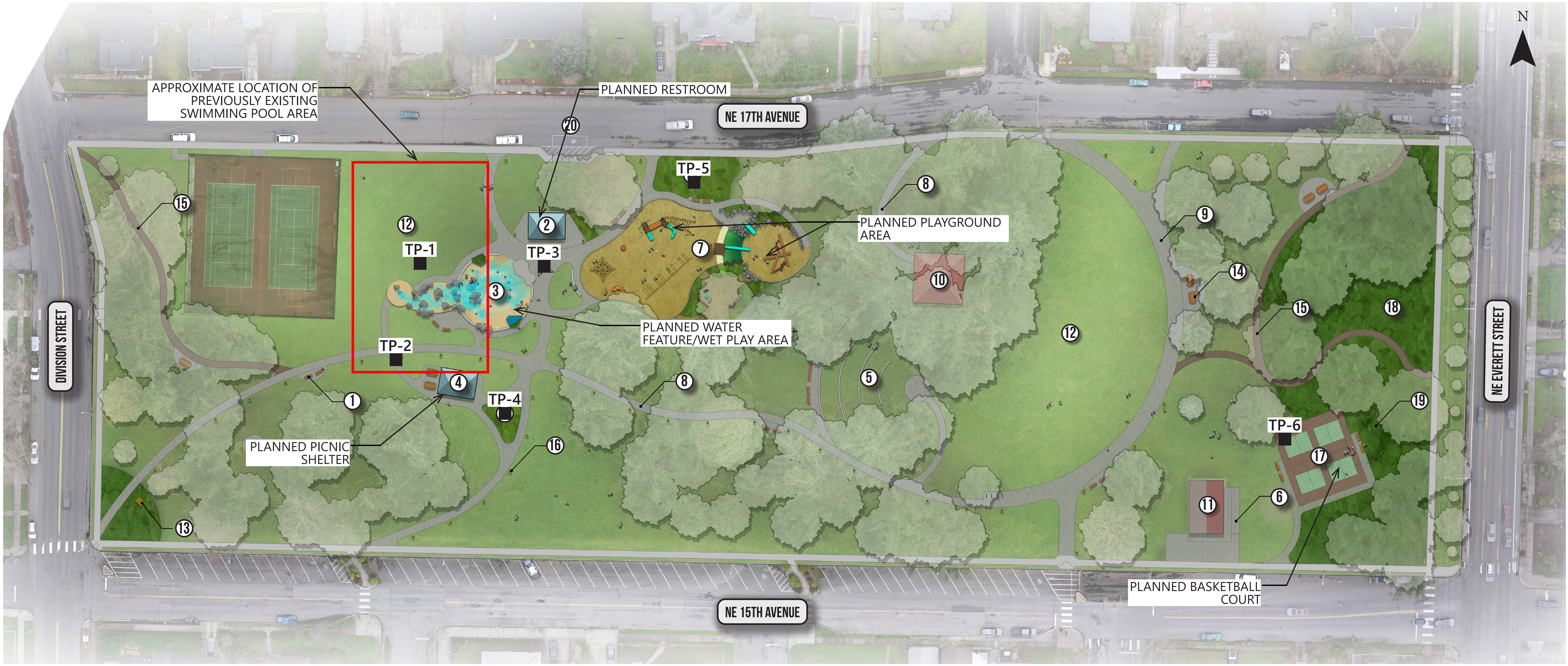
U.S. Geological Survey (USGS), Interactive Fault Map, accessed 5/5/22 from USGS website: https://www.usgs.gov/natural-hazards/earthquake-hazards/faults



