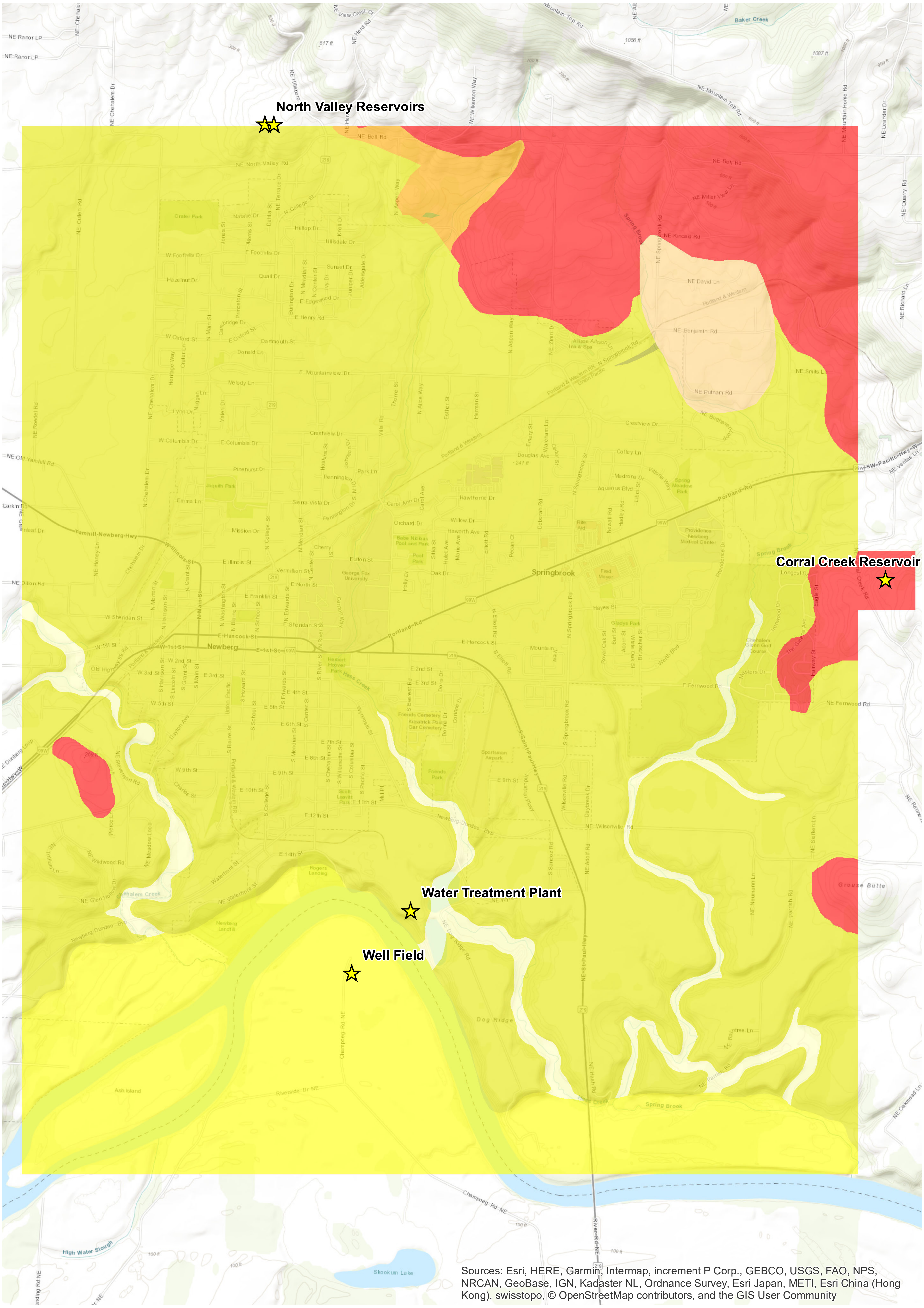
Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Geology.mxd Date: 9/11/2019 Login: DSJ



LEGEND

☆ City Properties

Map Unit Name

- Alluvium of smaller streams
- Floodplain deposits
- Landslide deposits
- Missoula Flood Deposits
- Troutdale Formation
- Scappoose Formation
- Columbia River Basalt Group

0 0.25 0.5 1

Miles

NOTES

1. Geologic mapping modified from DOGAMI publicaions OGDC-6 and SLIDO-3.4. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

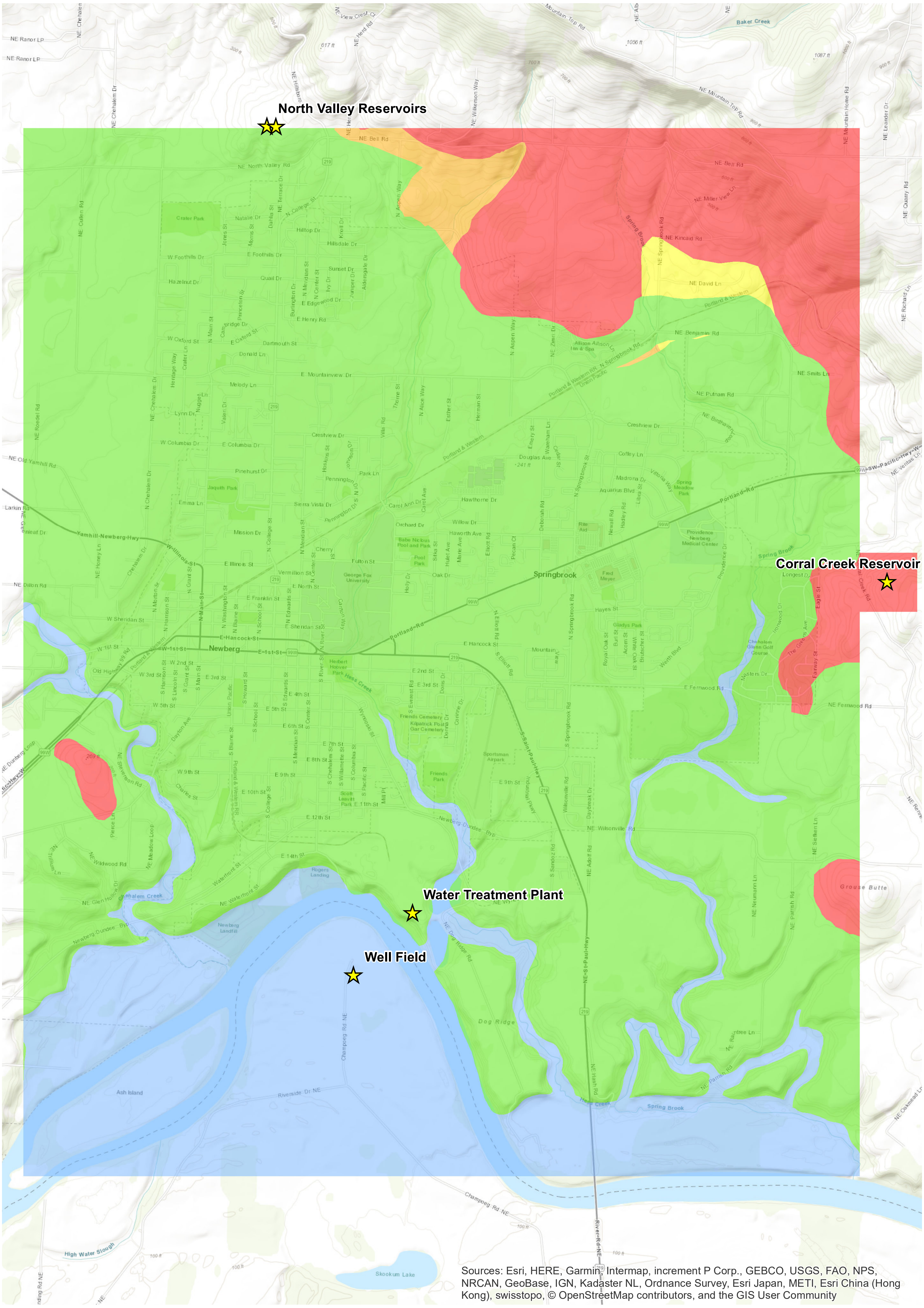
GEOLOGIC MAP

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

FIG. 1



LEGEND

☆ City Properties

Shear Wave Velocity, Vs30 (m/s)

- 180
- 270
- 540
- 760
- 1130

0 0.25 0.5 1
Miles

NOTES

1. Vs30 based on NEHRP site class and estimated from geologic descriptions. See text for details.

City of Newberg Seismic Resiliency
Yamhil County, Oregon

SHEAR WAVE VELOCITY, Vs 30

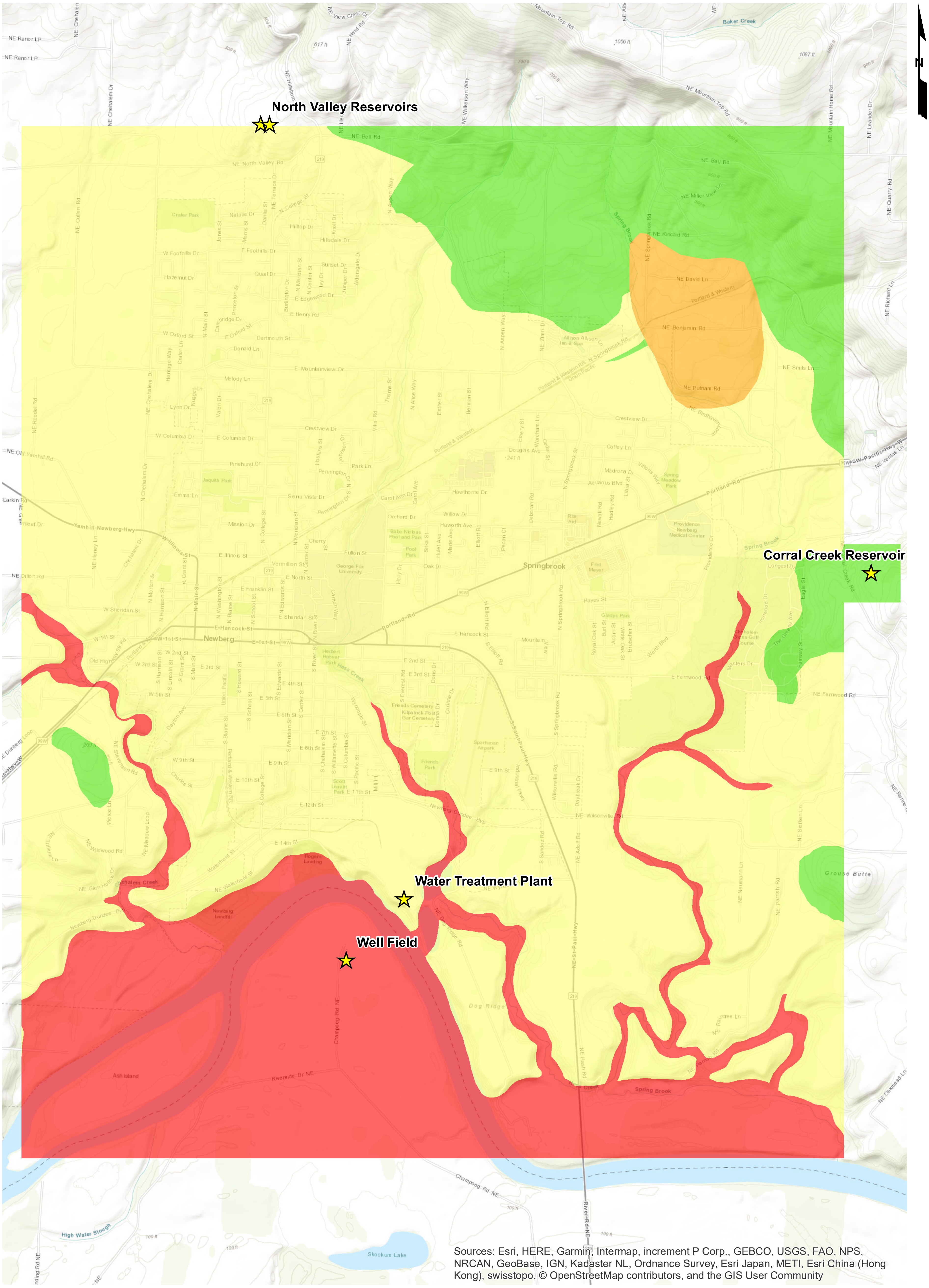
July 2020   101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2

FIG. 2

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Liquefaction Hazard.mxd Date: 9/11/2019 Login: DSJ



LEGEND

☆ City Properties

Liquefaction Hazard

- Very Low
- Low to Moderate
- Moderate
- High

0 0.25 0.5 1
Miles

NOTES

1. Liquefaction hazard map developed from data provided with DOGAMI publication OGDC-6, the Youd and Perkins, 1978 methodology, and knowledge of regional liquefaction hazards.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

LIQUEFACTION HAZARD

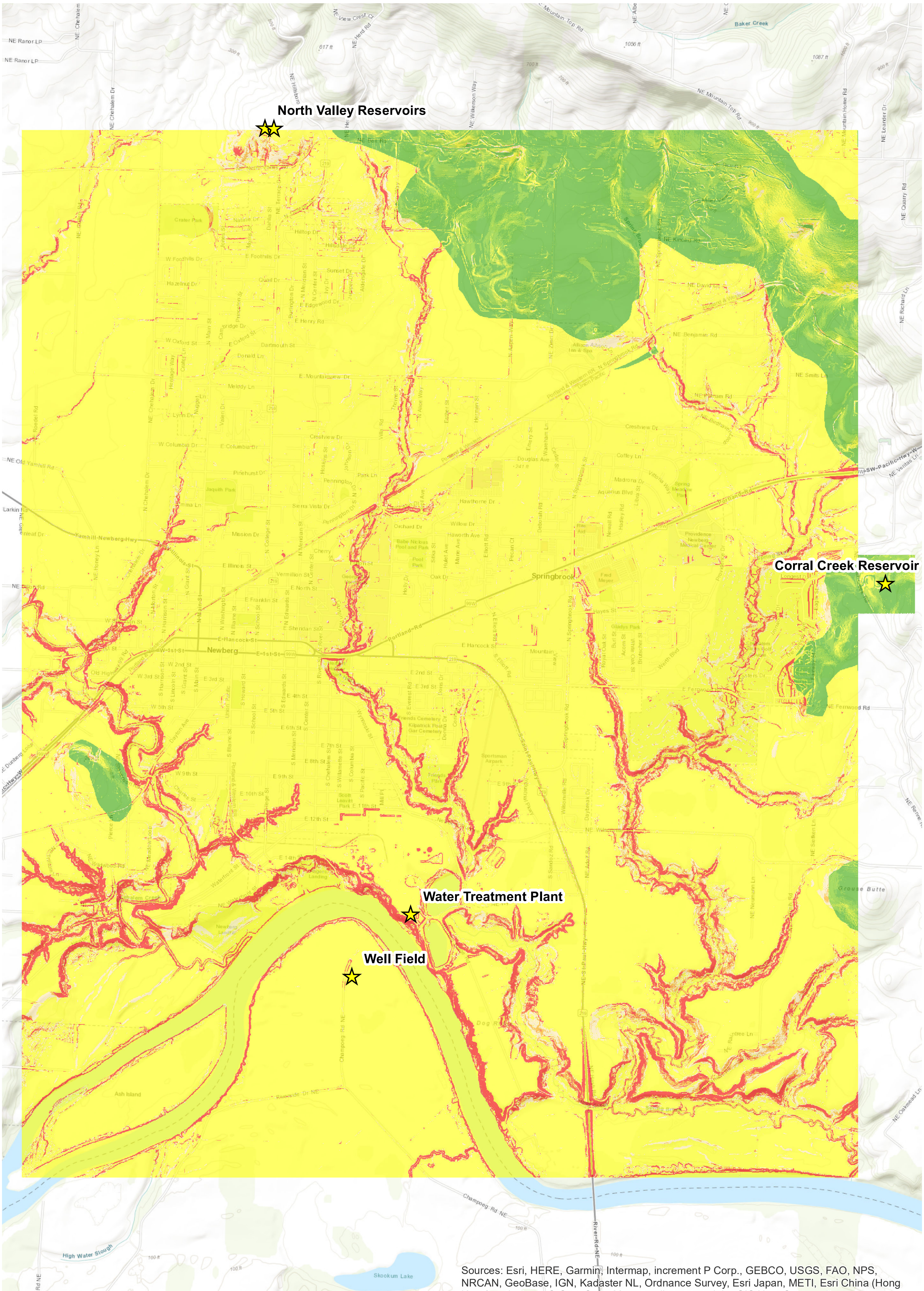
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 3

FIG. 3

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Landslide Susceptibility (Dry).mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

Landslide Susceptibility in Dry Conditions

(Scale of 0 - 10)

- 0
- 3
- 4
- 5
- 6
- 7
- 9

City Properties

0 0.25 0.5 1

Miles

NOTES

1. Landslide susceptibility calculated from data provided with DOGAMI publications SLIDO-3.4, O-12-02, OGDC-6 and LiDAR. Methodology taken from HAZUS. See text for details.

City of Newberg Seismic Resiliency
Yamhil County, Oregon

LANDSLIDE SUSCEPTIBILITY (DRY CONDITIONS)

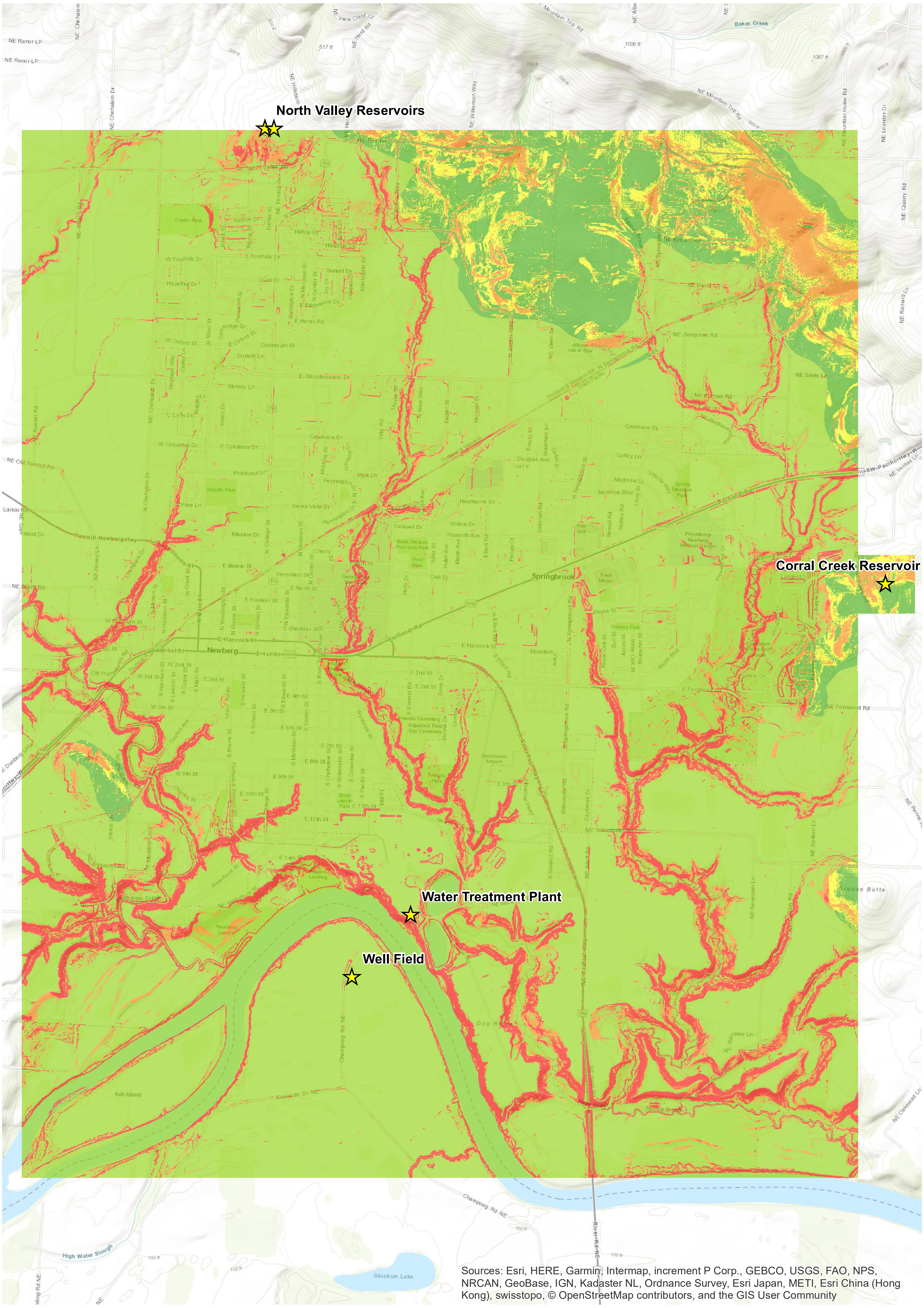
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 4

FIG. 4

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Landslide Susceptibility (Wet).mxd Date: 9/11/2019 Login: DSJ



LEGEND

Landslide Susceptibility in Wet Conditions

(Scale of 0 - 10)

- 5
- 7
- 8
- 9
- 10

☆ City Properties

0 0.25 0.5 1

Miles

NOTES

1. Landslide susceptibility calculated from data provided with DOGAMI publications SLIDO-3.4, O-12-02, OGDC-6 and LiDAR. Methodology taken from HAZUS. See text for details.