GREENWORKS
CROWN PARK IMPROVEMENTS

VICINITY MAP

JUL. 2022 JOB NO. W1327-A FIG. 1



■ TEST PIT COMPLETED BY GRI

0 70 140 FT

GRI GREENWORKS
CROWN PARK IMPROVEMENTS

SITE PLAN

JUL. 2022 JOB NO. W1327-A FIG. 2

APPENDIX A

Field Explorations and Laboratory Testing

APPENDIX A

FIELD EXPLORATIONS AND LABORATORY TESTING

A.1 FIELD EXPLORATIONS

A.1.1 General

Subsurface materials and conditions at the site were evaluated on April 7 and 8, 2022, with six test pits, designated TP-1 through TP-6, at the approximate locations shown on Figure 2. The test pits were excavated to depths of about 2.5 feet to 5 feet using a Hitachi EX30 rubber track-mounted excavator provided and operated by Dan J. Fischer Excavating of Forest Grove, Oregon. A GRI representative directed the explorations and maintained a detailed log of the materials and conditions disclosed during the course of work. The materials exposed in the sidewalls of the excavations were carefully examined in the field and representative portions of the exposed materials were saved in airtight bags. The samples collected in the explorations were returned to our laboratory for further examination and testing.

Logs of the test pit explorations are provided on Figures 1A through 3A. The logs present a descriptive summary of the various types of materials encountered in the explorations and note the depth where the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples taken, along with the natural moisture contents, Torvane shear strength values, and grain-size analysis, including percent passing the No. 200 sieve, are shown graphically. The terms used to describe the soils are defined in Table 1A and the attached legend.

A.2 LABORATORY TESTING

A.2.1 General

The samples obtained from the test pits were examined in our laboratory, where the physical characteristics of the samples were noted, and the field classifications modified where necessary. The laboratory program included determinations of natural moisture content and grain-size analyses (washed-sieve). Additional testing included Torvane shear strength testing. A summary of the laboratory test results have been provided in Table 3A. The following sections describe the testing program in more detail.

A.2.2 Natural Moisture Contents

Natural moisture content determinations were made in conformance with ASTM International (ASTM) D2216. The results are summarized on Figures 1A through 3A and in Table 3A.

A.2.3 Grain-Size Analysis

A.2.3.1 Washed-Sieve Method

To assist in classification of the soils, samples of known dry weight were washed over a No. 200 sieve. The material retained on the sieve is oven-dried and weighed. The percentage of material passing the No. 200 sieve is then calculated. The results are summarized on Figures 1A through 3A and in Table 3A.

A.2.4 Torvane Shear Strength

The approximate undrained shear strength of fine-grained soils exposed in the sidewalls of the excavations was determined using the Torvane shear device. The Torvane is a hand-held apparatus with vanes that are inserted into the soil. The torque required to fail the soil in shear around the vanes is measured using a calibrated spring. The results of the Torvane shear strength testing are summarized on Figures 1A through 3A and in Table 3A.

Table 1A

GUIDELINES FOR CLASSIFICATION OF SOIL

Description of Relative Density for Granular Soil

Relative Density	Standard Penetration Resistance, (N-values) blows/ft
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	over 50

Description of Consistency for Fine-Grained (Cohesive) Soils

Consistency	Standard Penetration Resistance (N-values), blows/ft	Torvane or Undrained Shear Strength, tsf
Very Soft	0 - 2	less than 0.125
Soft	2 - 4	0.125 - 0.25
Medium Stiff	4 - 8	0.25 - 0.50
Stiff	8 - 15	0.50 - 1.0
Very Stiff	15 - 30	1.0 - 2.0
Hard	over 30	over 2.0

Grain-Size Classification

Boulders:
  >12 in.

Cobbles:
  3-12 in.

Gravel:
  ¼ - ¾ in. (fine)
  ¾ - 3 in. (coarse)

Sand:
  No. 200 - No. 40 sieve (fine)
  No. 40 - No. 10 sieve (medium)
  No. 10 - No. 4 sieve (coarse)

Silt/Clay:
  Pass No. 200 sieve

Modifier for Subclassification

	Primary Constituent SAND or GRAVEL	Primary Constituent SILT or CLAY
Adjective	Percentage of Other Material (By Weight)	
trace:	5 - 15 (sand, gravel)	5 - 15 (sand, gravel)
some:	15 - 30 (sand, gravel)	15 - 30 (sand, gravel)
sandy, gravelly:	30 - 50 (sand, gravel)	30 - 50 (sand, gravel)
trace:	<5 (silt, clay)	*Relationship of clay and silt determined by plasticity index test*
some:	5 - 12 (silt, clay)	
silty, clayey:	12 - 50 (silt, clay)	

Table 2A
GUIDELINES FOR CLASSIFICATION OF ROCK

Relative Rock Weathering Scale

Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 in. into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident. May be reduced to soil with hand pressure.

Relative Rock Hardness Scale

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	< 100 psi
Very Soft	R1	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocketknife and scratched with fingernail.	100 - 1,000 psi
Soft	R2	Can be peeled by a pocketknife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.	1,000 - 4,000 psi
Medium Hard	R3	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.	4,000 - 8,000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.	8,000 - 16,000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	> 16,000 psi

RQD and Rock Quality

Relation of RQD and Rock Quality		Terminology for Planar Surface		
RQD (Rock Quality Designation), %	Description of Rock Quality	Bedding	Joints and Fractures	Spacing
0 - 25	Very Poor	Laminated	Very Close	< 2 in.
25 - 50	Poor	Thin	Close	2 in. – 12 in.
50 - 75	Fair	Medium	Moderately Close	12 in. – 36 in.
75 - 90	Good	Thick	Wide	36 in. – 10 ft
90 - 100	Excellent	Massive	Very Wide	> 10 ft

Reference

Kulhawy, F. H., and Mayne, P. W., 1990, Manual on Estimating Soil Properties for Foundation Design, Electric Power Research Institute, EL-6800.

Table 3A

SUMMARY OF LABORATORY RESULTS

Sample Information						Atterberg Limits			
Location	Sample	Depth, ft	Elevation, ft	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Fines Content, %	Soil Type
TP-1	S-1	1.0	246.0	13	--	--	--	10	FILL
TP-2	S-1	0.5	248.5	31	--	--	--	--	FILL
	S-2	2.0	247.0	39	--	--	--	--	SILT
	S-3	3.0	246.0	52	--	--	--	55	SILT
TP-4	S-1	2.0	243.0	37	--	--	--	59	Sandy SILT
	S-2	3.0	242.0	47	--	--	--	33	SANDSTONE
TP-5	S-1	1.0	239.0	39	--	--	--	--	Sandy SILT
	S-2	2.5	237.5	40	--	--	--	45	Silty SAND
TP-6	S-1	1.0	220.0	28	--	--	--	76	SILT

BORING AND TEST PIT LOG LEGEND

SOIL SYMBOLS

Symbol	Typical Description
⁙	LANDSCAPE MATERIALS
▩	FILL
○	GRAVEL; clean to some silt, clay, and sand
○	Sandy GRAVEL; clean to some silt and clay
○	Silty GRAVEL; up to some clay and sand
○	Clayey GRAVEL; up to some silt and sand
░	SAND; clean to some silt, clay, and gravel
░	Gravelly SAND; clean to some silt and clay
░	Silty SAND; up to some clay and gravel
░	Clayey SAND; up to some silt and gravel
▥	SILT; up to some clay, sand, and gravel
▥	Gravelly SILT; up to some clay and sand
▥	Sandy SILT; up to some clay and gravel
▥	Clayey SILT; up to some sand and gravel
▨	CLAY; up to some silt, sand, and gravel
▨	Gravelly CLAY; up to some silt and sand
▨	Sandy CLAY; up to some silt and gravel
▨	Silty CLAY; up to some sand and gravel
≋	PEAT

BEDROCK SYMBOLS

Symbol	Typical Description
⊞	BASALT
▤	MUDSTONE
☰	SILTSTONE
☰	SANDSTONE

SURFACE MATERIAL SYMBOLS

Symbol	Typical Description
■	Asphalt concrete PAVEMENT
■	Portland cement concrete PAVEMENT
○	Crushed rock BASE COURSE

SAMPLER SYMBOLS

Symbol	Sampler Description
I	2.0 in. O.D. split-spoon sampler and Standard Penetration Test with recovery (ASTM D1586)
▮	Shelby tube sampler with recovery (ASTM D1587)
▮	3.0 in. O.D. split-spoon sampler with recovery (ASTM D3550)
⊠	Grab Sample
▯	Rock core sample interval
▒	Sonic core sample interval
░	Push probe sample interval