City of Newberg Seismic Resiliency
Yamhil County, Oregon

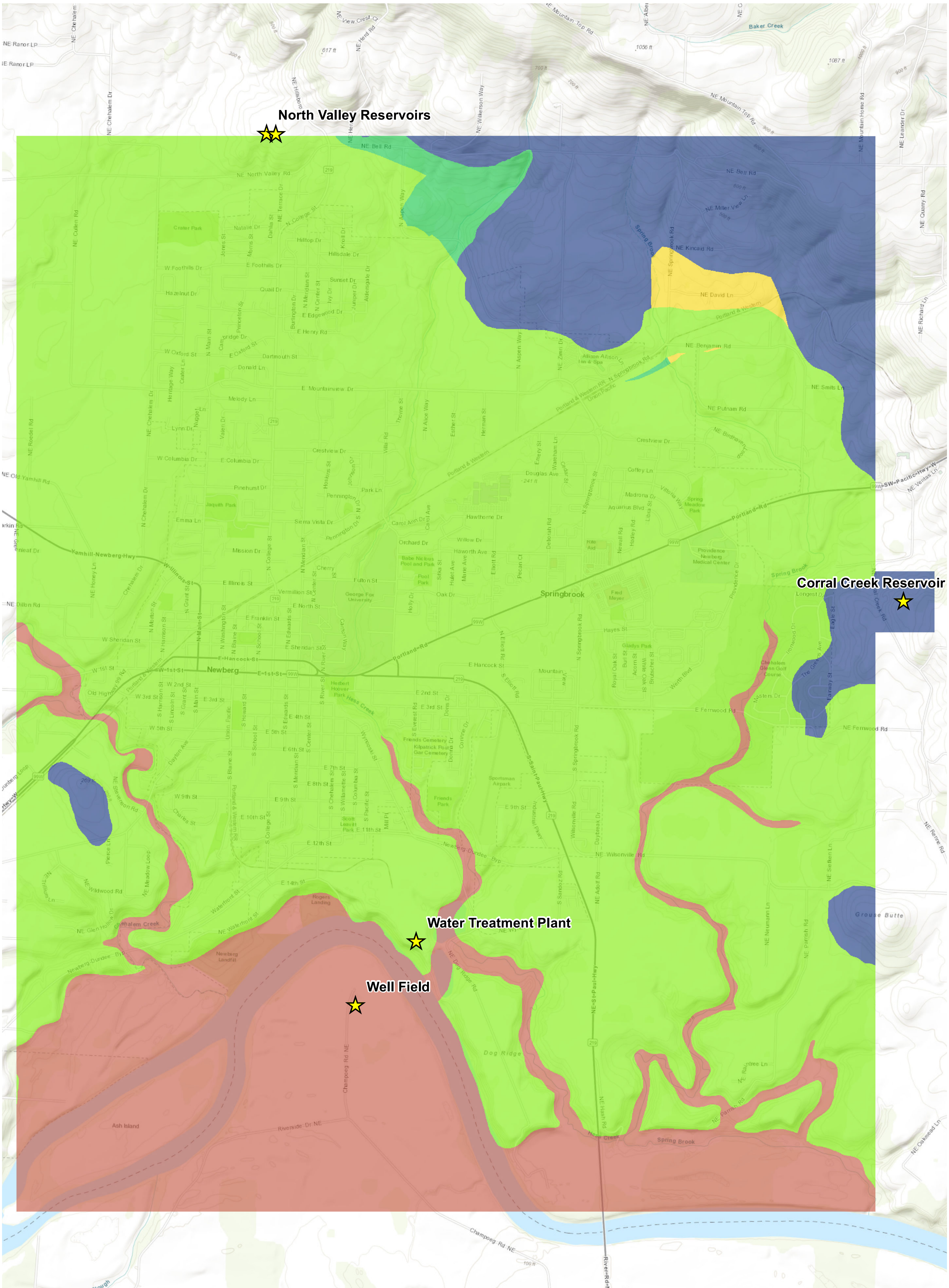
LANDSLIDE SUSCEPTIBILITY (WET CONDITIONS)

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 5

FIG. 5



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

Site PGA (g)

- 0.13 - 0.14
- 0.14 - 0.15
- 0.15 - 0.16
- 0.16 - 0.17
- 0.17 - 0.18
- 0.18 - 0.19
- 0.19 - 0.2

★ City Properties

0 0.25 0.5 1
Miles

NOTES

1. PGA map for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided in DOGAMI publication O-13-06 and methodology in Boore and Atkinson, 2008. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

PEAK GROUND ACCELERATION, PGA

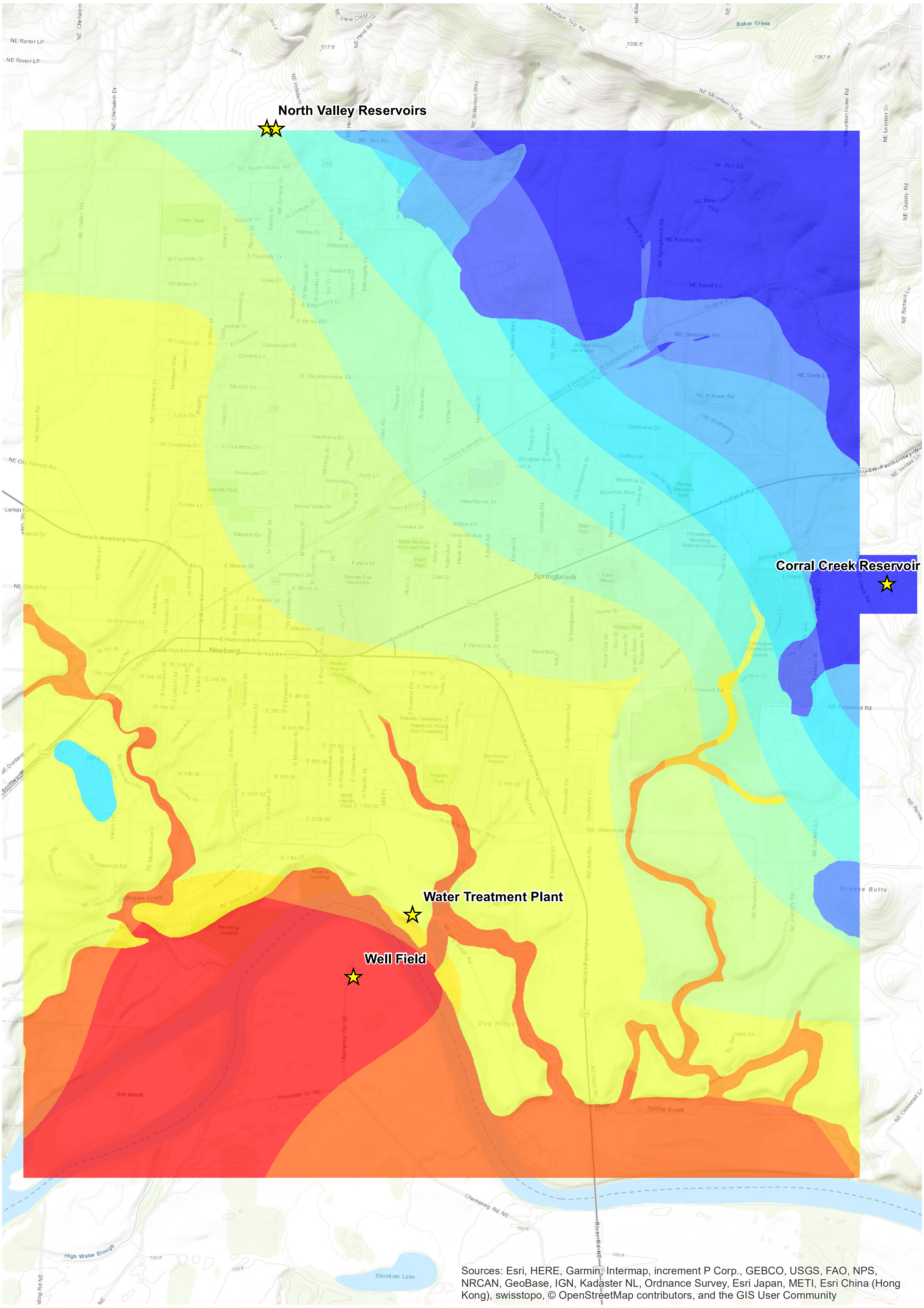
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 6

FIG. 6

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Site SA03.mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

☆ City Properties

Site SA 0.3 (g)

- 0.24 - 0.28
- 0.28 - 0.32
- 0.32 - 0.36
- 0.36 - 0.4
- 0.4 - 0.44
- 0.44 - 0.48
- 0.48 - 0.52
- 0.52 - 0.56
- 0.56 - 0.6
- 0.6 - 0.64
- 0.64 - 0.68
- 0.68 - 0.72
- 0.72 - 0.76
- 0.76 - 0.8

0 0.25 0.5 1
Miles

NOTES

1. SA0.3 map for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with the USGS Scenario published September 20, 2011, and DOGAMI publications O-12-02 and OGDC-6. See text for details.

City of Newberg Seismic Resiliency
Yamhil County, Oregon

0.3-SECOND SPECTRAL ACCELERATION, SA0.3

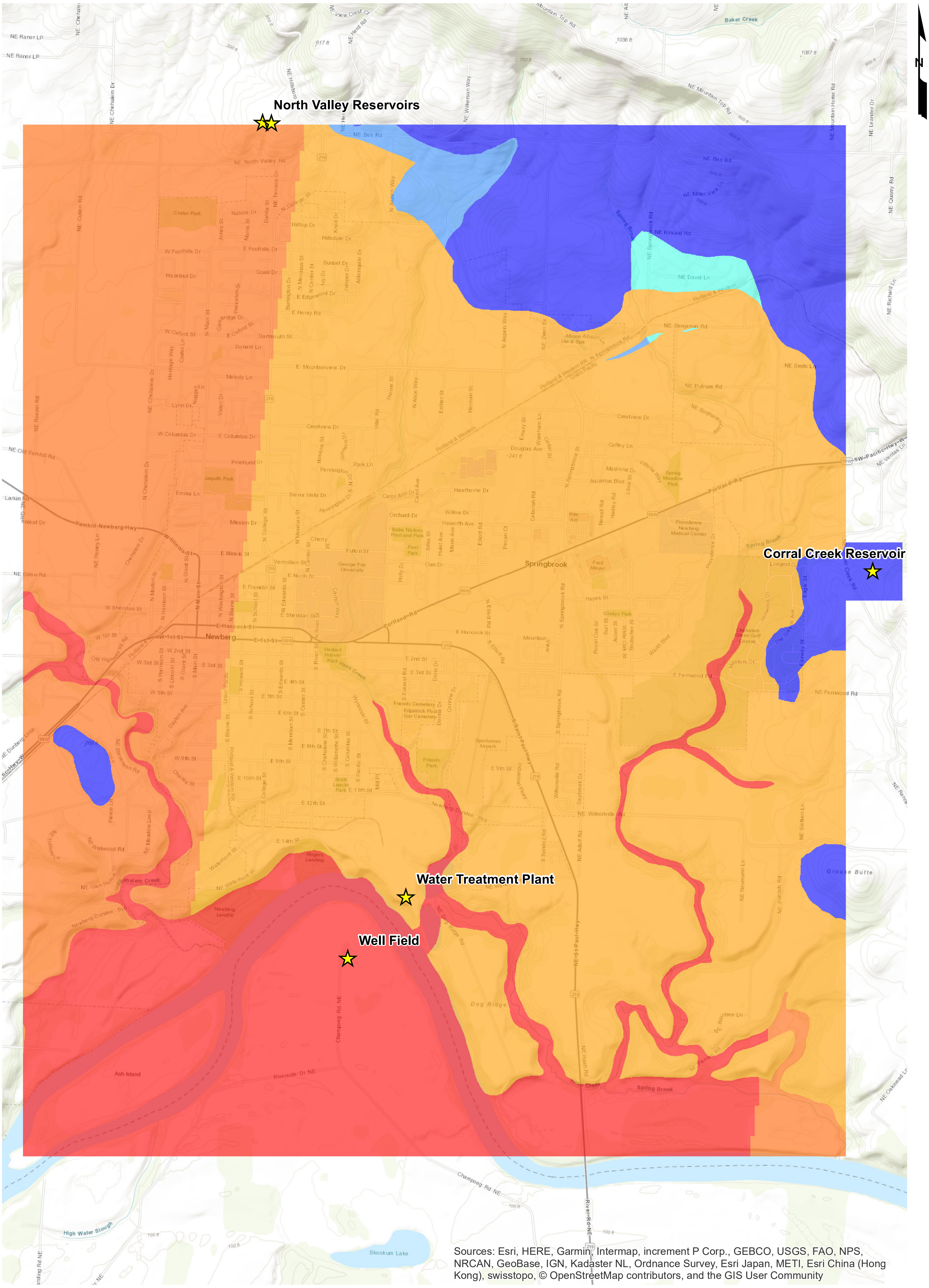
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 7

FIG. 7

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\SA1.mxd Date: 9/11/2019 Login: DSJ



LEGEND

☆ City Properties

Site SA1 (g)

- 0.10 - 0.12
- 0.12 - 0.14
- 0.14 - 0.16
- 0.16 - 0.18
- 0.18 - 0.2
- 0.2 - 0.22
- 0.22 - 0.24
- 0.24 - 0.26
- 0.26 - 0.28
- 0.28 - 0.3
- 0.3 - 0.32
- 0.32 - 0.34

0 0.25 0.5 1

Miles

NOTES

1. SA1 map for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided in DOGAMI publications O-13-06 and OGDC-6, and methodology in Boore and Atkinson, 2008. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

1-SECOND SPECTRAL ACCELERATION, SA1

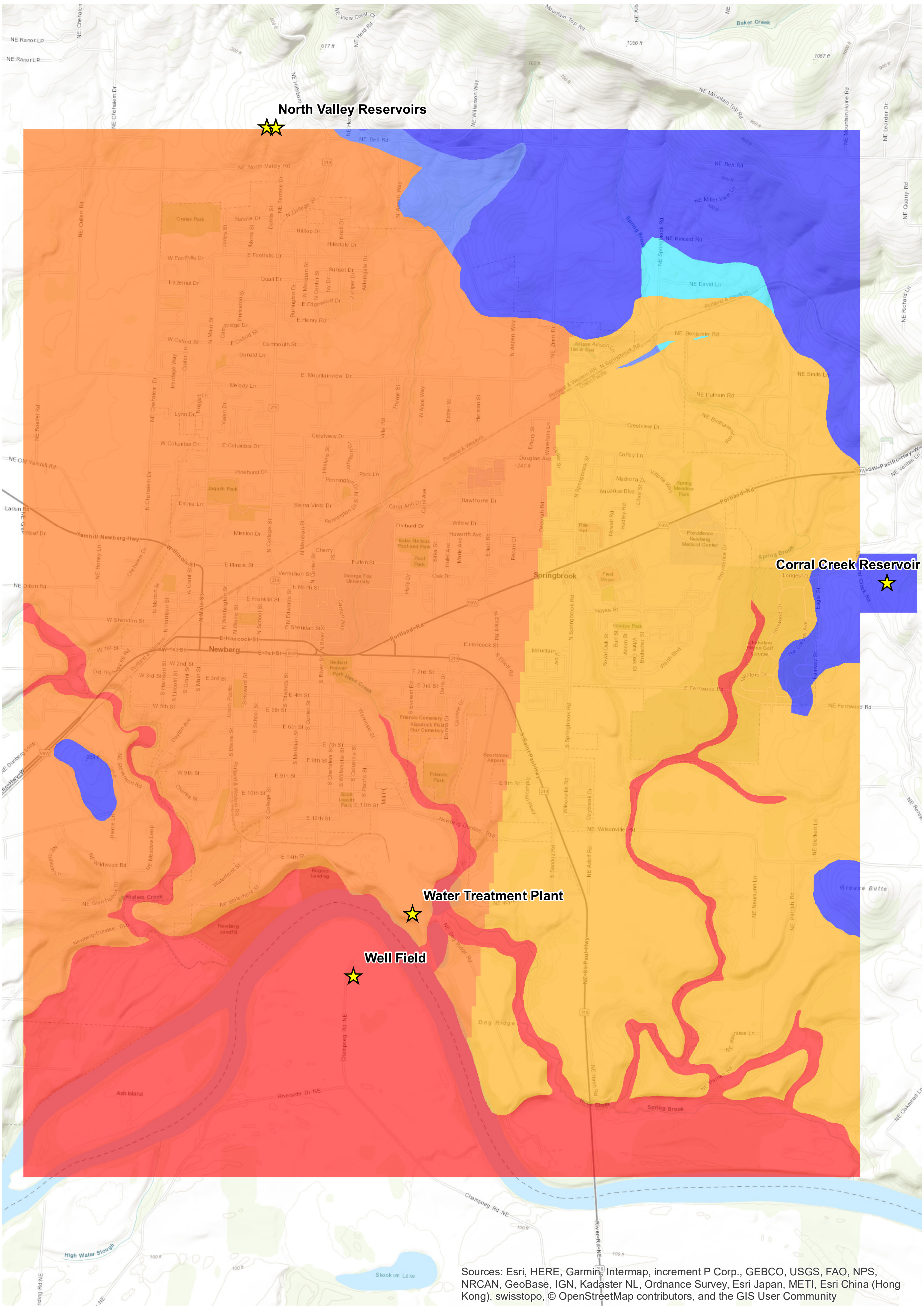
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 8

FIG. 8

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\PGV.mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

Site PGV (cm/sec)

10 - 12	20 - 22
12 - 14	22 - 24
14 - 16	24 - 26
16 - 18	26 - 28
18 - 20	28 - 30
	30 - 32

☆ City Properties

0 0.25 0.5 1
Miles

NOTES

1. PGV map for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided in DOGAMI publications O-13-06 and OGDC-6, and methodology in Boore and Atkinson, 2008. See text for details.

City of Newberg Seismic Resiliency
Yamhil County, Oregon

PEAK GROUND VELOCITY, PGV

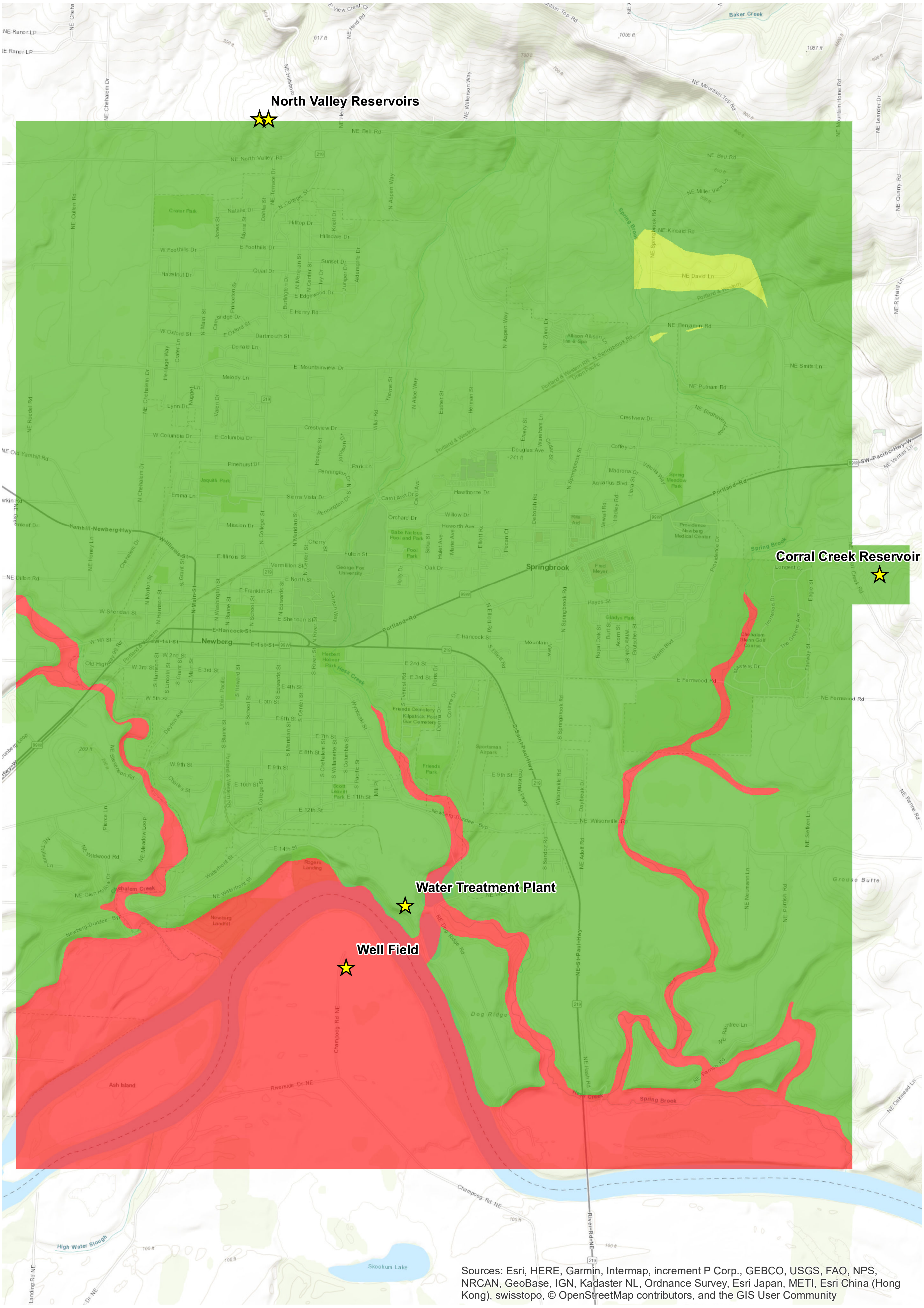
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 9

FIG. 9

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Liquefaction Probability.mxd Date: 9/11/2019 Login: DSJ



LEGEND

Liquefaction Probability (%)

(Proportion of Area Expected to Liquefy)

- 0 - 1
- 1 - 5
- 5 - 10
- 10 - 15

☆ City Properties

0 0.25 0.5 1

Miles

NOTES

1. Probability of liquefaction for magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02 and OGDC-6. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