INSTALLATION SYMBOLS

Symbol	Symbol Description
◫	Flush-mount monument set in concrete
◫	Concrete, well casing shown where applicable
▨	Bentonite seal, well casing shown if applicable
⁘	Filter pack, machine-slotted well casing shown where applicable
◫	Grout, vibrating-wire transducer cable shown where applicable
Ⓟ	Vibrating-wire pressure transducer
◫	1-in.-diameter solid PVC
◫	1-in.-diameter hand-slotted PVC
◫	Grout, inclinometer casing shown where applicable

FIELD MEASUREMENTS

Symbol	Typical Description
▽	Groundwater level during drilling and date measured
▼	Groundwater level after drilling and date measured
▨	Rock/sonic core or push probe recovery (%)
▨	Rock quality designation (RQD, %)

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	SAMPLE TYPE	● MOISTURE CONTENT, % ☐ FINES CONTENT, % LIQUID LIMIT, % PLASTIC LIMIT, % 0 50 100	COMMENTS AND ADDITIONAL TESTS

TP-1

Surface Elevation: 247.0 ft [±] (NGVD29)

Sandy GRAVEL, some silt, loose to medium dense, fine- to coarse-grained sand, subrounded to angular gravel, contains rope and wire debris, 4-inch-thick heavily rooted zone at the ground surface (Fill)

244.5
2.5

SANDSTONE, brown and rust, moderately weathered to predominantly decomposed, extremely soft to soft, R0 to R2 (Troutdale Formation)

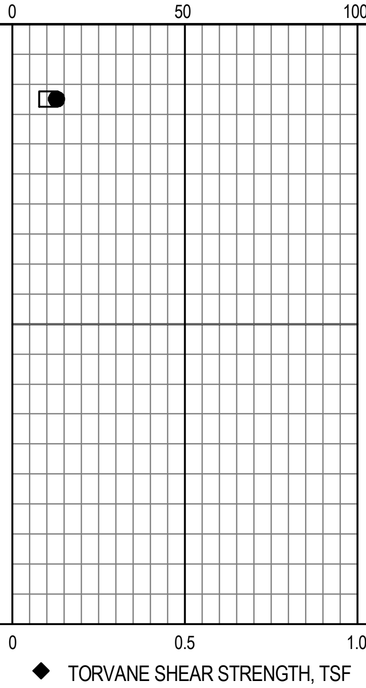
244.0
3.0

(4/7/2022)

Refusal encountered on sandstone at 3 feet

S-1 ☒

S-2 ☒



Depth, ft: 5, 10

Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/7/22 **GPS Coordinates:** 45.5913° N -122.4087° W (WGS84) **Note:** See Legend for Explanation of Symbols

TP-2

Surface Elevation: 249.0 ft [±] (NGVD29)

SILT, some fine- to coarse-grained sand to sandy, some subrounded gravel, trace clay, dark brown, medium stiff, contains concrete fragments and wood fragments, 3-inch-thick heavily rooted zone at the ground surface (Fill)

248.0
1.0

SILT, some fine-grained sand to sandy, trace to some clay, red-brown, soft to medium stiff (Residual Soil)
---sandy, increased rock structure below 3 feet

245.0
4.0

SANDSTONE, brown and rust, moderately weathered to predominantly decomposed, extremely soft to soft, R0 to R2 (Troutdale Formation)

244.0
5.0

(4/7/2022)

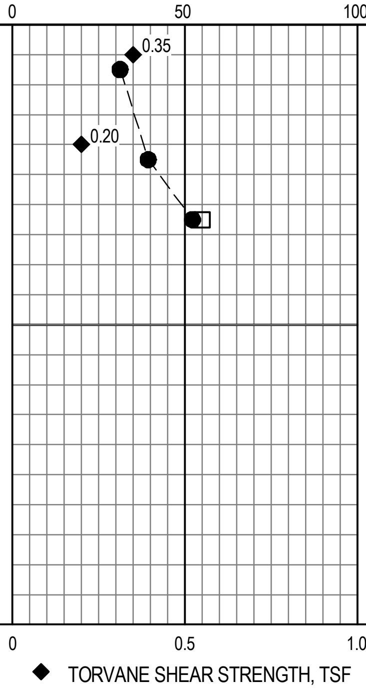
Refusal encountered on sandstone at 5 feet