PROBABILITY OF LIQUEFACTION

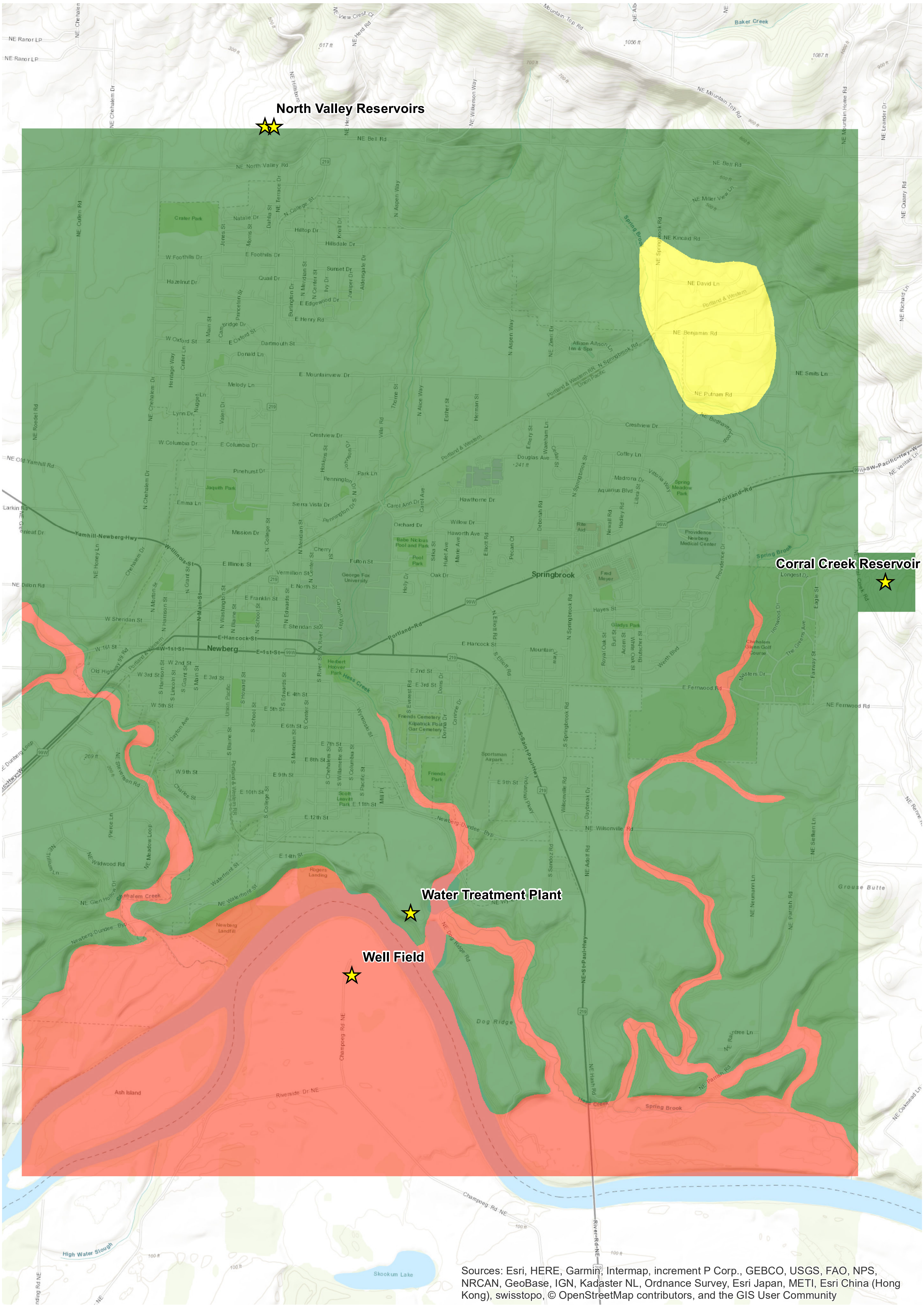
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 10

FIG. 10

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Liquefaction Lateral Spreading.mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

★ City Properties

Liquefaction-Induced Lateral Spreading PGD (in)

- 0 - 0.1
- 0.1 - 2
- 2 - 6
- 6 - 12
- 12 - 24

0 0.25 0.5 1
Miles

NOTES

1. Liquefaction-induced lateral spreading PGD for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6 and FEMA publication Hazus-MH 2.0 Technical Manual. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

LIQUEFACTION-INDUCED LATERAL SPREADING PERMANENT GROUND DEFORMATION, PGD

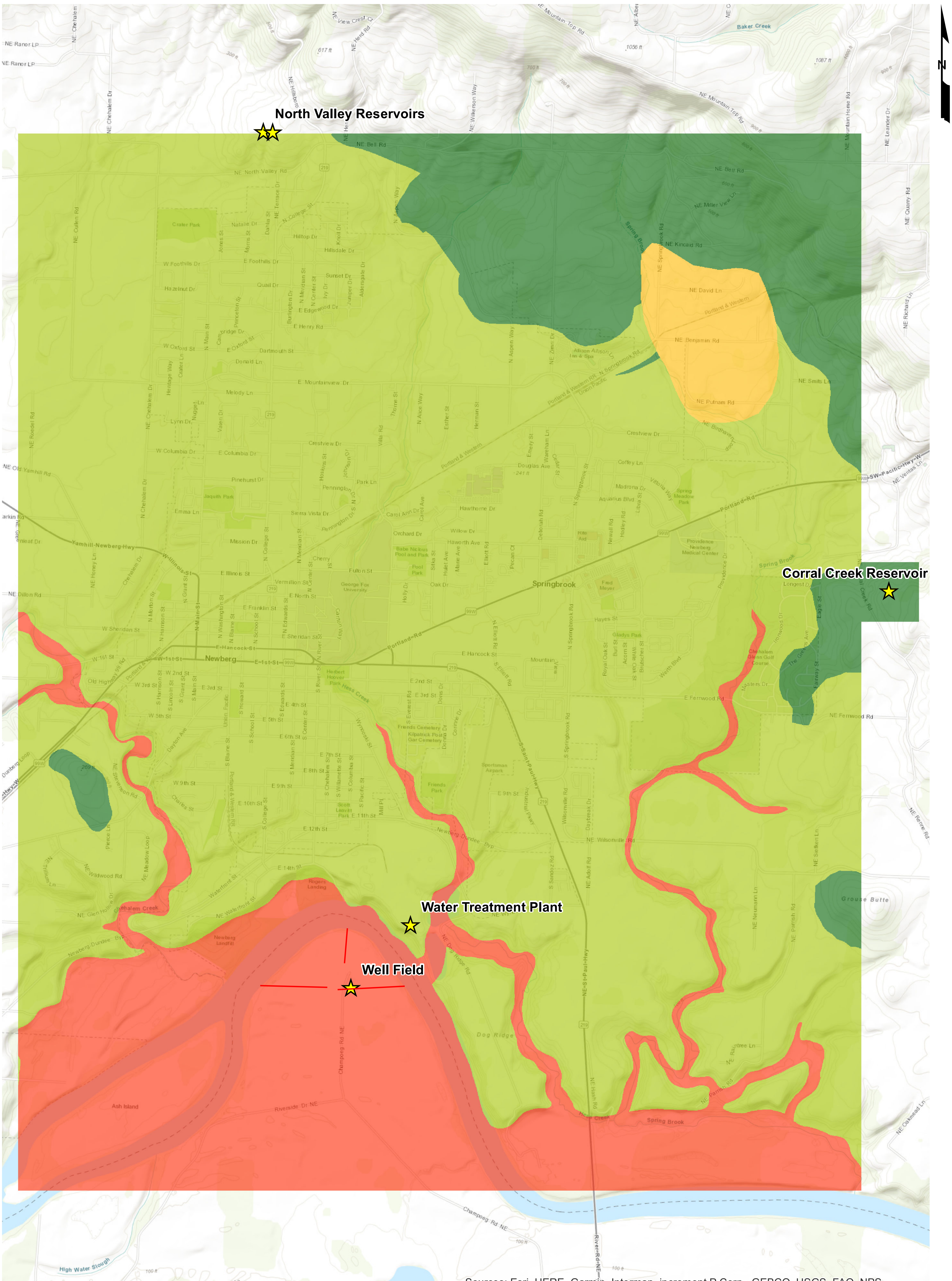
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 11

FIG. 11

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Liquefaction Settlement.mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

☆ City Properties

Liquefaction-Induced Settlement PGD (in)

- 0
- 0.5 - 1.5
- 1.5 - 2
- 2 - 6

0 0.25 0.5 1

Miles

NOTES

1. Liquefaction-induced settlement PGD for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6 and FEMA publication Hazus-MH 2.0 Technical Manual. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

LIQUEFACTION-INDUCED SETTLEMENT PERMANENT GROUND DEFORMATION, PGD

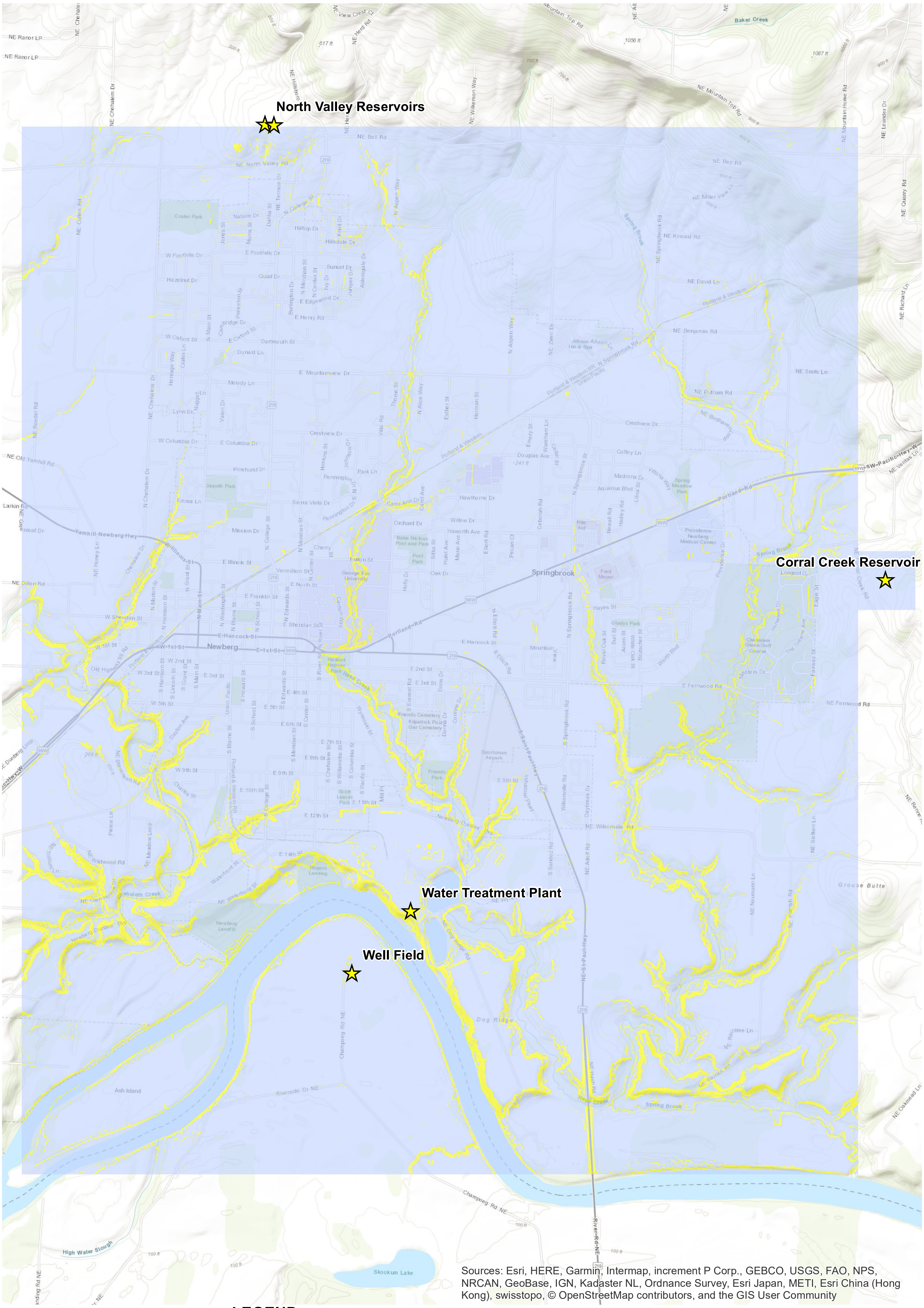
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 12

FIG. 12

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Landslide Probability (Dry).mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

☆ City Properties

Earthquake-Induced Lanslide Probability in Dry Conditions (%)

(Proportion of Area Expected to Fail)

- 0
- 25

0 0.25 0.5 1

Miles

NOTES

1. Earthquake-induced landslide probability for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6, SLIDO-3.4 and LiDAR. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

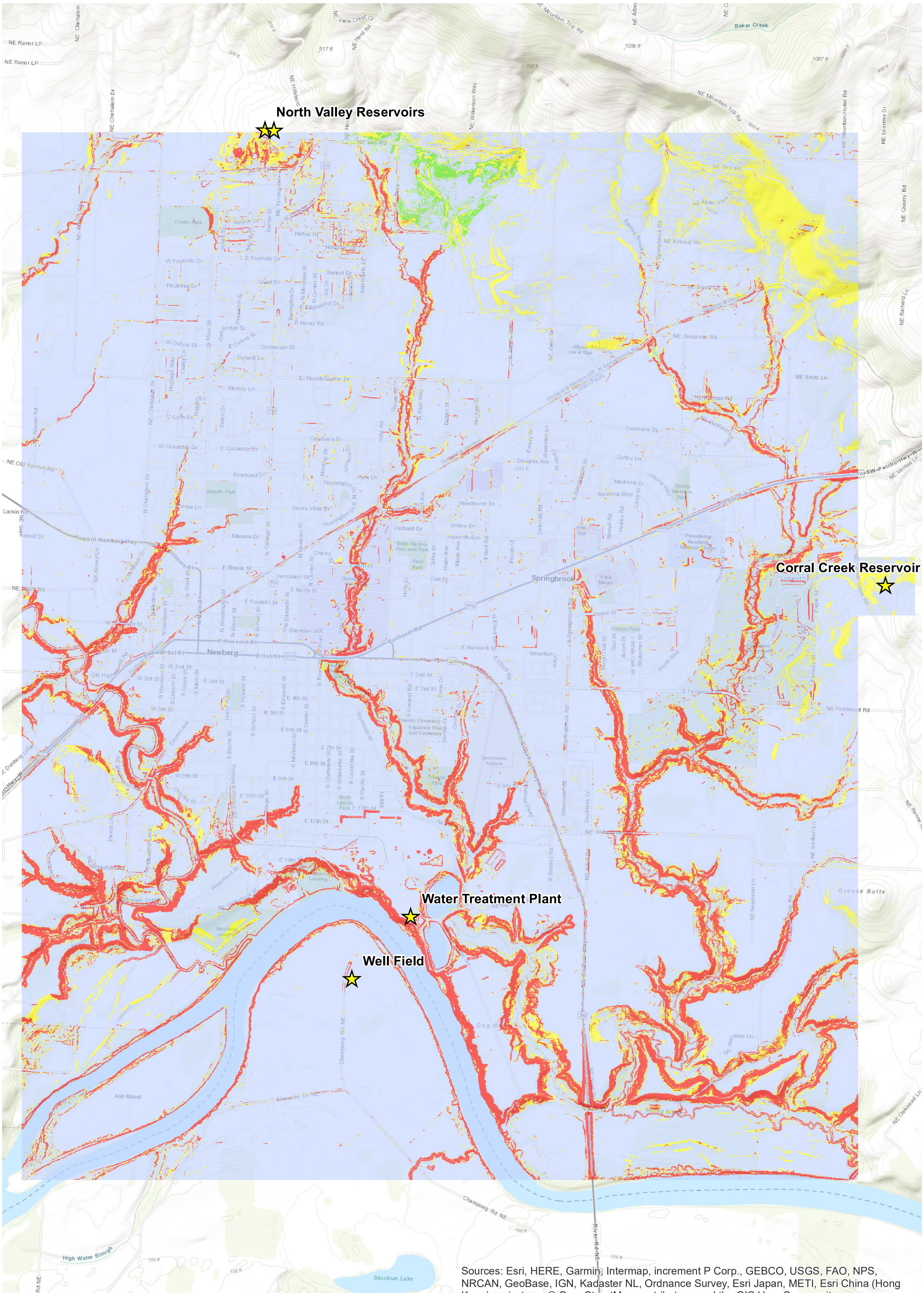
PROBABILITY OF EARTHQUAKE-INDUCED LANDSLIDES (DRY)

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 13

FIG. 13



LEGEND

☆ City Properties

Earthquake-Induced Landslide Probability in Wet Conditions (5)

(Proportion of Area Expected to Fail)

- 0
- 20
- 25
- 30

0 0.25 0.5 1
Miles

NOTES

1. Earthquake-induced landslide probability for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6, SLIDO-3.4 and LiDAR. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

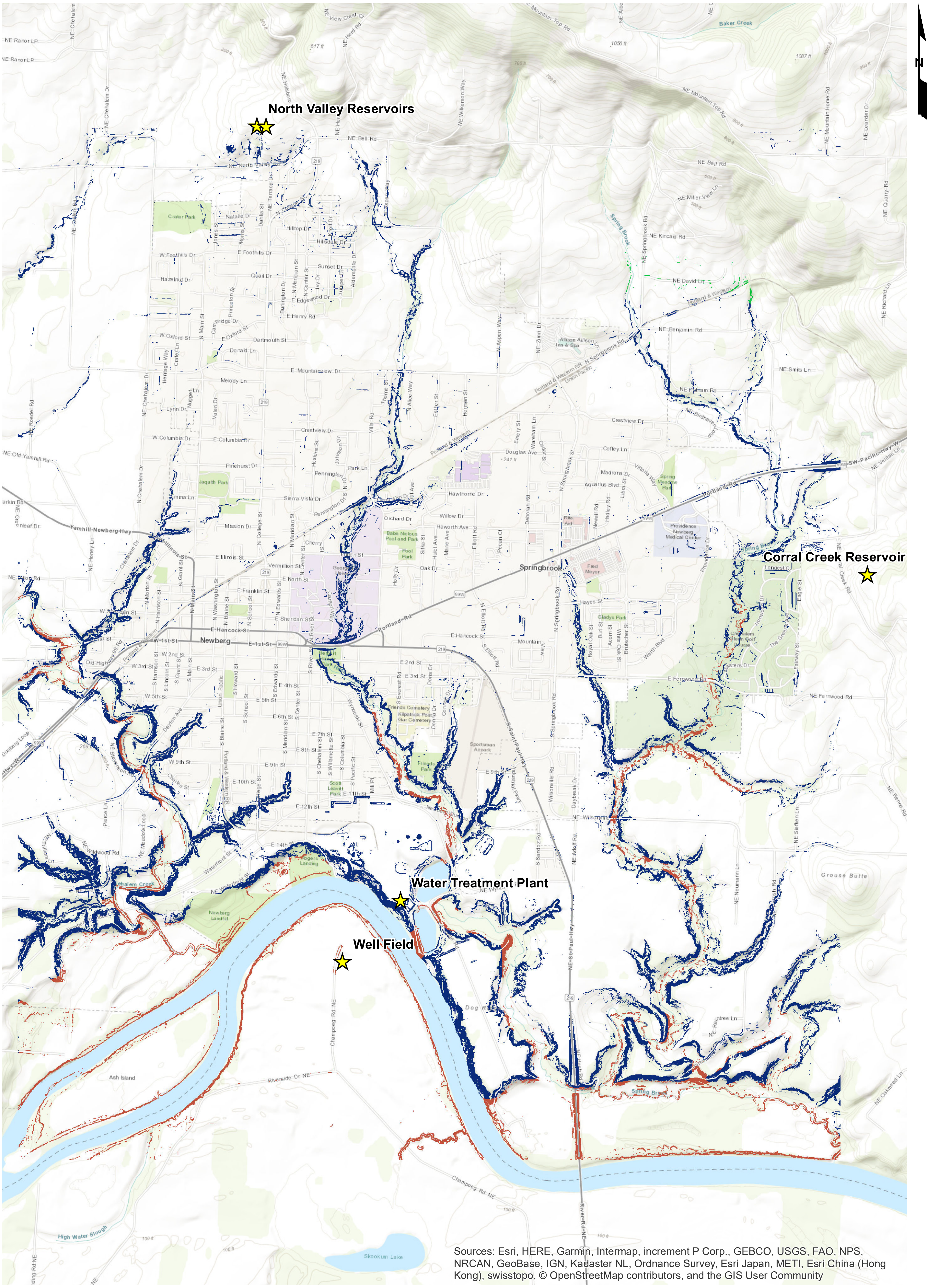
PROBABILITY OF EARTHQUAKE-INDUCED LANDSLIDES (WET)

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 14

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Landslide PGD (Dry).mxd Date: 9/11/2019 Login: DSJ



LEGEND

Earthquake-Induced Landslide PGD (ft)

- Negligible
- < 2
- 2 - 3
- 2 - 4
- 4+

☆ City Properties

0 0.25 0.5 1
Miles

NOTES

1. Earthquake-induced landslide PGD for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6, SLIDO-3.4, and LiDAR. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

EARTHQUAKE-INDUCED LANDSLIDE PERMANENT GROUND DEFORMATION, PGD (DRY)

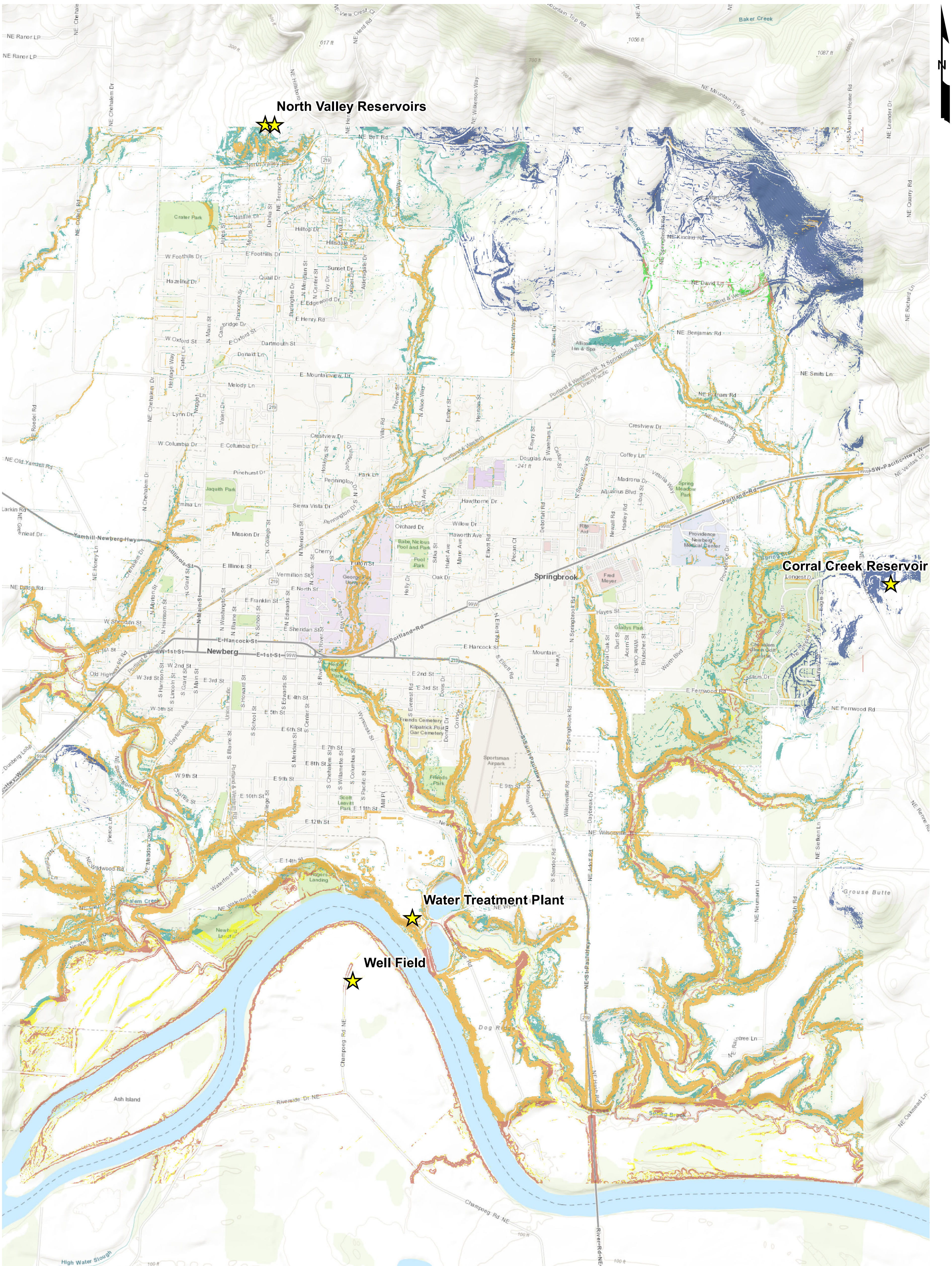
July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 15

FIG. 15

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\11x17 Files\Landslide PGD (Wet).mxd Date: 9/11/2019 Login: DSJ



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

Earthquake-Induced Landslide PGD (ft)
(Wet Conditions)

- Negligible
- < 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- 20+

☆ City Properties

0 0.25 0.5 1
Miles

NOTES

1. Earthquake-induced landslide PGD for the magnitude 9.0 Cascadia Earthquake Scenario calculated from data provided with DOGAMI publications O-12-02, OGDC-6, SLIDO-3.4, and LiDAR. See text for details.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

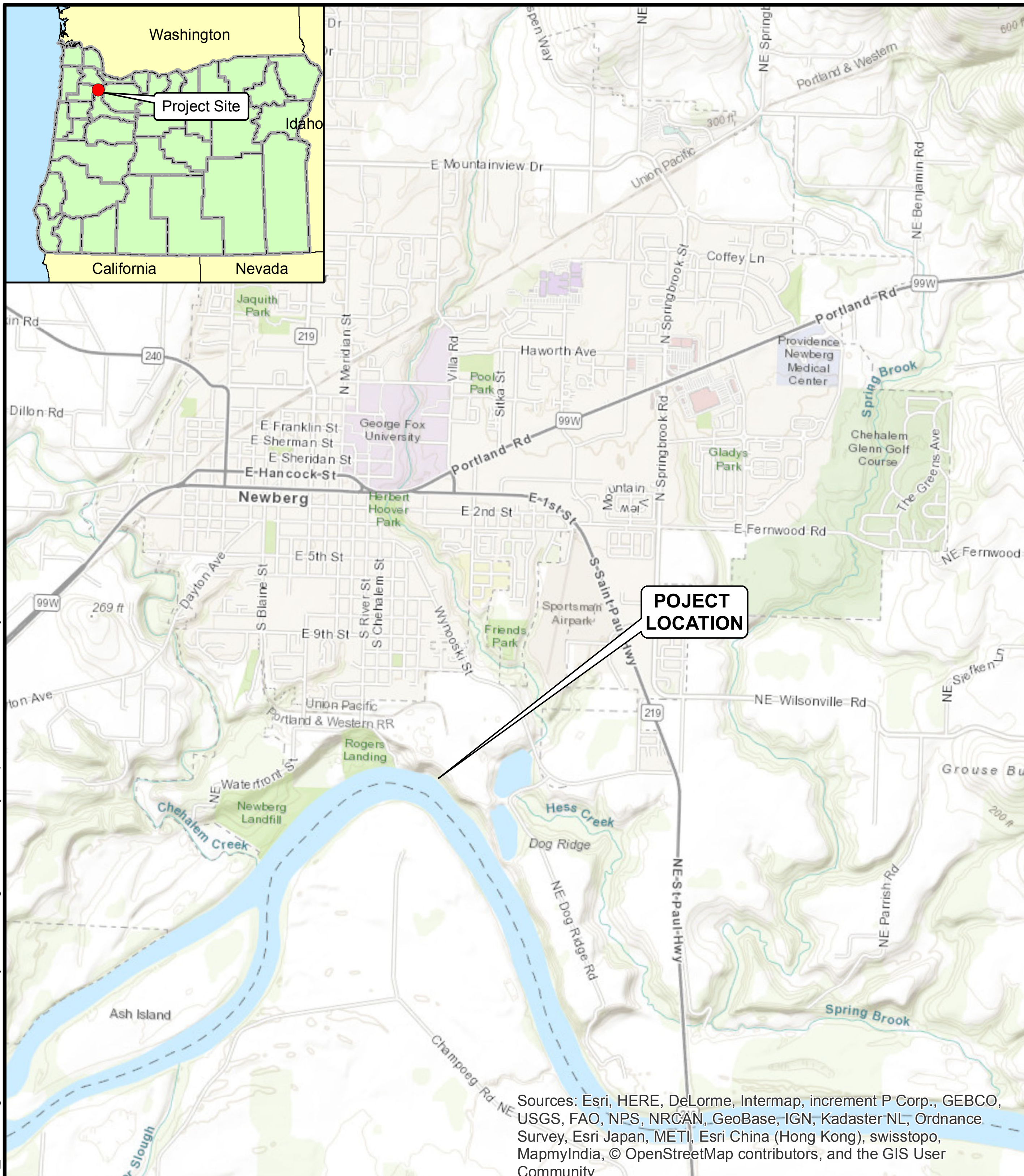
EARTHQUAKE-INDUCED LANDSLIDE PERMANENT GROUND DEFORMATION, PGD (WET)

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 16

FIG. 16



N

0 0.25 0.5 1

Scale in Miles

City of Newberg Water System Resilience
Yamhill County, Oregon

WATER TREATMENT PLANT VICINITY MAP

July 2020 101895

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 17

Path: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\Figure 1 - Vicinity Map.mxd 10/11/2018 kjw

LEGEND

B-1 Designation and Approximate Location of Boring

Approximate Location of Slope Stability Cross Section

0 25 50 100

Scale in Feet

Note: Not shown are the historical explorations for the slope repair performed by Squier Associates in 1999 and the slope evaluation performed by Northwest Geotech, Inc. in 2016

City of Newberg Water System Resilience
Yamhill County, Oregon

WATER TREATMENT PLANT SLOPE SITE AND EXPLORATION PLAN

July 2020 101895

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 18

Filename: T:\Projects\PDX\101000s\101895_Newberg Seismic Resiliency\Avmxd\Figure 18 - Site Plan.mxd Date: 5/7/2019 Login: kjw

APPENDIX A: FIELD EXPLORATIONS

Appendix A
Field Explorations

CONTENTS

Figures

Attachments

APPENDIX A: FIELD EXPLORATIONS

A.1 GENERAL

The field exploration program included two Cone Penetration Tests (CPTs) and two geoprobe explorations. The exploration locations were not surveyed but were referenced to nearby existing structures and should be considered approximate. Approximate CPT locations are shown on the Site and Exploration Plan, Figure 18. The CPTs and geoprobes were completed on May 20, 2019, by Oregon Geotechnical Explorations, Inc. (OGE), of Keizer, Oregon. This appendix describes general exploration methods and presents logs of the materials encountered.

A.1.1 Cone Penetration Testing

OGE pushed CPT-1 and CPT-2 using a track-mounted CPT rig, which uses helical anchors, drilled into the ground, to help the rig to push down with a force greater than its weight. CPT-1 and CPT-2 were advanced to depths of 83 and 68 feet, respectively.

During a CPT, a specialized cone assembly at the end of a steel probe is hydraulically pushed down through the subsurface. The cone assembly contains load cells and associated strain gauges which monitor the deformation of the load cells. One set of load cells deforms with increasing resistance to cone tip penetration. Another set of load cells deforms with increasing frictional resistance encountered on a sleeve on the outside of the assembly. The cone assembly also contains a piezometer which measures pore pressure. Data from the strain gauges and from the piezometer are transmitted from the cone assembly back through extension rods to a CPT recording device via a cable. Analysis software using industry standard calculations then converts the raw data signals from the instruments into cone resistance, sleeve friction, and pore pressure.

Pore pressure is useful in estimating soil behavior type because penetration has varying effects on pore pressure, depending on the type of material being penetrated. Dissipation of pore pressure can also be measured if the cone advance is temporarily halted. Pore pressure dissipation tests were performed at one depth in CPT-1 and can be used to estimate the static groundwater level and to estimate the soil hydraulic conductivity at the test location. Twenty-five shear wave velocity tests were performed in CPT-1.

A.1.2 CPT Logs

All raw CPT data was reduced by OGE into values of cone resistance, sleeve friction, and pore pressure. Shannon & Wilson prepared graphic plots of the reduced data, along with several interpreted engineering parameters. The plots are presented in Figures A1 and A2, and include cone resistance (q_t) in tons per square foot (tsf), sleeve friction (f_s) in tsf, friction ratio (f_s/q_t) expressed as a percentage, pore pressure in tsf, estimated soil behavior type (SBT), undrained shear strength in pounds per square foot (psf), and estimated SPT N-value (N_{60}) in blows per foot (bpf). Plots of the pore pressure dissipation tests, prepared by OGE, are enclosed at the end of this attachment.

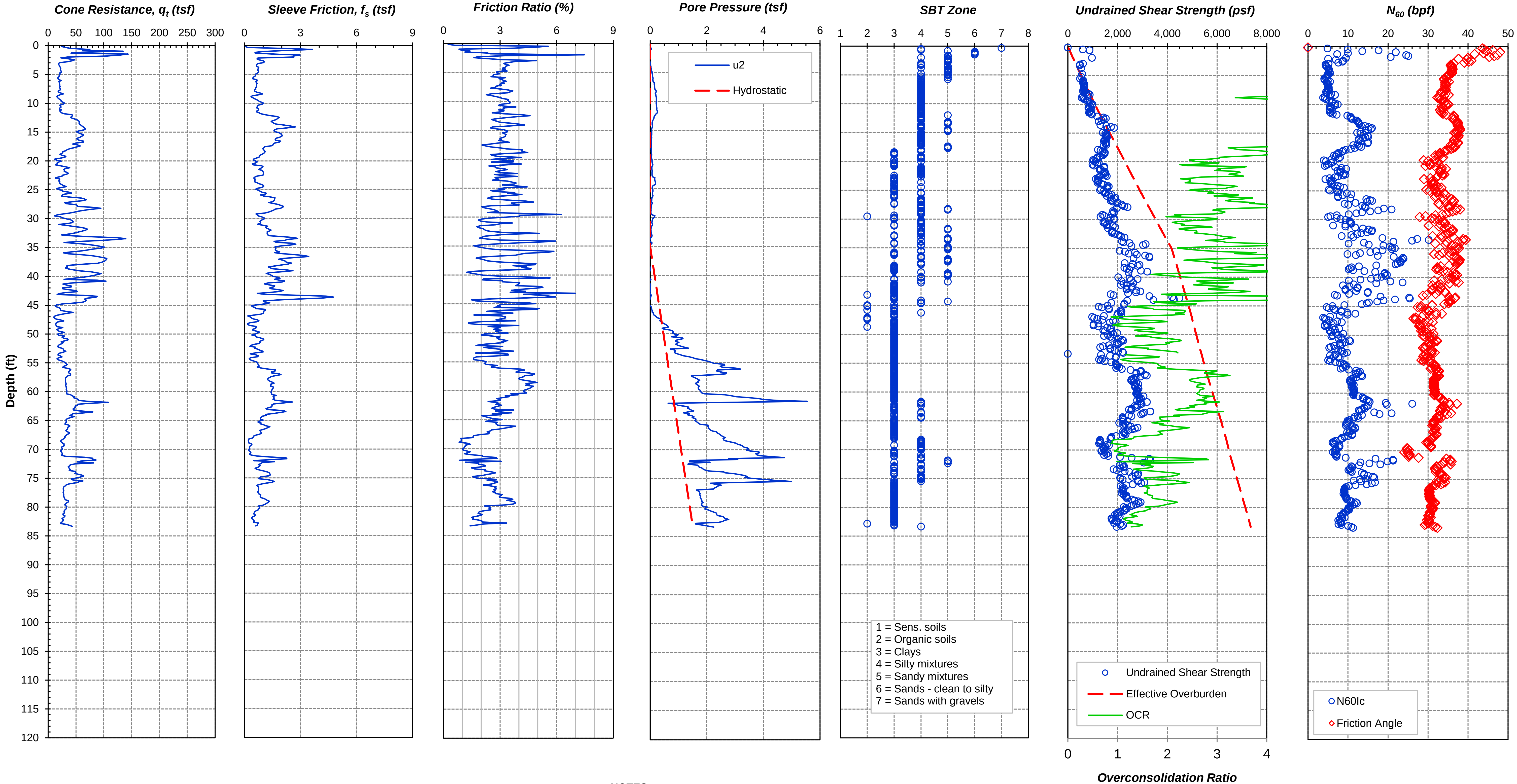
A.1.3 Geoprobe Explorations

Geoprobe explorations P-1 and P-2 were advanced to depths of 68 and 30 feet, respectively. Samples were not able to be recovered from approximately 10 to 40 feet during exploration P-1. Therefore, an additional geoprobe P-2 was performed to obtain samples from the zone that was not recovered from P-1.

The probes were advanced using a track-mounted Geoprobe™ drill rig capable of continuous push probe sampling. Soil sampling was performed using a track-mounted, direct push probe rig equipped with 2.5-inch-outside-diameter casing. Samples were collected by advancing casings lined with 4-foot plastic sleeves using percussive force to remove soils in their path.

A.1.4 Exploration Backfill

All holes were backfilled in accordance with Oregon Department of Ecology regulations. No wells or other instruments were installed in the holes. The holes were backfilled from the bottom up to the existing ground surface using bentonite chips.



NOTES:

1. SBT zone computed using procedure by Jefferies & Been (2006).
2. Undrained shear strength computed using the following equation:

$$s_u = \sigma'_v \left(s_u / \sigma'_v\right)_{NC} OCR^m$$

   where $(s_u/\sigma'_v)_{NC}$ = 0.22 and m = 0.8.

3. Preconsolidation pressure computed using procedure by Mayne and others (2009).
4. N_{60} computed using procedure by Lunne and others (1997).
5. Ground surface elevation apprx. = 170 ft.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

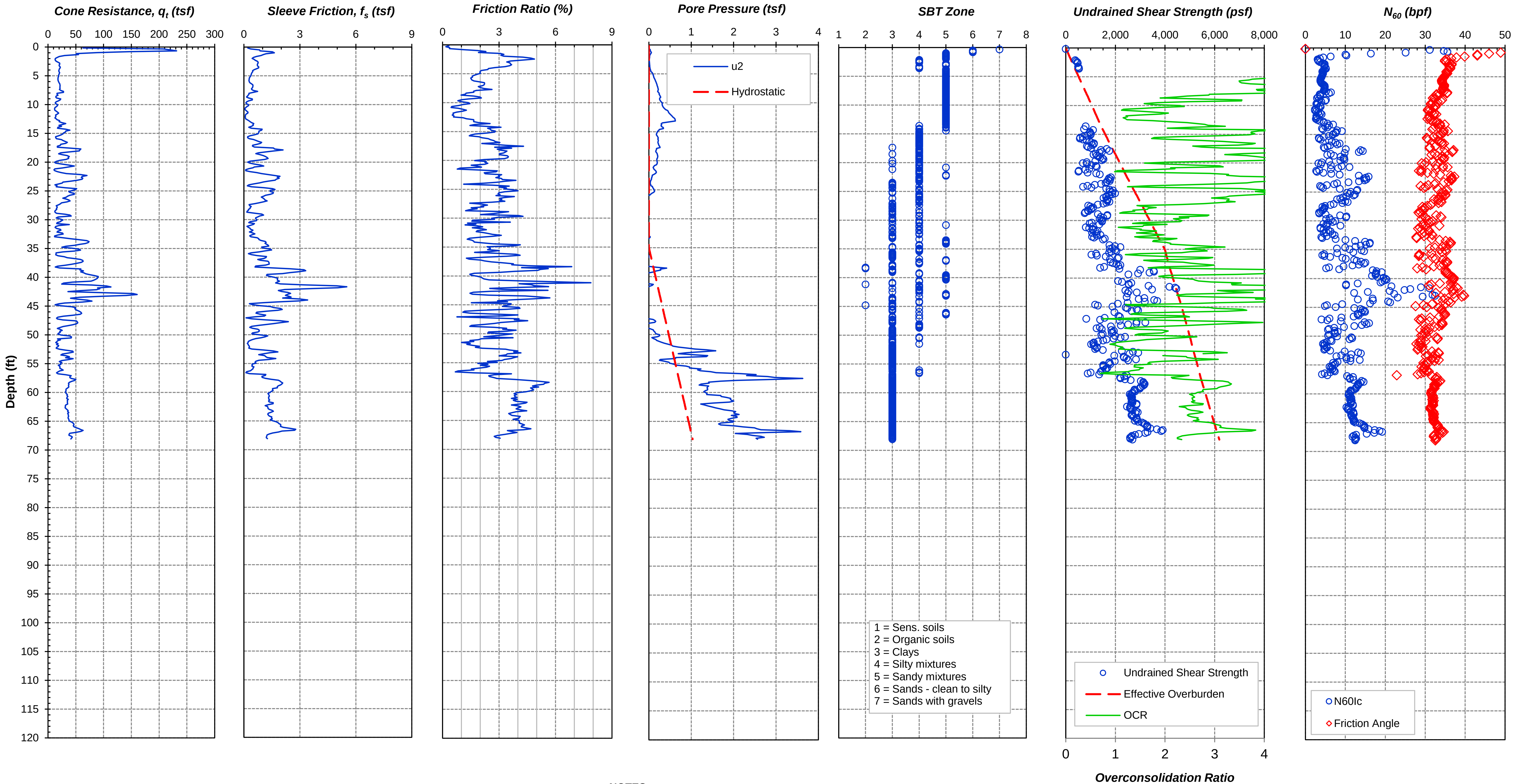
INTERPRETED CPT SOUNDING
CPT-1

July 2020 | 101895

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A1

I:\EF\PDX\101000s\101895 City of Newberg Seismic Resiliency Plan\Deliverables\Seismic Hazards Letter\Draft\Attachment A\CPT-2.xlsx



NOTES:

1. SBT zone computed using procedure by Jefferies & Been (2006).
2. Undrained shear strength computed using the following equation:

$$s_u = \sigma'_v \left(s_u / \sigma'_v\right)_{NC} OCR^m$$

where $(s_u/\sigma'_v)_{NC}$ = 0.22 and m = 0.8.

3. Preconsolidation pressure computed using procedure by Mayne and others (2009).
4. N_{60} computed using procedure by Lunne and others (1997).
5. Ground surface elevation apprx. = 170 ft.

City of Newberg Seismic Resiliency
Yamhill County, Oregon

INTERPRETED CPT SOUNDING
CPT-2

July 2020 101895

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A2

7/10/2019

Total Depth:	68 ft.	Northing:	~	Drilling Method:	Direct Push
Top Elevation:	~	Easting:	~	Drilling Company:	Oregon Geotechnical
Vert. Datum:		Station:	~	Drill Rig Equipment:	Geoprobe 6622 Track Rig
Horiz. Datum:		Offset:	~	Other Comments:	

Hole Diam.:	2.5 in.
Rod Type:	N/A
Hammer Type:	N/A

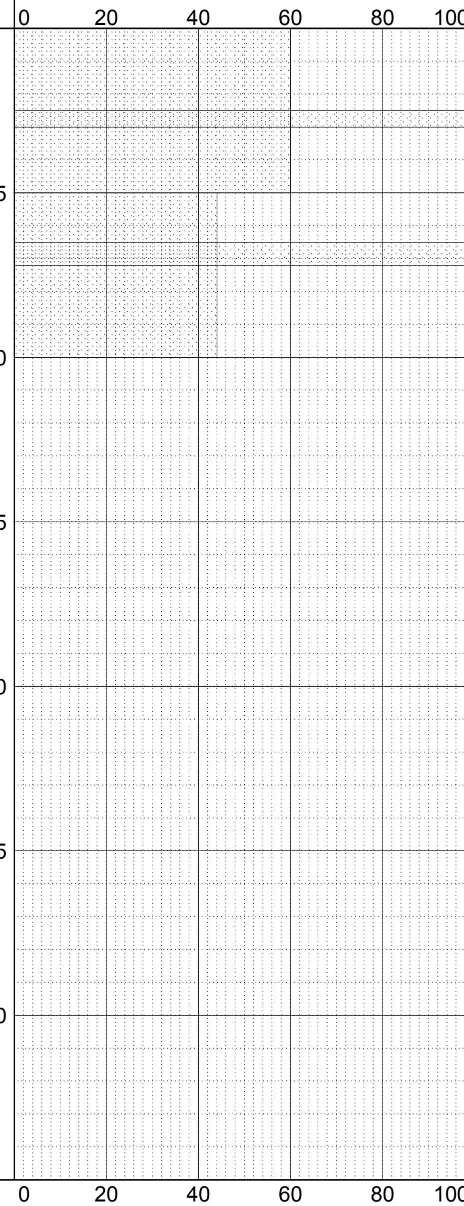
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples
Brown and gray, *Silty Gravel with Sand (GM)*; moist; fine to coarse, subangular to subrounded gravel; fine to coarse sand; nonplastic fines; trace organics and wood debris. **FILL**	1.0	
Red-brown rotten wood encountered from 1.0 to 1.2 feet	1.2	S-1
Dark brown mottled orange-brown, *Silt with Sand (ML)*; moist; fine sand; low plasticity; trace rootlets and organics; disturbed texture.	3.5	S-2
Brown mottled orange-brown, *Silt (ML)*; moist; trace fine sand; low plasticity; micaceous; slight iron oxidation and staining. **FINE-GRAINED MISSOULA FLOOD DEPOSITS**		*
Brown, *Silt with Sand (ML)*; moist; fine sand; nonplastic; micaceous; description based on material encountered in adjacent boring P-2. *Possible rock in probe tip preventing sample recovery, driller indicates it should clear*	18.2	*
Brown, *Sandy Silt (ML)*; moist; fine sand; nonplastic; micaceous; description based on material encountered in adjacent boring P-2.	24.5	*
Brown, *Silty Sand (SM)*; moist; fine sand; nonplastic fines; micaceous; occasional zones of slight iron oxidation with red-brown mottling; description based on material encountered in adjacent boring P-2.	28.0	*

Symbol | Samples | Ground Water | Depth, ft.