S-1 ☒

S-2 ☒

S-3 ☒

S-4 ☒



Encased falling head infiltration test completed at 3 feet

Depth, ft: 5, 10

Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/7/22 **GPS Coordinates:** 45.5911° N -122.4088° W (WGS84) **Note:** See Legend for Explanation of Symbols

GRI

TEST PITS

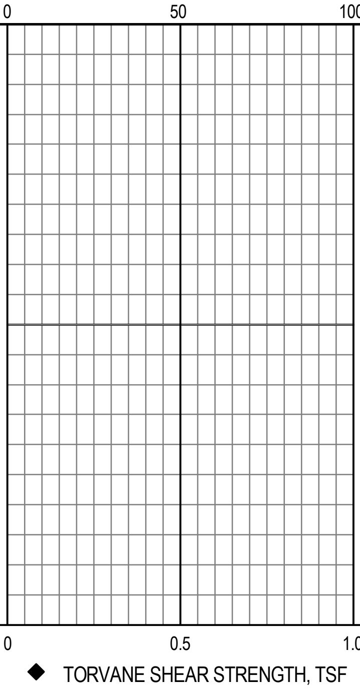
JUL. 2022 JOB NO. W1327-A FIG. 1A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT DEPTH, FT	SAMPLE NO. SAMPLE TYPE	● MOISTURE CONTENT, % ☐ FINES CONTENT, % LIQUID LIMIT, % PLASTIC LIMIT, % 0 50 100	COMMENTS AND ADDITIONAL TESTS

TP-3

Surface Elevation: 242.0 ft [±] (NGVD29)

0	Silty SAND, brown and rust, loose to medium dense, fine to coarse grained, contains up to cobble-sized pieces of extremely soft to very soft (R0 to R1) sandstone, 3-inch-thick heavily rooted zone at the ground surface (Irrigation Trench Backfill)	239.5 2.5	S-1 ☒	Irrigation pipe encountered at 1 foot
	(4/7/2022)			
5				
10				



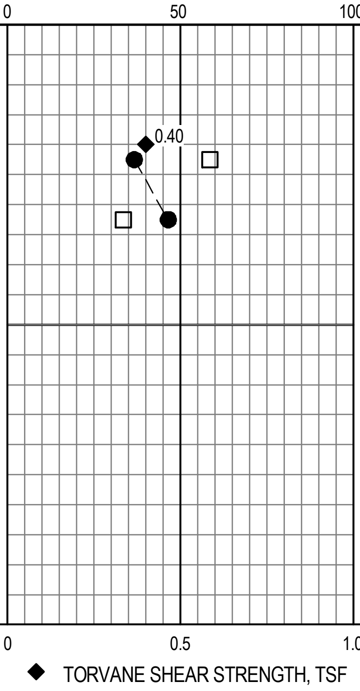
Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/7/22 **GPS Coordinates:** 45.5913° N -122.4084° W (WGS84) **Note:** See Legend for Explanation of Symbols

TP-4

Surface Elevation: 245.0 ft [±] (NGVD29)

0	Sandy SILT, trace to some clay, red-brown, medium stiff, fine-grained sand, 6-inch-thick heavily rooted zone at the ground surface (Residual Soil) ---increased rock structure, gravel- to cobble-sized pieces of decomposed sandstone below 2 feet	242.0 3.0	S-1 ☒	
	SANDSTONE, brown and rust, moderately weathered to predominantly decomposed, extremely soft to soft, R0 to R2 (Troutdale Formation)	241.0 4.0	S-2 ☒ S-3 ☒	Encased falling head infiltration test completed at 3 feet
5	(4/7/2022) Refusal encountered on sandstone at 4 feet			
10				



Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/7/22 **GPS Coordinates:** 45.591° N -122.4085° W (WGS84) **Note:** See Legend for Explanation of Symbols