PENETRATION RESISTANCE, N (blows/ft.)
▲ Hammer Wt. & Drop: 140 lbs / 30 inches



CONTINUED NEXT SHEET

LEGEND

- * Sample Not Recovered
- 1" Plastic Sheath
- Grab Sample

Recovery (%)

● % Water Content

Plastic Limit ├──┤ Liquid Limit

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

City of Newberg Seismic Resiliency Plan
Newberg, Oregon

LOG OF BORING P-1

June 2020 101895

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A3
Sheet 1 of 2

REV 2

Total Depth: 68 ft.	Northing: ~	Drilling Method:	Direct Push	Hole Diam.:	2.5 in.
Top Elevation: ~	Easting: ~	Drilling Company:	Oregon Geotechnical	Rod Type:	N/A
Vert. Datum:	Station: ~	Drill Rig Equipment:	Geoprobe 6622 Track Rig	Hammer Type:	N/A
Horiz. Datum:	Offset: ~	Other Comments:			

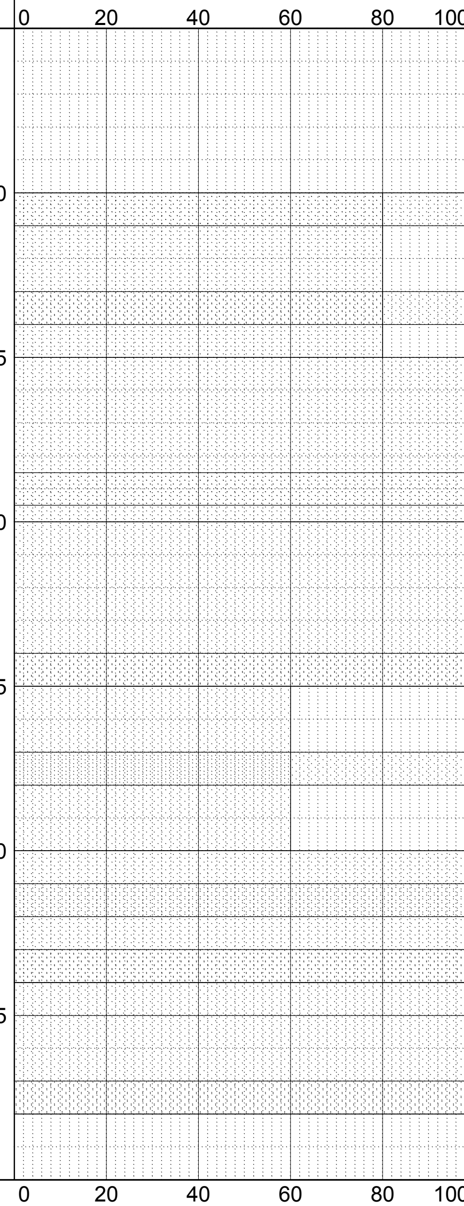
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

SOIL DESCRIPTION	Elev. Depth (ft.)	Samples	Depth, ft.
Gray, *Silty Sand (SM)*; moist to wet; fine sand; nonplastic fines; trace wood fragments and wood debris; micaceous. *Driller to pull rods to clear obstruction in probe tip* **FINE-GRAINED MISSOULA FLOOD DEPOSITS**	35.0	* ; S-3	40
Gray, *Silt (ML)*; wet; trace fine sand; nonplastic to low plasticity; micaceous; stratified with trace to few interbeds of *Silty Sand (SM)* and low to medium plasticity *Silt (ML)*. *Silty Sand (SM)* interbed from 46 to 46.5 feet	42.0	S-4 ; S-5	45 ; 50
Gray, *Lean Clay (CL)*; moist to wet; trace fine sand; medium plasticity; micaceous.	53.0	S-6	55
Gray, *Fat Clay (CH)*; moist; trace fine sand; high plasticity.	56.5	S-7	60
Green-gray mottled orange-brown, *Fat Clay (CH)*; moist; trace fine sand; high plasticity; stratified with few interbeds of relict, decomposed, fine to coarse sand; few hard, fine to coarse sand-sized iron oxide deposits; slight to moderate iron oxidation and staining. **HILLSBORO FORMATION**	60.0	S-8 ; S-9 ; S-10	65
Completed: May 20, 2019	68.0		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



● % Water Content

Plastic Limit ├──┤ Liquid Limit

LEGEND

* Sample Not Recovered

1" Plastic Sheath

Grab Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

City of Newberg Seismic Resiliency Plan
Newberg, Oregon

LOG OF BORING P-1

June 2020 101895

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A3
Sheet 2 of 2

REV 2

Total Depth: 30 ft.	Northing: ~	Drilling Method:	Direct Push	Hole Diam.:	2.5 in.
Top Elevation: ~	Easting: ~	Drilling Company:	Oregon Geotechnical	Rod Type:	N/A
Vert. Datum:	Station: ~	Drill Rig Equipment:	Geoprobe 6622 Track Rig	Hammer Type:	N/A
Horiz. Datum:	Offset: ~	Other Comments:			

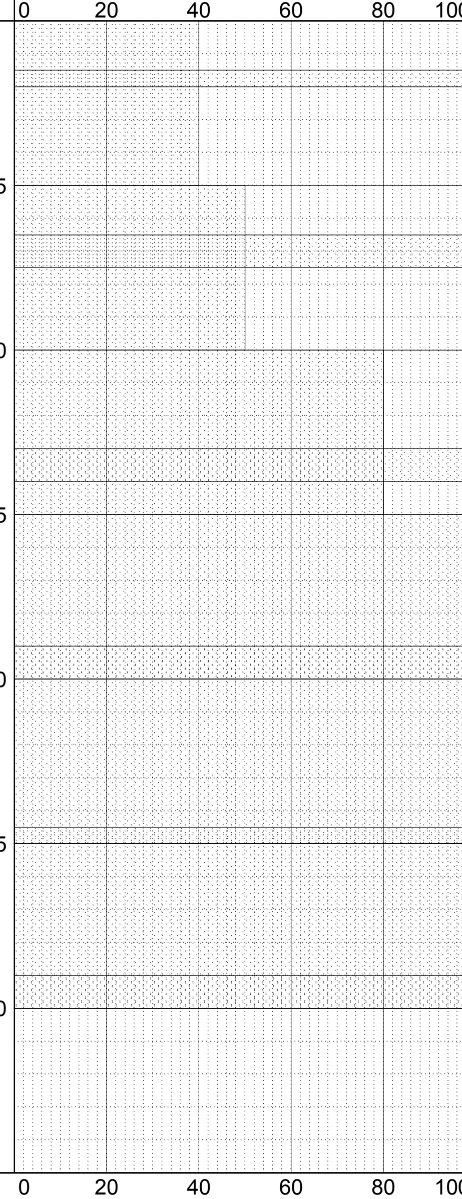
SOIL DESCRIPTION

Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines indicated below represent the approximate boundaries between soil types, and the transitions may be gradual.

Soil Description	Elev. Depth (ft.)	Samples	Depth, ft.
Dark brown, *Silty Gravel with Sand (GM)*; moist; fine to coarse, angular to subangular gravel; fine to coarse sand; nonplastic to low plasticity fines; trace organics and wood debris. **FILL**	1.5	S-1	
	3.5		5
Brown mottled orange-brown, *Silt with Sand (ML)*; moist; fine sand; nonplastic; trace roots; micaceous; disturbed texture.		S-2	
Brown and tan-brown mottled orange-brown, *Silt (ML)*; moist; trace fine sand; nonplastic; trace fine organics; micaceous; stratified with trace to few interbeds of *Sandy Silt (ML)*; slight iron oxidation and staining. **FINE-GRAINED MISSOULA FLOOD DEPOSITS**		S-3	10, 15
Brown, *Silt with Sand (ML)*; moist; fine sand; nonplastic; micaceous.	18.2	S-4	20
Brown, *Sandy Silt (ML)*; moist; fine sand; nonplastic; micaceous.	24.5	S-5	25
Brown, *Silty Sand (SM)*; moist; fine sand; nonplastic fines; micaceous; occasional zones of slight iron oxidation with red-brown mottling.	28.0	S-6	30
Completed: May 20, 2019	30.0		

PENETRATION RESISTANCE, N (blows/ft.)

▲ Hammer Wt. & Drop: 140 lbs / 30 inches



● % Water Content

Plastic Limit ⊢—⊣ Liquid Limit

LEGEND

2" Plastic Sheath

Grab Sample

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations, and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. Group symbol is based on visual-manual identification and selected lab testing.
4. The hole location and elevation should be considered approximate.

City of Newberg Seismic Resiliency Plan
Newberg, Oregon

LOG OF BORING P-2

June 2020 101895

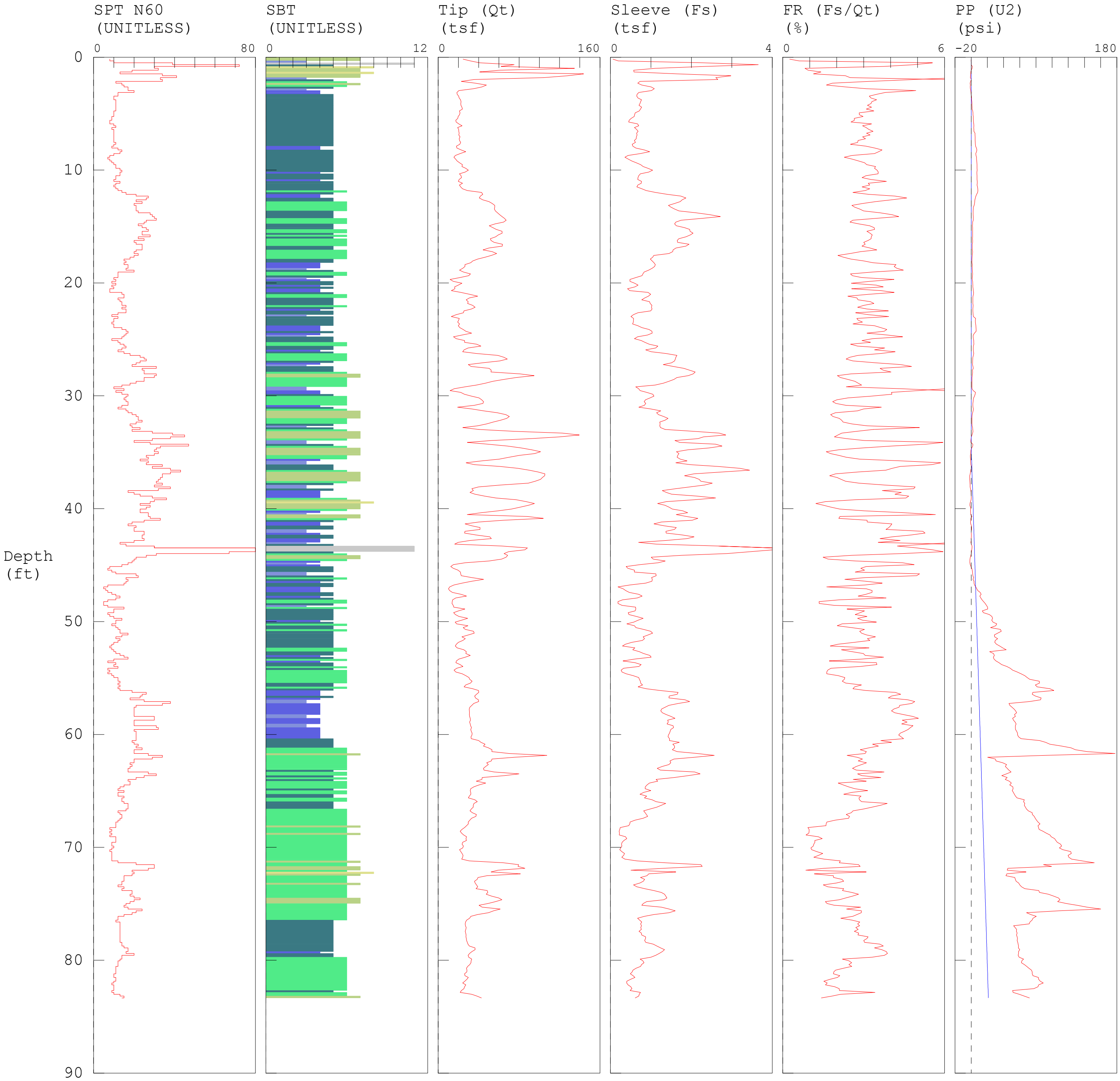
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A4

REV 2

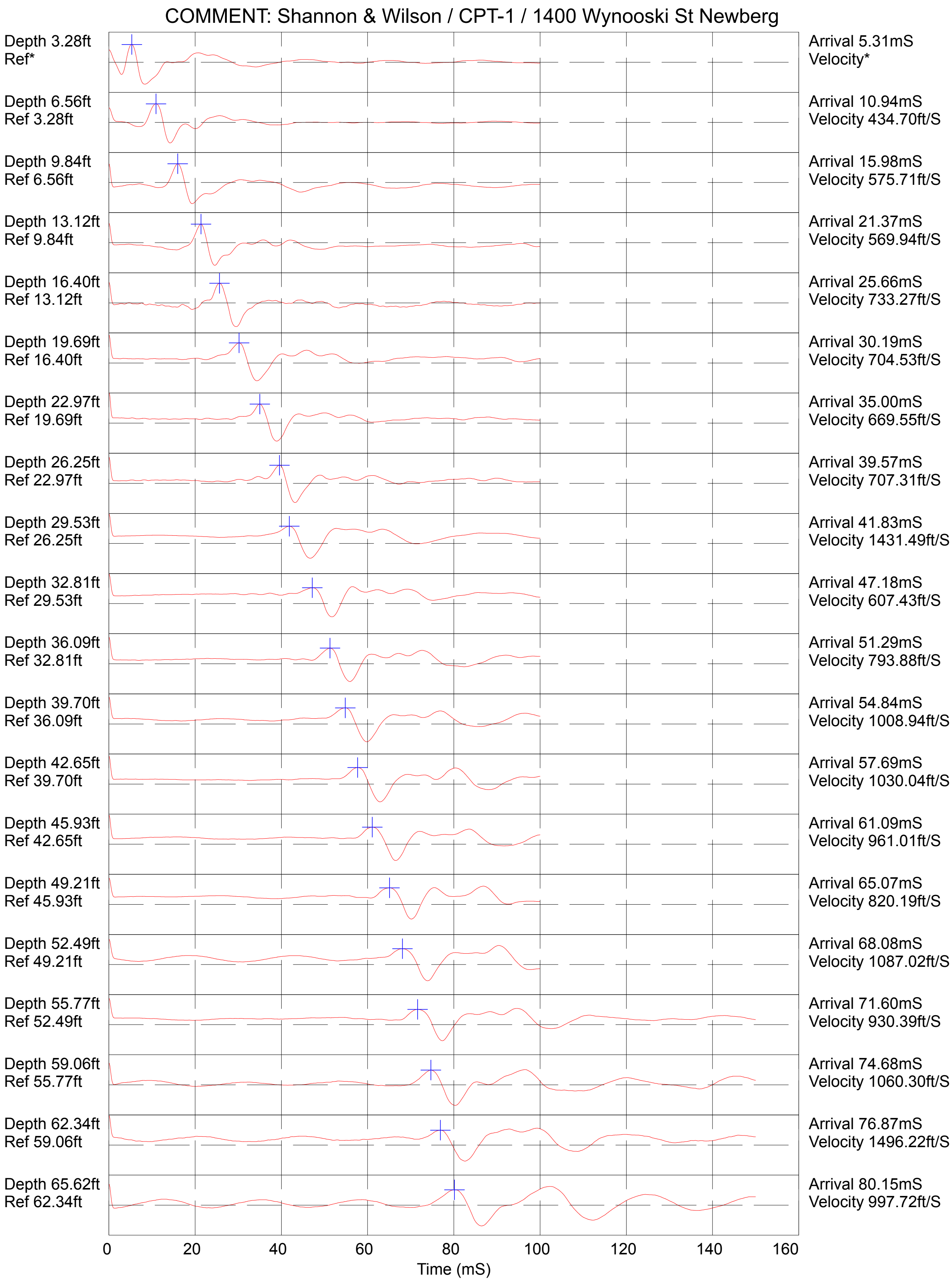
Shannon & Wilson / CPT-1 / 1400 Wynooski St Newberg

OPERATOR: OGE DMM
CONE ID: DDG1415
HOLE NUMBER: CPT-1
TEST DATE: 5/20/2019 8:53:04 AM
TOTAL DEPTH: 83.333 ft



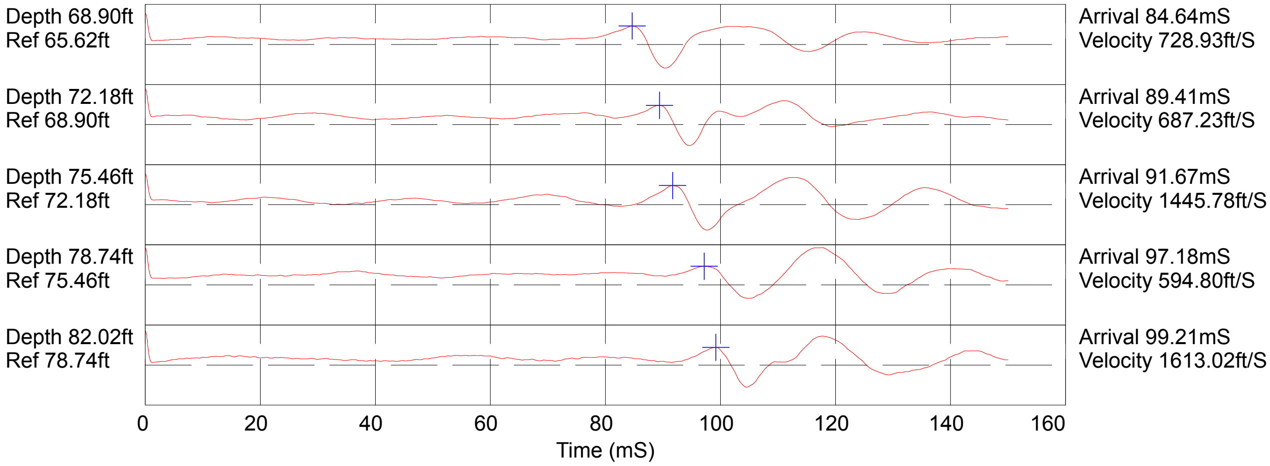
1	sensitive fine grained	4	silty clay to clay	7	silty sand to sandy silt	10	gravelly sand to sand
2	organic material	5	clayey silt to silty clay	8	sand to silty sand	11	very stiff fine grained (*)
3	clay	6	sandy silt to clayey silt	9	sand	12	sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983



Hammer to Rod String Distance (ft): 4.27
* = Not Determined

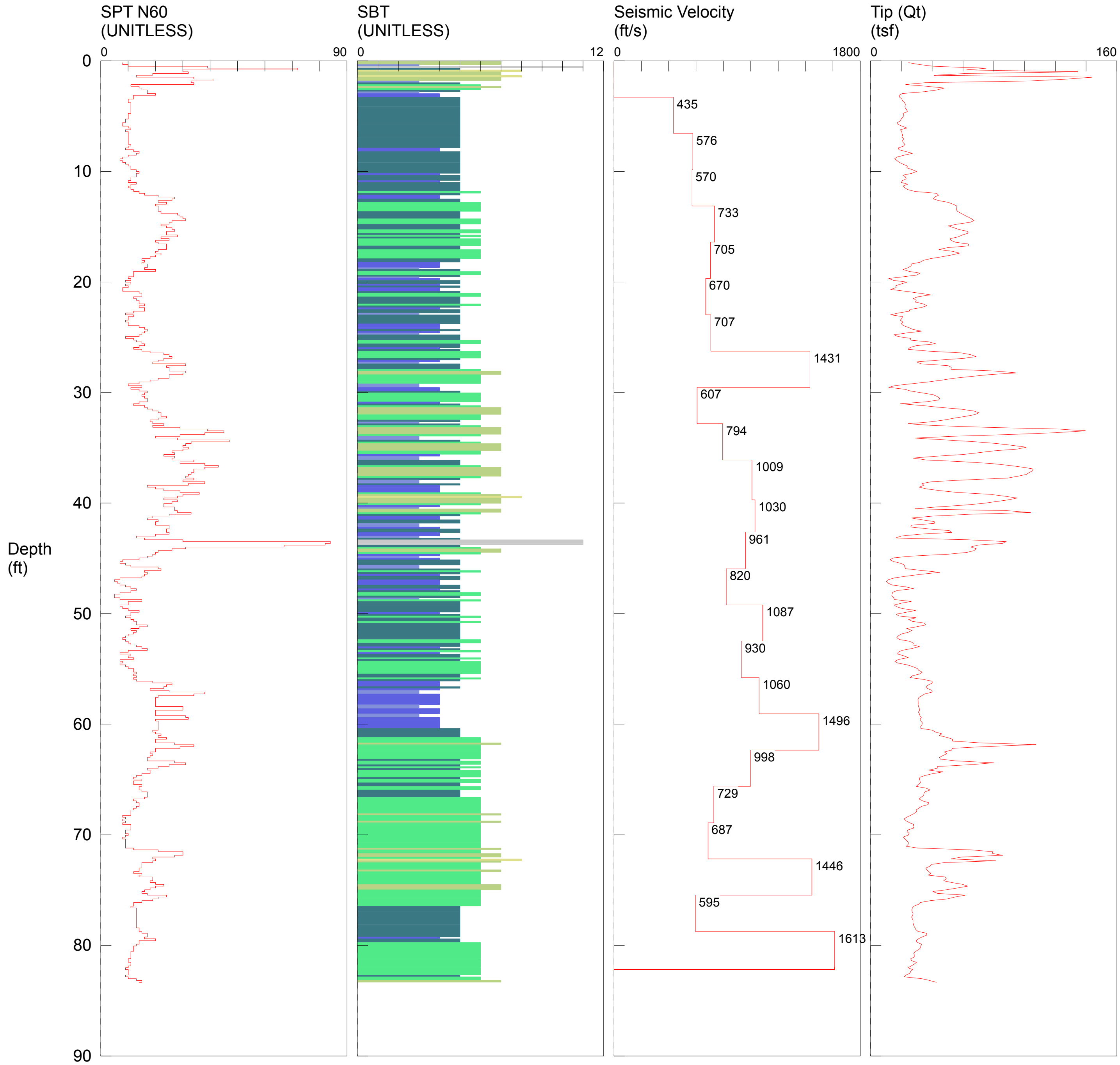
COMMENT: Shannon & Wilson / CPT-1 / 1400 Wynooski St Newberg



Hammer to Rod String Distance (ft): 4.27
* = Not Determined

Shannon & Wilson / CPT-1 / 1400 Wynooski St Newberg

OPERATOR: OGE DMM
CONE ID: DDG1415
HOLE NUMBER: CPT-1
TEST DATE: 5/20/2019 8:53:04 AM
TOTAL DEPTH: 83.333 ft

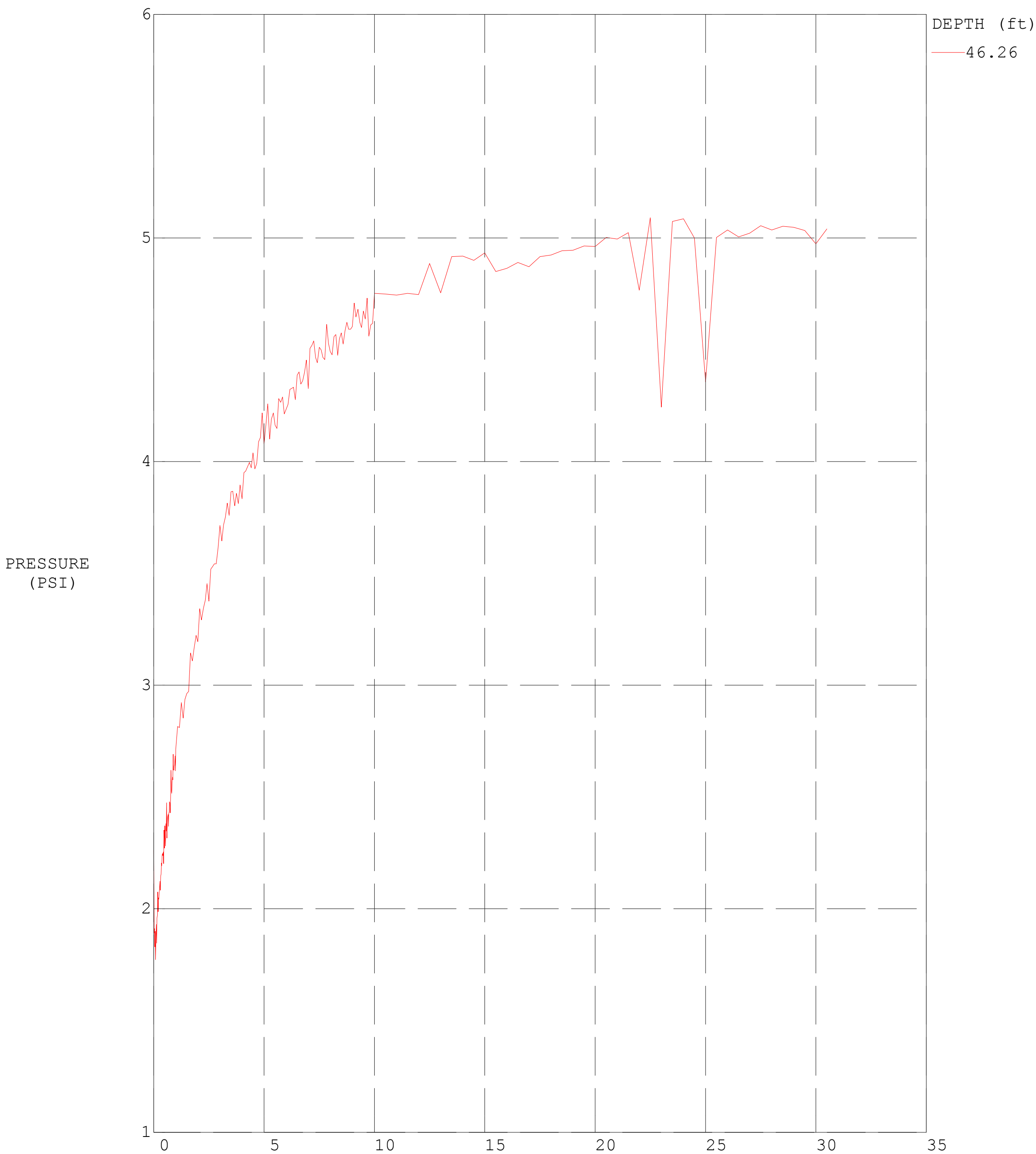


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: Shannon & Wilson / CPT-1 / 1400 Wynooski St Newberg

TEST DATE: 5/20/2019 8:53:04 AM



MAXIMUM PRESSURE = 5.091 (PSI)IME: (MINUTES)

HYDROSTATIC PRESSURE = 5.153 (PSI), WATER TABLE: 34.37 ft

Shannon & Wilson / CPT-1 / 1400 Wynooski St Newberg

OPERATOR: OGE DMM
CONE ID: DDG1415
HOLE NUMBER: CPT-1
TEST DATE: 5/20/2019 8:53:04 AM
TOTAL DEPTH: 83.333 ft

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
0.164	24.60	0.0622	0.253	-0.062	8	7	silty sand to sandy silt
0.328	31.82	0.1930	0.607	-0.227	10	7	silty sand to sandy silt
0.492	41.08	2.2819	5.554	0.041	39	3	clay
0.656	75.02	3.6534	4.870	-0.017	72	11	very stiff fine grained (*)
0.820	62.25	2.3299	3.743	1.319	30	5	clayey silt to silty clay
0.984	134.71	1.1113	0.825	1.109	32	8	sand to silty sand
1.148	61.01	0.5736	0.940	-0.083	19	7	silty sand to sandy silt
1.312	41.08	0.5810	1.414	-0.513	13	7	silty sand to sandy silt
1.476	143.70	1.6389	1.140	-0.766	34	8	sand to silty sand
1.640	128.15	2.9762	2.322	-0.907	41	7	silty sand to sandy silt
1.804	104.20	2.6030	2.498	-1.076	33	7	silty sand to sandy silt
1.969	35.50	2.6523	7.471	0.172	34	3	clay
2.133	22.80	0.7309	3.206	-0.864	11	5	clayey silt to silty clay
2.297	36.56	0.6723	1.839	-1.295	14	6	sandy silt to clayey silt
2.461	47.71	0.7708	1.615	-1.033	15	7	silty sand to sandy silt
2.625	43.23	1.0040	2.322	-1.279	17	6	sandy silt to clayey silt
2.789	35.10	1.0828	3.085	-1.143	17	5	clayey silt to silty clay
2.953	20.56	1.0142	4.933	-0.678	20	3	clay
3.117	18.45	0.7020	3.805	-0.370	12	4	silty clay to clay
3.281	18.81	0.6579	3.498	-0.229	12	4	silty clay to clay
3.445	20.24	0.6489	3.206	0.303	10	5	clayey silt to silty clay
3.609	20.72	0.6783	3.273	0.444	10	5	clayey silt to silty clay
3.773	22.04	0.7664	3.477	0.520	11	5	clayey silt to silty clay
3.937	22.58	0.7460	3.304	0.768	11	5	clayey silt to silty clay
4.101	22.23	0.7273	3.271	0.844	11	5	clayey silt to silty clay
4.265	22.46	0.7055	3.141	1.011	11	5	clayey silt to silty clay
4.429	23.39	0.7696	3.290	1.090	11	5	clayey silt to silty clay
4.593	23.91	0.7414	3.100	1.176	11	5	clayey silt to silty clay
4.757	20.97	0.7089	3.381	1.939	10	5	clayey silt to silty clay
4.921	21.57	0.6108	2.832	2.142	10	5	clayey silt to silty clay
5.085	20.99	0.5954	2.836	2.090	10	5	clayey silt to silty clay
5.249	19.68	0.5855	2.976	2.374	9	5	clayey silt to silty clay
5.413	19.40	0.5142	2.650	2.502	9	5	clayey silt to silty clay
5.577	17.34	0.4606	2.656	2.634	8	5	clayey silt to silty clay
5.741	17.74	0.4483	2.528	2.846	8	5	clayey silt to silty clay
5.906	20.34	0.6701	3.294	3.120	10	5	clayey silt to silty clay
6.070	23.53	0.6957	2.957	3.178	11	5	clayey silt to silty clay
6.234	19.24	0.5943	3.089	2.996	9	5	clayey silt to silty clay
6.398	20.20	0.6450	3.193	3.204	10	5	clayey silt to silty clay
6.562	20.36	0.6811	3.345	3.342	10	5	clayey silt to silty clay
6.726	20.76	0.6454	3.108	4.635	10	5	clayey silt to silty clay
6.890	20.32	0.6577	3.237	4.564	10	5	clayey silt to silty clay
7.054	21.59	0.6393	2.961	4.735	10	5	clayey silt to silty clay
7.218	20.71	0.6350	3.067	4.840	10	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
7.382	21.13	0.5897	2.791	4.921	10	5	clayey silt to silty clay
7.546	22.20	0.6171	2.780	5.041	11	5	clayey silt to silty clay
7.710	21.38	0.5368	2.511	5.189	10	5	clayey silt to silty clay
7.874	17.92	0.5527	3.084	5.403	9	5	clayey silt to silty clay
8.038	18.40	0.6279	3.412	6.429	12	4	silty clay to clay
8.202	22.65	0.8339	3.681	6.913	14	4	silty clay to clay
8.366	27.18	0.9667	3.557	6.599	13	5	clayey silt to silty clay
8.530	21.65	0.7373	3.406	5.666	10	5	clayey silt to silty clay
8.694	16.97	0.4347	2.562	5.911	8	5	clayey silt to silty clay
8.858	15.55	0.3548	2.282	6.508	7	5	clayey silt to silty clay
9.022	17.16	0.4414	2.573	6.508	8	5	clayey silt to silty clay
9.186	18.81	0.5287	2.812	6.823	9	5	clayey silt to silty clay
9.350	21.02	0.6379	3.035	7.002	10	5	clayey silt to silty clay
9.514	23.89	0.7437	3.113	7.009	11	5	clayey silt to silty clay
9.678	23.44	0.8060	3.439	7.042	11	5	clayey silt to silty clay
9.843	27.18	0.9241	3.400	7.040	13	5	clayey silt to silty clay
10.007	29.74	1.0398	3.496	7.307	14	5	clayey silt to silty clay
10.171	26.71	0.9453	3.539	6.880	13	5	clayey silt to silty clay
10.335	20.89	0.7377	3.532	6.885	13	4	silty clay to clay
10.499	22.61	0.6975	3.085	7.052	11	5	clayey silt to silty clay
10.663	23.06	0.6785	2.942	7.033	11	5	clayey silt to silty clay
10.827	20.70	0.6746	3.259	7.135	10	5	clayey silt to silty clay
10.991	19.94	0.7672	3.848	7.474	13	4	silty clay to clay
11.155	24.02	0.7609	3.168	7.493	11	5	clayey silt to silty clay
11.319	20.98	0.6767	3.226	7.190	10	5	clayey silt to silty clay
11.483	22.16	0.6516	2.940	7.727	11	5	clayey silt to silty clay
11.647	24.04	0.7749	3.224	8.113	12	5	clayey silt to silty clay
11.811	28.76	0.8801	3.060	8.242	14	5	clayey silt to silty clay
11.975	42.82	1.1127	2.598	7.970	16	6	sandy silt to clayey silt
12.139	44.11	1.4028	3.180	6.737	21	5	clayey silt to silty clay
12.303	41.80	1.7399	4.163	5.725	27	4	silty clay to clay
12.467	40.59	1.8652	4.596	5.103	26	4	silty clay to clay
12.631	44.08	1.7726	4.021	4.514	21	5	clayey silt to silty clay
12.795	50.15	1.7265	3.443	4.335	24	5	clayey silt to silty clay
12.959	53.51	1.5832	2.958	4.060	20	6	sandy silt to clayey silt
13.123	55.95	1.4325	2.560	3.631	21	6	sandy silt to clayey silt
13.287	56.01	1.4940	2.668	2.643	21	6	sandy silt to clayey silt
13.451	55.56	1.5843	2.851	2.467	21	6	sandy silt to clayey silt
13.615	56.44	1.6915	2.997	2.331	22	6	sandy silt to clayey silt
13.780	58.70	2.1163	3.605	2.307	28	5	clayey silt to silty clay
13.944	60.71	2.4573	4.048	2.247	29	5	clayey silt to silty clay
14.108	63.16	2.7152	4.299	2.538	30	5	clayey silt to silty clay
14.272	65.49	2.2713	3.468	2.586	31	5	clayey silt to silty clay
14.436	67.25	1.7454	2.595	2.450	26	6	sandy silt to clayey silt
14.600	64.66	1.6142	2.497	1.823	25	6	sandy silt to clayey silt
14.764	56.27	1.5834	2.814	1.699	22	6	sandy silt to clayey silt
14.928	50.51	1.6273	3.222	1.443	24	5	clayey silt to silty clay
15.092	53.95	1.8281	3.388	1.691	26	5	clayey silt to silty clay
15.256	57.40	1.9561	3.408	1.694	27	5	clayey silt to silty clay
15.420	63.06	1.9666	3.118	1.761	24	6	sandy silt to clayey silt
15.584	63.17	2.0417	3.232	1.656	24	6	sandy silt to clayey silt
15.748	59.42	1.9729	3.320	1.694	28	5	clayey silt to silty clay
15.912	56.78	1.8623	3.280	1.629	22	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
16.076	51.58	1.6901	3.277	1.522	25	5	clayey silt to silty clay
16.240	52.19	1.6505	3.163	1.653	20	6	sandy silt to clayey silt
16.404	55.21	1.6575	3.002	1.622	21	6	sandy silt to clayey silt
16.568	63.47	1.9421	3.060	1.226	24	6	sandy silt to clayey silt
16.732	63.41	1.8617	2.936	1.272	24	6	sandy silt to clayey silt
16.896	50.04	1.6180	3.233	1.293	24	5	clayey silt to silty clay
17.060	44.34	1.5462	3.487	1.338	21	5	clayey silt to silty clay
17.224	53.33	1.5380	2.884	1.572	20	6	sandy silt to clayey silt
17.388	57.76	1.4418	2.496	1.462	22	6	sandy silt to clayey silt
17.552	52.51	1.0729	2.043	1.291	20	6	sandy silt to clayey silt
17.717	46.38	1.0428	2.248	1.152	18	6	sandy silt to clayey silt
17.881	38.98	0.9845	2.525	0.949	15	6	sandy silt to clayey silt
18.045	34.20	1.0301	3.012	1.040	16	5	clayey silt to silty clay
18.209	32.15	1.0746	3.342	1.042	15	5	clayey silt to silty clay
18.373	26.40	1.1092	4.202	1.331	17	4	silty clay to clay
18.537	26.39	1.0903	4.131	1.241	17	4	silty clay to clay
18.701	24.38	1.0311	4.229	1.283	16	4	silty clay to clay
18.865	21.09	0.9431	4.472	1.367	20	3	clay
19.029	24.99	0.8323	3.331	1.558	12	5	clayey silt to silty clay
19.193	31.91	0.8014	2.512	1.741	12	6	sandy silt to clayey silt
19.357	30.19	0.7788	2.580	1.470	12	6	sandy silt to clayey silt
19.521	21.43	0.6272	2.927	1.353	10	5	clayey silt to silty clay
19.685	11.70	0.4823	4.124	1.307	11	3	clay
19.849	14.84	0.4800	3.235	1.813	9	4	silty clay to clay
20.013	23.44	0.5968	2.545	1.930	11	5	clayey silt to silty clay
20.177	19.75	0.6841	3.463	2.016	9	5	clayey silt to silty clay
20.341	16.28	0.6064	3.724	2.042	10	4	silty clay to clay
20.505	16.48	0.4210	2.554	2.307	8	5	clayey silt to silty clay
20.669	13.07	0.4769	3.648	2.505	8	4	silty clay to clay
20.833	22.43	0.9265	4.131	2.987	14	4	silty clay to clay
20.997	31.09	0.9946	3.200	2.834	15	5	clayey silt to silty clay
21.161	38.92	0.9388	2.412	2.164	15	6	sandy silt to clayey silt
21.325	30.77	0.8459	2.749	1.997	12	6	sandy silt to clayey silt
21.490	27.72	0.7732	2.790	1.997	13	5	clayey silt to silty clay
21.654	29.69	0.9653	3.252	1.987	14	5	clayey silt to silty clay
21.818	29.04	0.9813	3.379	2.068	14	5	clayey silt to silty clay
21.982	34.01	1.0231	3.008	2.240	16	5	clayey silt to silty clay
22.146	36.43	1.0117	2.777	2.142	14	6	sandy silt to clayey silt
22.310	32.87	1.0274	3.125	2.056	16	5	clayey silt to silty clay
22.474	25.43	0.9953	3.914	2.080	16	4	silty clay to clay
22.638	24.99	0.6760	2.705	2.142	12	5	clayey silt to silty clay
22.802	17.86	0.5661	3.170	2.333	9	5	clayey silt to silty clay
22.966	12.83	0.5039	3.928	2.696	12	3	clay
23.130	20.78	0.5702	2.744	5.327	10	5	clayey silt to silty clay
23.294	20.25	0.5671	2.800	5.096	10	5	clayey silt to silty clay
23.458	19.18	0.5660	2.952	5.177	9	5	clayey silt to silty clay
23.622	21.02	0.5469	2.602	5.437	10	5	clayey silt to silty clay
23.786	19.87	0.6769	3.406	5.740	10	5	clayey silt to silty clay
23.950	21.39	0.7768	3.631	5.942	14	4	silty clay to clay
24.114	24.70	0.9534	3.859	6.000	16	4	silty clay to clay
24.278	27.27	1.0255	3.761	6.100	17	4	silty clay to clay
24.442	33.01	1.0320	3.126	4.003	16	5	clayey silt to silty clay
24.606	23.56	0.9135	3.877	2.579	15	4	silty clay to clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
24.770	15.12	0.6720	4.443	2.262	14	3	clay
24.934	17.85	0.5940	3.327	2.724	9	5	clayey silt to silty clay
25.098	25.99	0.7628	2.935	3.008	12	5	clayey silt to silty clay
25.262	26.13	0.8502	3.254	3.065	13	5	clayey silt to silty clay
25.427	38.00	0.9549	2.513	3.149	15	6	sandy silt to clayey silt
25.591	42.16	1.1705	2.777	2.686	16	6	sandy silt to clayey silt
25.755	29.57	1.1182	3.781	2.550	14	5	clayey silt to silty clay
25.919	25.58	0.8702	3.402	2.486	12	5	clayey silt to silty clay
26.083	24.24	1.0096	4.166	2.801	15	4	silty clay to clay
26.247	37.82	1.3721	3.628	3.099	18	5	clayey silt to silty clay
26.411	58.97	1.6422	2.785	2.712	23	6	sandy silt to clayey silt
26.575	64.95	1.6129	2.483	1.956	25	6	sandy silt to clayey silt
26.739	68.38	1.6044	2.346	1.889	26	6	sandy silt to clayey silt
26.903	60.84	1.5816	2.600	1.665	23	6	sandy silt to clayey silt
27.067	43.77	1.5107	3.451	1.689	21	5	clayey silt to silty clay
27.231	29.87	1.3056	4.372	1.546	19	4	silty clay to clay
27.395	32.52	1.5536	4.777	2.133	31	3	clay
27.559	50.27	1.8122	3.605	2.531	24	5	clayey silt to silty clay
27.723	52.41	1.9482	3.718	1.520	25	5	clayey silt to silty clay
27.887	52.15	2.0945	4.016	1.582	25	5	clayey silt to silty clay
28.051	80.75	2.0431	2.530	1.491	31	6	sandy silt to clayey silt
28.215	94.79	1.9232	2.029	1.255	30	7	silty sand to sandy silt
28.379	76.95	1.6433	2.136	1.033	25	7	silty sand to sandy silt
28.543	65.02	1.5683	2.412	0.878	25	6	sandy silt to clayey silt
28.707	54.05	1.4457	2.675	0.995	21	6	sandy silt to clayey silt
28.871	46.74	1.3080	2.798	0.813	18	6	sandy silt to clayey silt
29.035	37.73	1.1023	2.921	0.830	14	6	sandy silt to clayey silt
29.199	26.55	0.6245	2.353	0.818	10	6	sandy silt to clayey silt
29.364	15.83	0.6953	4.392	1.042	15	3	clay
29.528	11.71	0.7334	6.261	2.505	11	3	clay
29.692	22.19	0.8950	4.034	5.317	14	4	silty clay to clay
29.856	25.87	1.0467	4.047	4.838	17	4	silty clay to clay
30.020	32.83	1.0763	3.279	4.067	16	5	clayey silt to silty clay
30.184	40.43	0.9766	2.416	2.972	15	6	sandy silt to clayey silt
30.348	43.05	0.8651	2.010	2.557	16	6	sandy silt to clayey silt
30.512	44.90	0.8311	1.851	2.314	17	6	sandy silt to clayey silt
30.676	44.26	0.8723	1.971	2.047	17	6	sandy silt to clayey silt
30.840	35.80	0.8375	2.339	1.959	14	6	sandy silt to clayey silt
31.004	19.24	0.7027	3.652	2.185	12	4	silty clay to clay
31.168	33.30	0.9977	2.996	2.615	16	5	clayey silt to silty clay
31.332	44.91	1.2435	2.769	2.269	17	6	sandy silt to clayey silt
31.496	58.41	1.1391	1.950	1.746	19	7	silty sand to sandy silt
31.660	66.86	1.1863	1.774	1.214	21	7	silty sand to sandy silt
31.824	70.36	1.3122	1.865	0.949	22	7	silty sand to sandy silt
31.988	67.74	1.4215	2.098	0.868	22	7	silty sand to sandy silt
32.152	61.58	1.3438	2.182	0.854	24	6	sandy silt to clayey silt
32.316	54.44	1.2182	2.238	0.945	21	6	sandy silt to clayey silt
32.480	47.79	1.2267	2.567	0.811	18	6	sandy silt to clayey silt
32.644	38.93	1.2187	3.130	1.095	19	5	clayey silt to silty clay
32.808	24.36	1.2348	5.069	1.629	23	3	clay
32.972	40.25	1.3508	3.356	1.856	19	5	clayey silt to silty clay
33.136	75.54	2.0677	2.737	2.152	29	6	sandy silt to clayey silt
33.301	122.83	2.6863	2.187	1.751	39	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
33.465	139.48	2.8496	2.043	0.792	45	7	silty sand to sandy silt
33.629	119.94	2.2982	1.916	0.074	38	7	silty sand to sandy silt
33.793	91.38	2.1639	2.368	-0.219	29	7	silty sand to sandy silt
33.957	52.68	1.5924	3.023	-0.439	20	6	sandy silt to clayey silt
34.121	28.84	1.7126	5.937	-0.427	28	3	clay
34.285	48.78	2.5983	5.326	1.970	47	3	clay
34.449	68.50	2.7565	4.024	1.949	33	5	clayey silt to silty clay
34.613	82.08	2.4348	2.966	0.542	31	6	sandy silt to clayey silt
34.777	92.49	1.9056	2.060	-0.253	30	7	silty sand to sandy silt
34.941	101.12	1.6294	1.611	-0.685	32	7	silty sand to sandy silt
35.105	95.30	1.6938	1.777	-0.871	30	7	silty sand to sandy silt
35.269	80.33	1.6628	2.070	-1.150	26	7	silty sand to sandy silt
35.433	70.10	1.6484	2.351	-1.102	27	6	sandy silt to clayey silt
35.597	60.46	1.7217	2.848	-0.971	23	6	sandy silt to clayey silt
35.761	42.87	1.8923	4.414	-0.985	27	4	silty clay to clay
35.925	27.57	1.6144	5.856	-0.842	26	3	clay
36.089	35.86	1.9770	5.513	-0.494	34	3	clay
36.253	60.84	2.6494	4.355	0.396	29	5	clayey silt to silty clay
36.417	78.74	3.1976	4.061	0.119	38	5	clayey silt to silty clay
36.581	89.95	3.4395	3.824	-0.506	43	5	clayey silt to silty clay
36.745	98.65	2.7649	2.803	-0.942	38	6	sandy silt to clayey silt
36.909	105.48	2.0601	1.953	-1.202	34	7	silty sand to sandy silt
37.073	105.25	1.8285	1.737	-1.813	34	7	silty sand to sandy silt
37.238	103.02	2.0758	2.015	-1.861	33	7	silty sand to sandy silt
37.402	101.14	2.1933	2.169	-1.894	32	7	silty sand to sandy silt
37.566	95.81	2.2338	2.331	-1.687	31	7	silty sand to sandy silt
37.730	89.07	2.5177	2.826	-1.591	34	6	sandy silt to clayey silt
37.894	61.70	2.3272	3.772	-1.510	30	5	clayey silt to silty clay
38.058	39.95	1.9602	4.907	-1.388	38	3	clay
38.222	33.24	1.6147	4.858	-0.971	32	3	clay
38.386	34.70	1.2804	3.690	-0.389	17	5	clayey silt to silty clay
38.550	31.43	1.3809	4.394	-0.210	20	4	silty clay to clay
38.714	36.37	1.5129	4.160	-0.138	23	4	silty clay to clay
38.878	45.84	2.1410	4.671	-0.103	29	4	silty clay to clay
39.042	56.95	2.5994	4.564	-0.005	36	4	silty clay to clay
39.206	77.21	2.0706	2.682	-0.239	30	6	sandy silt to clayey silt
39.370	86.90	1.3783	1.586	-0.904	28	7	silty sand to sandy silt
39.534	95.21	1.1668	1.225	-1.570	23	8	sand to silty sand
39.698	89.27	1.3477	1.510	-1.727	28	7	silty sand to sandy silt
39.862	81.06	1.4491	1.788	-0.942	26	7	silty sand to sandy silt
40.026	72.43	1.5291	2.111	-0.835	23	7	silty sand to sandy silt
40.190	59.38	1.7874	3.010	-0.902	23	6	sandy silt to clayey silt
40.354	42.54	1.9077	4.485	-0.828	27	4	silty clay to clay
40.518	28.71	1.6242	5.658	-0.589	27	3	clay
40.682	88.33	1.8752	2.123	0.856	28	7	silty sand to sandy silt
40.846	103.89	2.1595	2.079	-0.439	33	7	silty sand to sandy silt
41.011	64.58	2.0212	3.130	-0.749	25	6	sandy silt to clayey silt
41.175	40.24	1.2596	3.130	-1.000	19	5	clayey silt to silty clay
41.339	26.57	1.0749	4.045	-0.615	17	4	silty clay to clay
41.503	33.12	1.3238	3.997	0.358	21	4	silty clay to clay
41.667	41.34	1.6260	3.934	0.482	20	5	clayey silt to silty clay
41.831	41.31	1.5810	3.827	0.456	20	5	clayey silt to silty clay
41.995	26.39	1.3696	5.190	-0.076	25	3	clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
42.159	26.07	1.3757	5.277	-0.088	25	3	clay
42.323	37.22	1.7734	4.765	0.079	24	4	silty clay to clay
42.487	51.04	2.0687	4.053	0.236	24	5	clayey silt to silty clay
42.651	52.59	1.8933	3.600	-0.157	25	5	clayey silt to silty clay
42.815	31.44	1.3683	4.352	-0.021	20	4	silty clay to clay
42.979	19.67	0.6953	3.535	-0.386	13	4	silty clay to clay
43.143	16.25	1.1342	6.980	0.265	16	3	clay
43.307	62.86	2.6705	4.248	1.023	30	5	clayey silt to silty clay
43.471	88.14	4.3772	4.966	1.038	84	11	very stiff fine grained (*)
43.635	85.77	4.7623	5.553	0.604	82	11	very stiff fine grained (*)
43.799	69.66	4.1405	5.944	0.394	67	11	very stiff fine grained (*)
43.963	65.06	2.8777	4.423	0.231	31	5	clayey silt to silty clay
44.127	68.67	1.7510	2.550	-0.468	26	6	sandy silt to clayey silt
44.291	67.16	1.0060	1.498	-1.071	21	7	silty sand to sandy silt
44.455	62.69	1.0552	1.683	-1.589	20	7	silty sand to sandy silt
44.619	50.22	1.3561	2.700	-1.777	19	6	sandy silt to clayey silt
44.783	26.59	1.1804	4.440	-1.703	17	4	silty clay to clay
44.948	14.98	0.7302	4.873	-1.202	14	3	clay
45.112	12.46	0.3855	3.095	-0.253	8	4	silty clay to clay
45.276	14.77	0.4274	2.894	0.577	7	5	clayey silt to silty clay
45.440	19.59	0.5934	3.030	1.272	9	5	clayey silt to silty clay
45.604	21.97	0.5897	2.683	1.496	11	5	clayey silt to silty clay
45.768	22.14	1.1226	5.071	1.730	21	3	clay
45.932	22.77	1.1297	4.962	1.982	22	3	clay
46.096	33.16	1.0166	3.066	2.872	16	5	clayey silt to silty clay
46.260	44.85	1.0325	2.302	2.135	17	6	sandy silt to clayey silt
46.424	33.23	1.0222	3.076	3.502	16	5	clayey silt to silty clay
46.588	23.70	0.8736	3.687	3.507	15	4	silty clay to clay
46.752	15.59	0.4744	3.042	4.158	7	5	clayey silt to silty clay
46.916	11.41	0.1857	1.628	5.644	5	5	clayey silt to silty clay
47.080	10.13	0.3142	3.102	6.837	6	4	silty clay to clay
47.244	11.33	0.3757	3.316	8.113	7	4	silty clay to clay
47.408	14.04	0.4648	3.310	11.038	9	4	silty clay to clay
47.572	22.60	0.6969	3.083	12.205	11	5	clayey silt to silty clay
47.736	27.96	0.7814	2.795	10.594	13	5	clayey silt to silty clay
47.900	17.30	0.6627	3.831	11.873	11	4	silty clay to clay
48.064	14.29	0.2979	2.085	13.359	7	5	clayey silt to silty clay
48.228	13.89	0.1869	1.346	15.282	5	6	sandy silt to clayey silt
48.392	13.64	0.1842	1.350	17.269	5	6	sandy silt to clayey silt
48.556	14.95	0.2856	1.910	18.796	7	5	clayey silt to silty clay
48.720	15.37	0.6200	4.033	20.189	15	3	clay
48.885	26.31	0.6264	2.381	20.325	10	6	sandy silt to clayey silt
49.049	20.05	0.6077	3.031	13.665	10	5	clayey silt to silty clay
49.213	15.26	0.4382	2.872	15.120	7	5	clayey silt to silty clay
49.377	17.00	0.4567	2.686	22.420	8	5	clayey silt to silty clay
49.541	20.51	0.6408	3.124	25.466	10	5	clayey silt to silty clay
49.705	29.13	0.8073	2.771	26.375	14	5	clayey silt to silty clay
49.869	23.09	0.6827	2.957	25.321	11	5	clayey silt to silty clay
50.033	16.65	0.5776	3.469	26.928	11	4	silty clay to clay
50.197	18.24	0.4015	2.201	31.585	9	5	clayey silt to silty clay
50.361	29.48	0.5944	2.017	30.294	11	6	sandy silt to clayey silt
50.525	24.68	0.6305	2.555	23.906	12	5	clayey silt to silty clay
50.689	26.89	0.8155	3.033	36.084	13	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
50.853	34.90	0.9952	2.851	37.117	13	6	sandy silt to clayey silt
51.017	35.61	1.0403	2.921	32.551	17	5	clayey silt to silty clay
51.181	29.92	0.9293	3.106	28.548	14	5	clayey silt to silty clay
51.345	23.42	0.8057	3.440	28.897	11	5	clayey silt to silty clay
51.509	26.83	0.8410	3.135	32.606	13	5	clayey silt to silty clay
51.673	24.39	0.7881	3.231	29.727	12	5	clayey silt to silty clay
51.837	19.97	0.5289	2.649	29.033	10	5	clayey silt to silty clay
52.001	17.95	0.3668	2.044	31.330	9	5	clayey silt to silty clay
52.165	16.94	0.2982	1.760	35.056	8	5	clayey silt to silty clay
52.329	18.75	0.5998	3.199	38.840	9	5	clayey silt to silty clay
52.493	25.30	0.5495	2.172	43.260	10	6	sandy silt to clayey silt
52.657	27.75	0.7104	2.560	22.756	11	6	sandy silt to clayey silt
52.822	27.38	0.8186	2.989	27.549	13	5	clayey silt to silty clay
52.986	31.73	0.9711	3.060	28.512	15	5	clayey silt to silty clay
53.150	26.87	1.0057	3.742	27.463	17	4	silty clay to clay
53.314	20.38	0.5987	2.939	28.038	10	5	clayey silt to silty clay
53.478	17.91	0.3091	1.726	30.710	7	6	sandy silt to clayey silt
53.642	17.52	0.6089	3.474	34.398	11	4	silty clay to clay
53.806	21.66	0.7555	3.488	37.675	10	5	clayey silt to silty clay
53.970	24.49	0.7032	2.871	43.950	12	5	clayey silt to silty clay
54.134	18.33	0.3276	1.788	48.189	7	6	sandy silt to clayey silt
54.298	15.68	0.2611	1.665	51.164	8	5	clayey silt to silty clay
54.462	17.50	0.2859	1.634	56.805	7	6	sandy silt to clayey silt
54.626	23.71	0.3866	1.630	61.474	9	6	sandy silt to clayey silt
54.790	27.29	0.5617	2.058	66.128	10	6	sandy silt to clayey silt
54.954	30.32	0.6981	2.302	69.101	12	6	sandy silt to clayey silt
55.118	31.19	0.7112	2.280	72.264	12	6	sandy silt to clayey silt
55.282	33.48	0.7381	2.205	84.159	13	6	sandy silt to clayey silt
55.446	31.89	0.7442	2.334	84.457	12	6	sandy silt to clayey silt
55.610	27.15	0.7923	2.919	79.285	13	5	clayey silt to silty clay
55.774	25.58	0.6817	2.665	81.382	12	5	clayey silt to silty clay
55.938	34.13	0.8871	2.599	97.222	13	6	sandy silt to clayey silt
56.102	39.91	1.2276	3.076	102.198	19	5	clayey silt to silty clay
56.266	40.05	1.6705	4.171	76.126	26	4	silty clay to clay
56.430	37.77	1.6509	4.371	75.289	24	4	silty clay to clay
56.594	36.02	1.4514	4.029	79.197	23	4	silty clay to clay
56.759	36.84	1.4424	3.915	86.289	18	5	clayey silt to silty clay
56.923	39.72	1.8423	4.638	85.702	25	4	silty clay to clay
57.087	39.96	1.9557	4.894	72.030	38	3	clay
57.251	35.11	1.6788	4.782	46.533	34	3	clay
57.415	33.27	1.4429	4.337	47.805	21	4	silty clay to clay
57.579	31.33	1.3501	4.309	50.383	20	4	silty clay to clay
57.743	30.71	1.2652	4.120	52.800	20	4	silty clay to clay
57.907	30.81	1.2413	4.028	54.856	20	4	silty clay to clay
58.071	30.87	1.2822	4.153	56.030	20	4	silty clay to clay
58.235	30.83	1.3761	4.464	53.501	20	4	silty clay to clay
58.399	31.08	1.4960	4.813	54.465	30	3	clay
58.563	31.67	1.5922	5.028	51.094	30	3	clay
58.727	31.90	1.4141	4.433	52.321	20	4	silty clay to clay
58.891	30.98	1.4277	4.608	54.239	20	4	silty clay to clay
59.055	31.72	1.3988	4.410	55.472	20	4	silty clay to clay
59.219	32.04	1.5475	4.829	54.470	31	3	clay
59.383	32.96	1.5587	4.729	54.551	32	3	clay