GRI TP LOG (GPS) - 2 PP GRI DATA TEMPLATE.GDT 6/21/22

GRI

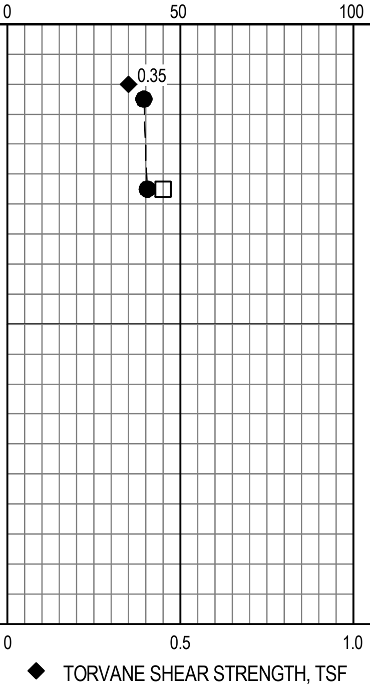
TEST PITS

JUL. 2022 JOB NO. W1327-A FIG. 2A

DEPTH, FT	GRAPHIC LOG	CLASSIFICATION OF MATERIAL	ELEVATION, FT / DEPTH, FT	SAMPLE NO.	SAMPLE TYPE	● MOISTURE CONTENT, % ☐ FINES CONTENT, % LIQUID LIMIT, % PLASTIC LIMIT, %	COMMENTS AND ADDITIONAL TESTS

TP-5

Surface Elevation: 240.0 ft [±] (NGVD29)



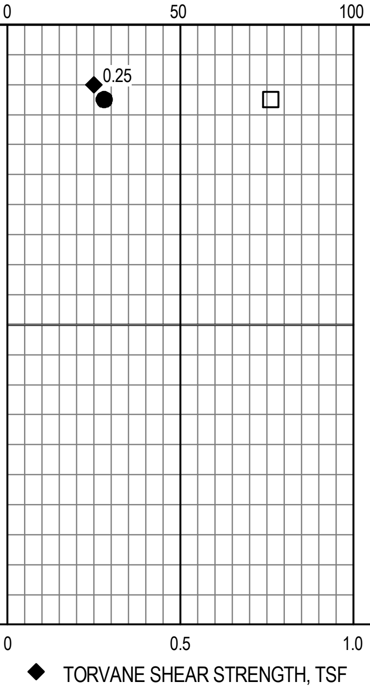
	Sandy SILT, trace to some clay, red-brown, medium stiff, fine- to coarse-grained sand, contains gravel-sized pieces of decomposed sandstone, 4-inch-thick heavily rooted zone at the ground surface (Residual Soil)	238.0 2.0	S-1	☒	
	Silty SAND, trace clay, red-brown, medium dense to dense, fine to coarse grained, contains cobble- to boulder-sized pieces of decomposed sandstone (Residual Soil)	236.0 4.0	S-2	☒	Encased falling head infiltration test attempted at 3 feet. Pipe embedment was refused by cobble to boulder size pieces of sandstone.
5	SANDSTONE, brown and rust, moderately weathered to predominantly decomposed, extremely soft to soft, R0 to R2 (Troutdale Formation)	235.0 5.0	S-3	☒	
	(4/7/2022) Refusal encountered on sandstone at 5 feet				
10					

Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/7/22 **GPS Coordinates:** 45.5915° N -122.4079° W (WGS84) **Note:** See Legend for Explanation of Symbols

TP-6

Surface Elevation: 221.0 ft [±] (NGVD29)



	SILT,some fine-grained sand, trace to some clay, red-brown, soft to medium stiff, contains fine roots, 4-inch-thick heavily rooted zone at the ground surface (Residual Soil)	219.0 2.0	S-1	☒	
	SANDSTONE, brown and rust, moderately weathered to predominantly decomposed, extremely soft to soft, R0 to R2 (Troutdale Formation)	217.0 4.0	S-2 S-3	☒ ☒	
5	(4/8/2022) Refusal encountered on sandstone at 4 feet				
10					

Logged By: D. Schade **Excavated by:** Dan J. Fischer Excavating, Inc. **Equipment:** Hitachi EX30 Track-Mounted Excavator

Date Started: 4/8/22 **GPS Coordinates:** 45.591° N -122.4061° W (WGS84) **Note:** See Legend for Explanation of Symbols

GRI TP LOG (GPS) - 2 PP GRI DATA TEMPLATE.GDT 6/21/22

GRI

TEST PITS