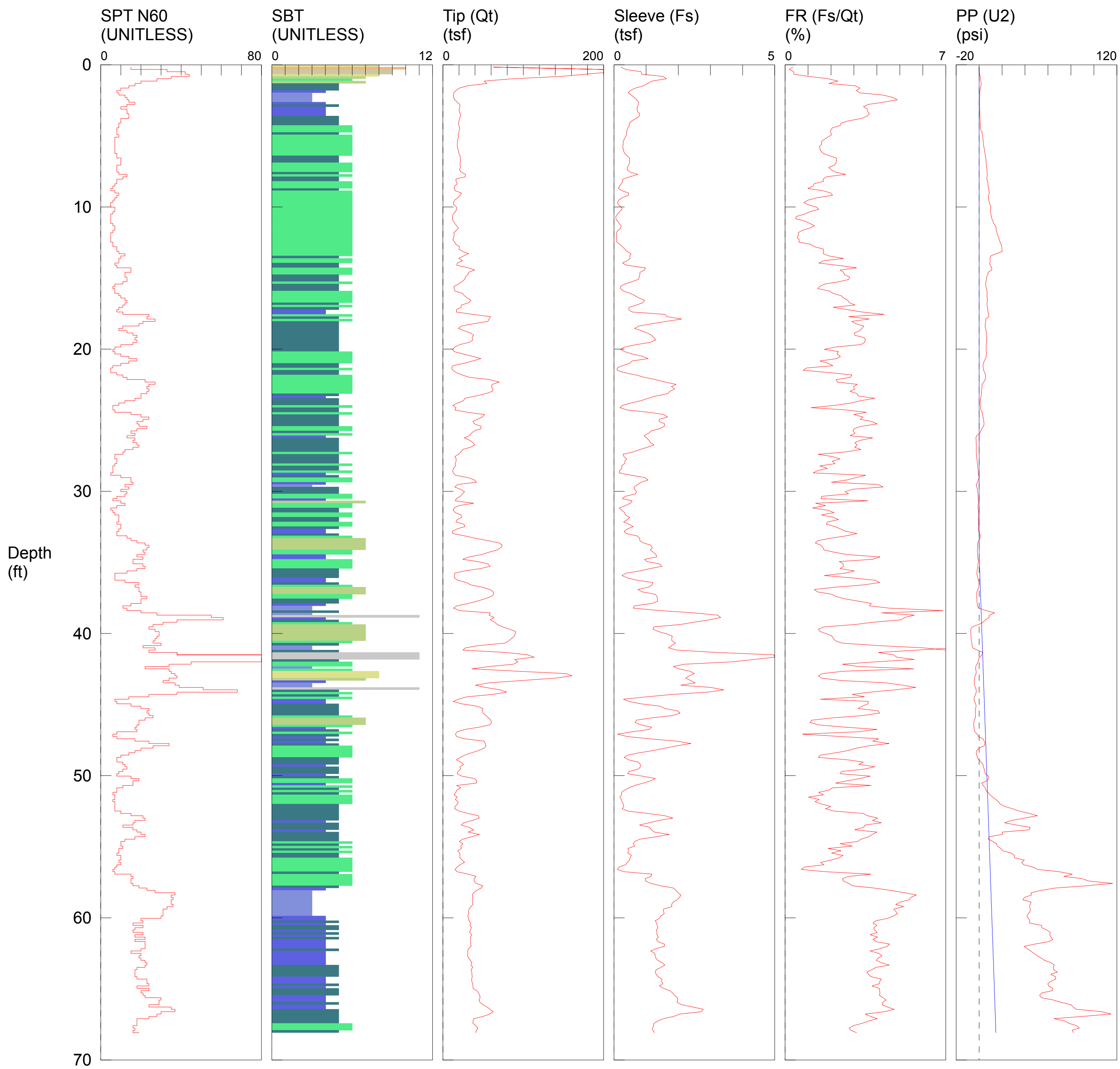
Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
59.547	32.10	1.4922	4.648	54.790	20	4	silty clay to clay
59.711	32.65	1.4739	4.515	56.095	21	4	silty clay to clay
59.875	33.55	1.4614	4.356	57.199	21	4	silty clay to clay
60.039	33.35	1.4333	4.299	57.357	21	4	silty clay to clay
60.203	32.41	1.4213	4.386	58.363	21	4	silty clay to clay
60.367	32.63	1.4613	4.479	61.414	21	4	silty clay to clay
60.532	40.04	1.4552	3.634	84.466	19	5	clayey silt to silty clay
60.696	42.16	1.6986	4.029	91.773	20	5	clayey silt to silty clay
60.860	46.28	1.5414	3.330	97.148	22	5	clayey silt to silty clay
61.024	44.62	1.5837	3.549	111.710	21	5	clayey silt to silty clay
61.188	49.67	1.5857	3.193	123.337	24	5	clayey silt to silty clay
61.352	53.13	1.5277	2.876	128.678	20	6	sandy silt to clayey silt
61.516	53.05	1.6461	3.103	143.087	20	6	sandy silt to clayey silt
61.680	70.20	2.1418	3.051	177.800	27	6	sandy silt to clayey silt
61.844	107.35	2.5619	2.387	90.483	34	7	silty sand to sandy silt
62.008	75.11	2.0736	2.761	20.351	29	6	sandy silt to clayey silt
62.172	53.20	1.5707	2.952	29.918	20	6	sandy silt to clayey silt
62.336	52.52	1.4678	2.795	30.655	20	6	sandy silt to clayey silt
62.500	47.96	1.4893	3.105	39.028	18	6	sandy silt to clayey silt
62.664	49.51	1.4468	2.923	43.766	19	6	sandy silt to clayey silt
62.828	46.96	1.2791	2.724	42.203	18	6	sandy silt to clayey silt
62.992	44.71	1.1564	2.586	44.508	17	6	sandy silt to clayey silt
63.156	45.22	1.2324	2.725	46.466	17	6	sandy silt to clayey silt
63.320	55.36	2.0795	3.757	49.312	27	5	clayey silt to silty clay
63.484	79.90	2.2161	2.773	43.456	31	6	sandy silt to clayey silt
63.648	65.46	1.9192	2.932	37.718	25	6	sandy silt to clayey silt
63.812	43.39	1.5764	3.633	44.567	21	5	clayey silt to silty clay
63.976	43.26	1.1280	2.607	41.977	17	6	sandy silt to clayey silt
64.140	37.76	1.1674	3.091	46.994	18	5	clayey silt to silty clay
64.304	46.91	0.9646	2.056	49.534	18	6	sandy silt to clayey silt
64.469	40.38	0.9050	2.241	47.523	15	6	sandy silt to clayey silt
64.633	35.24	0.8590	2.438	51.507	13	6	sandy silt to clayey silt
64.797	32.08	0.8564	2.670	51.724	12	6	sandy silt to clayey silt
64.961	31.71	0.9986	3.149	50.691	15	5	clayey silt to silty clay
65.125	32.10	0.8250	2.570	52.082	12	6	sandy silt to clayey silt
65.289	32.28	0.7296	2.260	53.320	12	6	sandy silt to clayey silt
65.453	30.80	0.8938	2.902	54.747	15	5	clayey silt to silty clay
65.617	29.70	0.8391	2.825	56.514	14	5	clayey silt to silty clay
65.781	36.25	1.0293	2.839	65.668	14	6	sandy silt to clayey silt
65.945	38.62	1.1280	2.921	64.773	15	6	sandy silt to clayey silt
66.109	35.31	1.3677	3.874	66.097	17	5	clayey silt to silty clay
66.273	34.58	1.2528	3.623	65.658	17	5	clayey silt to silty clay
66.437	34.57	1.1421	3.303	67.054	17	5	clayey silt to silty clay
66.601	32.75	0.9857	3.009	68.220	16	5	clayey silt to silty clay
66.765	31.44	0.8181	2.602	70.546	12	6	sandy silt to clayey silt
66.929	33.75	0.8568	2.538	75.339	13	6	sandy silt to clayey silt
67.093	37.75	0.8890	2.355	75.601	14	6	sandy silt to clayey silt
67.257	37.17	0.9199	2.475	77.763	14	6	sandy silt to clayey silt
67.421	33.05	0.8069	2.442	79.101	13	6	sandy silt to clayey silt
67.585	31.27	0.6087	1.947	80.697	12	6	sandy silt to clayey silt
67.749	29.62	0.4842	1.635	82.632	11	6	sandy silt to clayey silt
67.913	29.76	0.4777	1.605	85.091	11	6	sandy silt to clayey silt
68.077	28.10	0.4503	1.603	82.629	11	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
68.241	25.96	0.2421	0.933	83.054	8	7	silty sand to sandy silt
68.406	23.43	0.2293	0.978	83.848	9	6	sandy silt to clayey silt
68.570	21.73	0.2117	0.974	88.553	8	6	sandy silt to clayey silt
68.734	23.10	0.2231	0.966	92.713	9	6	sandy silt to clayey silt
68.898	25.22	0.2162	0.857	97.327	8	7	silty sand to sandy silt
69.062	28.08	0.3695	1.316	98.780	11	6	sandy silt to clayey silt
69.226	27.49	0.4017	1.461	103.043	11	6	sandy silt to clayey silt
69.390	27.84	0.3305	1.187	104.620	11	6	sandy silt to clayey silt
69.554	24.14	0.2885	1.195	106.321	9	6	sandy silt to clayey silt
69.718	23.65	0.2723	1.151	110.333	9	6	sandy silt to clayey silt
69.882	25.01	0.2831	1.132	111.748	10	6	sandy silt to clayey silt
70.046	24.21	0.2521	1.041	108.830	9	6	sandy silt to clayey silt
70.210	21.13	0.2270	1.074	113.203	8	6	sandy silt to clayey silt
70.374	22.30	0.2811	1.261	123.003	9	6	sandy silt to clayey silt
70.538	23.51	0.3483	1.481	123.692	9	6	sandy silt to clayey silt
70.702	24.58	0.3267	1.329	119.661	9	6	sandy silt to clayey silt
70.866	24.27	0.2794	1.151	120.591	9	6	sandy silt to clayey silt
71.030	23.19	0.3539	1.526	123.988	9	6	sandy silt to clayey silt
71.194	30.64	0.6536	2.133	137.161	12	6	sandy silt to clayey silt
71.358	64.43	1.3532	2.100	152.062	21	7	silty sand to sandy silt
71.522	79.46	2.2325	2.810	89.218	30	6	sandy silt to clayey silt
71.686	78.92	2.2674	2.873	99.178	30	6	sandy silt to clayey silt
71.850	85.79	1.3118	1.529	45.240	27	7	silty sand to sandy silt
72.014	59.12	0.5060	0.856	44.524	19	7	silty sand to sandy silt
72.178	52.29	1.6172	3.093	67.722	20	6	sandy silt to clayey silt
72.343	81.25	0.9492	1.168	44.000	19	8	sand to silty sand
72.507	48.12	0.9024	1.875	42.876	15	7	silty sand to sandy silt
72.671	39.33	0.7400	1.881	53.742	15	6	sandy silt to clayey silt
72.835	38.50	0.8458	2.197	54.444	15	6	sandy silt to clayey silt
72.999	35.85	0.8098	2.259	55.520	14	6	sandy silt to clayey silt
73.163	36.51	0.7261	1.989	58.652	14	6	sandy silt to clayey silt
73.327	37.79	0.5689	1.505	59.942	12	7	silty sand to sandy silt
73.491	39.14	0.6522	1.666	62.118	15	6	sandy silt to clayey silt
73.655	37.40	0.8443	2.258	66.181	14	6	sandy silt to clayey silt
73.819	48.50	1.0727	2.212	83.488	19	6	sandy silt to clayey silt
73.983	49.14	1.2560	2.556	84.438	19	6	sandy silt to clayey silt
74.147	47.45	1.3337	2.810	95.223	18	6	sandy silt to clayey silt
74.311	52.69	1.3658	2.592	101.716	20	6	sandy silt to clayey silt
74.475	59.87	1.3947	2.330	107.790	23	6	sandy silt to clayey silt
74.639	63.00	1.3197	2.095	109.706	20	7	silty sand to sandy silt
74.803	56.70	0.8943	1.577	106.817	18	7	silty sand to sandy silt
74.967	49.21	0.8098	1.646	117.595	16	7	silty sand to sandy silt
75.131	40.35	0.7711	1.911	130.639	15	6	sandy silt to clayey silt
75.295	43.42	1.2556	2.892	143.237	17	6	sandy silt to clayey silt
75.459	61.38	1.4495	2.362	160.106	24	6	sandy silt to clayey silt
75.623	54.86	1.6013	2.919	108.324	21	6	sandy silt to clayey silt
75.787	49.82	1.4502	2.911	68.395	19	6	sandy silt to clayey silt
75.951	38.80	1.0677	2.752	73.660	15	6	sandy silt to clayey silt
76.115	32.24	0.8367	2.595	80.327	12	6	sandy silt to clayey silt
76.280	31.09	0.6699	2.154	76.420	12	6	sandy silt to clayey silt
76.444	28.14	0.7213	2.563	75.162	11	6	sandy silt to clayey silt
76.608	27.09	0.7733	2.855	72.670	13	5	clayey silt to silty clay
76.772	26.71	0.7425	2.780	71.625	13	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
76.936	26.90	0.7662	2.849	52.378	13	5	clayey silt to silty clay
77.100	27.62	0.7477	2.708	54.203	13	5	clayey silt to silty clay
77.264	27.30	0.7638	2.797	56.178	13	5	clayey silt to silty clay
77.428	26.59	0.7057	2.654	55.730	13	5	clayey silt to silty clay
77.592	27.17	0.7644	2.813	56.731	13	5	clayey silt to silty clay
77.756	27.59	0.7683	2.785	55.961	13	5	clayey silt to silty clay
77.920	27.47	0.8691	3.164	56.705	13	5	clayey silt to silty clay
78.084	27.73	0.8645	3.117	57.204	13	5	clayey silt to silty clay
78.248	28.11	0.8438	3.002	56.722	13	5	clayey silt to silty clay
78.412	28.76	0.8724	3.033	57.409	14	5	clayey silt to silty clay
78.576	29.38	1.0574	3.599	57.962	14	5	clayey silt to silty clay
78.740	30.74	1.1461	3.728	58.525	15	5	clayey silt to silty clay
78.904	36.38	1.2372	3.400	58.187	17	5	clayey silt to silty clay
79.068	36.46	1.3367	3.667	59.942	17	5	clayey silt to silty clay
79.232	33.42	1.2820	3.836	58.349	16	5	clayey silt to silty clay
79.396	31.03	1.2044	3.882	58.554	20	4	silty clay to clay
79.560	29.58	1.1155	3.771	57.953	14	5	clayey silt to silty clay
79.724	30.18	1.0002	3.314	59.270	14	5	clayey silt to silty clay
79.888	33.13	0.7342	2.216	64.609	13	6	sandy silt to clayey silt
80.052	32.55	0.7993	2.456	62.533	12	6	sandy silt to clayey silt
80.217	32.46	0.8288	2.553	62.004	12	6	sandy silt to clayey silt
80.381	31.24	0.7658	2.451	65.737	12	6	sandy silt to clayey silt
80.545	29.09	0.7439	2.557	68.514	11	6	sandy silt to clayey silt
80.709	28.03	0.6300	2.248	71.274	11	6	sandy silt to clayey silt
80.873	28.36	0.5549	1.957	74.487	11	6	sandy silt to clayey silt
81.037	28.33	0.5359	1.891	75.298	11	6	sandy silt to clayey silt
81.201	26.04	0.4889	1.878	75.298	10	6	sandy silt to clayey silt
81.365	26.45	0.5587	2.113	76.308	10	6	sandy silt to clayey silt
81.529	29.74	0.6031	2.028	82.947	11	6	sandy silt to clayey silt
81.693	28.32	0.4937	1.743	83.350	11	6	sandy silt to clayey silt
81.857	26.28	0.4006	1.524	85.270	10	6	sandy silt to clayey silt
82.021	24.16	0.3984	1.649	89.032	9	6	sandy silt to clayey silt
82.185	27.22	0.4318	1.586	83.376	10	6	sandy silt to clayey silt
82.349	26.04	0.5021	1.928	82.429	10	6	sandy silt to clayey silt
82.513	25.40	0.5312	2.091	77.422	10	6	sandy silt to clayey silt
82.677	22.97	0.4833	2.104	51.090	9	6	sandy silt to clayey silt
82.841	21.68	0.7404	3.415	51.715	10	5	clayey silt to silty clay
83.005	33.13	0.7104	2.144	59.465	13	6	sandy silt to clayey silt
83.169	38.26	0.7002	1.830	65.394	15	6	sandy silt to clayey silt
83.333	42.66	0.6102	1.430	71.994	14	7	silty sand to sandy silt

Shannon & Wilson / CPT-2 / 1400 Wynooski St Newberg

OPERATOR: OGE DMM
CONE ID: DDG1415
HOLE NUMBER: CPT-2
TEST DATE: 5/20/2019 7:45:54 AM
TOTAL DEPTH: 68.077 ft



1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

Shannon & Wilson / CPT-2 / 1400 Wynooski St Newberg

OPERATOR: OGE DMM
CONE ID: DDG1415
HOLE NUMBER: CPT-2
TEST DATE: 5/20/2019 7:45:54 AM
TOTAL DEPTH: 68.077 ft

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
0.164	62.94	0.2117	0.336	0.014	15	8	sand to silty sand
0.328	207.74	0.3627	0.175	-0.248	33	10	gravelly sand to sand
0.492	220.35	0.8408	0.382	-0.029	42	9	sand
0.656	231.36	0.8648	0.374	0.329	44	9	sand
0.820	145.86	1.5280	1.048	1.031	35	8	sand to silty sand
0.984	87.35	1.6293	1.865	1.021	28	7	silty sand to sandy silt
1.148	51.36	1.1799	2.297	1.515	20	6	sandy silt to clayey silt
1.312	54.76	1.0444	1.907	1.866	17	7	silty sand to sandy silt
1.476	29.87	0.9160	3.066	1.472	14	5	clayey silt to silty clay
1.640	20.43	0.6653	3.257	1.011	10	5	clayey silt to silty clay
1.804	16.42	0.5084	3.096	0.680	8	5	clayey silt to silty clay
1.969	13.49	0.4385	3.251	0.496	9	4	silty clay to clay
2.133	12.81	0.5471	4.272	0.482	12	3	clay
2.297	13.16	0.6182	4.697	0.413	13	3	clay
2.461	14.52	0.7087	4.882	0.310	14	3	clay
2.625	17.77	0.7615	4.286	0.284	17	3	clay
2.789	20.94	0.7576	3.618	0.355	13	4	silty clay to clay
2.953	21.20	0.7237	3.414	0.370	10	5	clayey silt to silty clay
3.117	20.13	0.7204	3.578	0.475	13	4	silty clay to clay
3.281	20.32	0.7316	3.600	0.542	13	4	silty clay to clay
3.445	21.65	0.7936	3.666	0.553	14	4	silty clay to clay
3.609	21.93	0.7844	3.577	0.613	14	4	silty clay to clay
3.773	20.64	0.6861	3.324	0.661	10	5	clayey silt to silty clay
3.937	19.90	0.5532	2.780	0.840	10	5	clayey silt to silty clay
4.101	19.32	0.4716	2.440	0.947	9	5	clayey silt to silty clay
4.265	19.83	0.4765	2.403	1.159	9	5	clayey silt to silty clay
4.429	20.93	0.4308	2.058	1.345	8	6	sandy silt to clayey silt
4.593	20.36	0.4053	1.990	1.472	8	6	sandy silt to clayey silt
4.757	19.74	0.3924	1.988	2.455	8	6	sandy silt to clayey silt
4.921	19.07	0.3857	2.023	2.774	9	5	clayey silt to silty clay
5.085	19.00	0.3532	1.859	3.085	7	6	sandy silt to clayey silt
5.249	18.38	0.3134	1.705	3.333	7	6	sandy silt to clayey silt
5.413	18.07	0.2856	1.580	3.540	7	6	sandy silt to clayey silt
5.577	17.85	0.2851	1.597	3.750	7	6	sandy silt to clayey silt
5.741	18.04	0.2705	1.499	4.022	7	6	sandy silt to clayey silt
5.906	18.48	0.2819	1.525	4.394	7	6	sandy silt to clayey silt
6.070	19.14	0.2979	1.557	4.769	7	6	sandy silt to clayey silt
6.234	19.91	0.3333	1.674	5.072	8	6	sandy silt to clayey silt
6.398	21.24	0.4116	1.938	5.387	8	6	sandy silt to clayey silt
6.562	21.56	0.4805	2.229	5.651	10	5	clayey silt to silty clay
6.726	21.75	0.4860	2.235	5.950	10	5	clayey silt to silty clay
6.890	21.49	0.4778	2.223	6.088	10	5	clayey silt to silty clay
7.054	21.30	0.4557	2.139	6.286	8	6	sandy silt to clayey silt
7.218	21.65	0.4116	1.901	6.599	8	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
7.382	20.52	0.4121	2.008	6.737	8	6	sandy silt to clayey silt
7.546	22.85	0.5029	2.201	6.959	9	6	sandy silt to clayey silt
7.710	27.86	0.7335	2.633	7.126	13	5	clayey silt to silty clay
7.874	27.68	0.4992	1.803	6.882	11	6	sandy silt to clayey silt
8.038	16.07	0.2661	1.655	6.651	8	5	clayey silt to silty clay
8.202	16.15	0.2694	1.668	7.340	8	5	clayey silt to silty clay
8.366	17.82	0.2242	1.258	7.794	7	6	sandy silt to clayey silt
8.530	14.72	0.1796	1.220	7.741	6	6	sandy silt to clayey silt
8.694	13.77	0.1368	0.993	8.199	5	6	sandy silt to clayey silt
8.858	15.24	0.2524	1.657	8.590	7	5	clayey silt to silty clay
9.022	22.90	0.4549	1.986	8.965	9	6	sandy silt to clayey silt
9.186	21.69	0.4480	2.066	8.171	8	6	sandy silt to clayey silt
9.350	18.40	0.2562	1.393	8.087	7	6	sandy silt to clayey silt
9.514	14.47	0.1451	1.003	8.381	6	6	sandy silt to clayey silt
9.678	13.00	0.1061	0.816	8.810	5	6	sandy silt to clayey silt
9.843	13.48	0.1353	1.004	9.483	5	6	sandy silt to clayey silt
10.007	17.04	0.2337	1.371	10.222	7	6	sandy silt to clayey silt
10.171	17.19	0.2515	1.463	9.998	7	6	sandy silt to clayey silt
10.335	15.27	0.1644	1.077	10.022	6	6	sandy silt to clayey silt
10.499	12.67	0.1082	0.854	10.217	5	6	sandy silt to clayey silt
10.663	11.91	0.0583	0.489	10.623	5	6	sandy silt to clayey silt
10.827	11.85	0.0541	0.457	11.131	5	6	sandy silt to clayey silt
10.991	12.51	0.1058	0.846	11.880	5	6	sandy silt to clayey silt
11.155	14.72	0.1589	1.079	12.596	6	6	sandy silt to clayey silt
11.319	17.12	0.2189	1.278	14.211	7	6	sandy silt to clayey silt
11.483	19.13	0.2065	1.079	14.707	7	6	sandy silt to clayey silt
11.647	16.80	0.1254	0.747	14.931	6	6	sandy silt to clayey silt
11.811	13.41	0.0759	0.566	15.475	5	6	sandy silt to clayey silt
11.975	14.13	0.0827	0.585	16.155	5	6	sandy silt to clayey silt
12.139	13.43	0.0698	0.520	16.816	5	6	sandy silt to clayey silt
12.303	12.36	0.0760	0.615	17.541	5	6	sandy silt to clayey silt
12.467	14.49	0.0858	0.592	18.223	6	6	sandy silt to clayey silt
12.631	16.00	0.1774	1.109	19.101	6	6	sandy silt to clayey silt
12.795	20.63	0.2637	1.278	19.741	8	6	sandy silt to clayey silt
12.959	19.96	0.3330	1.668	19.891	8	6	sandy silt to clayey silt
13.123	24.58	0.4110	1.672	20.046	9	6	sandy silt to clayey silt
13.287	31.76	0.5274	1.660	15.003	12	6	sandy silt to clayey silt
13.451	25.60	0.4893	1.911	10.134	10	6	sandy silt to clayey silt
13.615	19.69	0.4989	2.534	9.328	9	5	clayey silt to silty clay
13.780	24.18	0.4108	1.699	9.654	9	6	sandy silt to clayey silt
13.944	17.91	0.2623	1.464	9.177	7	6	sandy silt to clayey silt
14.108	17.20	0.3924	2.281	9.688	8	5	clayey silt to silty clay
14.272	31.47	0.9786	3.109	10.893	15	5	clayey silt to silty clay
14.436	39.44	0.9471	2.401	11.024	15	6	sandy silt to clayey silt
14.600	31.75	0.8078	2.544	7.801	12	6	sandy silt to clayey silt
14.764	31.12	0.8036	2.582	7.431	12	6	sandy silt to clayey silt
14.928	27.94	0.7848	2.808	6.517	13	5	clayey silt to silty clay
15.092	27.00	0.7488	2.774	6.310	13	5	clayey silt to silty clay
15.256	23.62	0.5596	2.369	5.864	11	5	clayey silt to silty clay
15.420	19.17	0.3332	1.738	5.628	7	6	sandy silt to clayey silt
15.584	13.57	0.2046	1.507	5.804	6	5	clayey silt to silty clay
15.748	14.01	0.1997	1.426	6.355	7	5	clayey silt to silty clay
15.912	14.97	0.2900	1.936	6.706	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
16.076	24.35	0.5088	2.090	7.059	9	6	sandy silt to clayey silt
16.240	26.61	0.6479	2.435	6.775	10	6	sandy silt to clayey silt
16.404	30.58	0.7787	2.547	7.107	12	6	sandy silt to clayey silt
16.568	34.87	0.9498	2.724	7.078	13	6	sandy silt to clayey silt
16.732	31.74	0.8913	2.808	6.882	12	6	sandy silt to clayey silt
16.896	22.96	0.7003	3.050	6.854	11	5	clayey silt to silty clay
17.060	22.38	0.4684	2.093	7.283	9	6	sandy silt to clayey silt
17.224	16.78	0.4557	2.716	7.343	8	5	clayey silt to silty clay
17.388	16.73	0.5611	3.355	7.677	11	4	silty clay to clay
17.552	36.87	1.5895	4.310	8.159	24	4	silty clay to clay
17.717	59.16	1.6428	2.777	8.490	23	6	sandy silt to clayey silt
17.881	57.26	2.1018	3.671	5.713	27	5	clayey silt to silty clay
18.045	56.05	1.6295	2.907	5.749	21	6	sandy silt to clayey silt
18.209	39.02	1.1964	3.066	5.351	19	5	clayey silt to silty clay
18.373	22.81	0.7812	3.425	5.153	11	5	clayey silt to silty clay
18.537	19.19	0.6423	3.347	5.475	9	5	clayey silt to silty clay
18.701	26.28	0.8534	3.247	6.143	13	5	clayey silt to silty clay
18.865	34.44	1.0382	3.014	6.329	16	5	clayey silt to silty clay
19.029	38.25	1.1612	3.036	6.463	18	5	clayey silt to silty clay
19.193	36.10	1.2423	3.441	6.687	17	5	clayey silt to silty clay
19.357	37.04	1.2955	3.497	6.677	18	5	clayey silt to silty clay
19.521	32.53	1.1270	3.465	6.505	16	5	clayey silt to silty clay
19.685	21.01	0.6927	3.297	6.036	10	5	clayey silt to silty clay
19.849	14.94	0.3303	2.211	6.050	7	5	clayey silt to silty clay
20.013	11.92	0.2041	1.711	6.067	6	5	clayey silt to silty clay
20.177	13.86	0.3224	2.327	6.219	7	5	clayey silt to silty clay
20.341	25.05	0.5649	2.255	6.346	10	6	sandy silt to clayey silt
20.505	37.09	0.8931	2.408	6.126	14	6	sandy silt to clayey silt
20.669	47.14	1.0614	2.252	5.754	18	6	sandy silt to clayey silt
20.833	36.81	0.5619	1.526	4.318	14	6	sandy silt to clayey silt
20.997	26.05	0.4860	1.866	3.717	10	6	sandy silt to clayey silt
21.161	12.18	0.2529	2.076	3.237	6	5	clayey silt to silty clay
21.325	10.69	0.1002	0.937	3.597	5	5	clayey silt to silty clay
21.490	12.17	0.0948	0.779	3.970	5	6	sandy silt to clayey silt
21.654	16.88	0.3339	1.977	4.814	8	5	clayey silt to silty clay
21.818	23.64	0.6882	2.911	5.442	11	5	clayey silt to silty clay
21.982	33.02	0.9393	2.845	5.606	13	6	sandy silt to clayey silt
22.146	58.21	1.2928	2.221	5.205	22	6	sandy silt to clayey silt
22.310	69.96	1.5876	2.269	4.055	27	6	sandy silt to clayey silt
22.474	61.54	1.9306	3.137	2.603	24	6	sandy silt to clayey silt
22.638	59.97	1.7852	2.977	2.522	23	6	sandy silt to clayey silt
22.802	62.42	1.8879	3.025	2.426	24	6	sandy silt to clayey silt
22.966	61.33	1.7348	2.829	2.018	23	6	sandy silt to clayey silt
23.130	53.21	1.6713	3.141	1.997	20	6	sandy silt to clayey silt
23.294	41.36	1.3125	3.173	1.710	20	5	clayey silt to silty clay
23.458	27.10	1.0576	3.903	1.212	17	4	silty clay to clay
23.622	25.48	0.8380	3.290	1.126	12	5	clayey silt to silty clay
23.786	18.52	0.5359	2.894	0.973	9	5	clayey silt to silty clay
23.950	12.49	0.2729	2.185	1.064	6	5	clayey silt to silty clay
24.114	16.28	0.1831	1.124	1.353	6	6	sandy silt to clayey silt
24.278	14.93	0.3954	2.649	1.398	7	5	clayey silt to silty clay
24.442	30.56	1.0814	3.539	2.557	15	5	clayey silt to silty clay
24.606	51.65	1.5488	2.999	2.887	20	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
24.770	49.08	1.6649	3.392	3.309	24	5	clayey silt to silty clay
24.934	43.00	1.4064	3.271	3.822	21	5	clayey silt to silty clay
25.098	37.27	1.4063	3.773	4.072	18	5	clayey silt to silty clay
25.262	39.42	1.5817	4.012	4.299	19	5	clayey silt to silty clay
25.427	47.25	1.5639	3.310	3.650	23	5	clayey silt to silty clay
25.591	47.11	1.4160	3.006	2.355	18	6	sandy silt to clayey silt
25.755	39.18	1.1565	2.952	1.436	15	6	sandy silt to clayey silt
25.919	35.21	1.0746	3.051	0.697	17	5	clayey silt to silty clay
26.083	32.78	0.9296	2.835	-2.219	13	6	sandy silt to clayey silt
26.247	26.70	1.0170	3.809	-2.856	17	4	silty clay to clay
26.411	33.22	1.0886	3.276	-2.679	16	5	clayey silt to silty clay
26.575	37.42	1.1342	3.031	-2.588	18	5	clayey silt to silty clay
26.739	39.68	1.2471	3.143	-2.512	19	5	clayey silt to silty clay
26.903	34.15	1.0349	3.031	-2.407	16	5	clayey silt to silty clay
27.067	24.29	0.8021	3.302	-2.514	12	5	clayey silt to silty clay
27.231	22.38	0.5844	2.611	-2.483	11	5	clayey silt to silty clay
27.395	19.21	0.2783	1.449	-2.400	7	6	sandy silt to clayey silt
27.559	14.78	0.3063	2.072	-2.350	7	5	clayey silt to silty clay
27.723	16.41	0.3911	2.383	-1.947	8	5	clayey silt to silty clay
27.887	16.47	0.3381	2.053	-1.811	8	5	clayey silt to silty clay
28.051	15.14	0.3297	2.177	-1.610	7	5	clayey silt to silty clay
28.215	15.73	0.2398	1.525	-1.310	6	6	sandy silt to clayey silt
28.379	13.36	0.2450	1.834	-1.102	6	5	clayey silt to silty clay
28.543	12.23	0.1723	1.409	-0.825	6	5	clayey silt to silty clay
28.707	12.85	0.1571	1.222	-0.735	5	6	sandy silt to clayey silt
28.871	15.49	0.5428	3.505	-0.542	10	4	silty clay to clay
29.035	31.17	0.9619	3.086	-0.024	15	5	clayey silt to silty clay
29.199	39.29	1.0580	2.693	-0.754	15	6	sandy silt to clayey silt
29.364	41.68	0.8405	2.016	-1.429	16	6	sandy silt to clayey silt
29.528	18.21	0.7370	4.047	-2.555	12	4	silty clay to clay
29.692	14.74	0.6291	4.269	-2.056	14	3	clay
29.856	21.47	0.6302	2.935	-1.429	10	5	clayey silt to silty clay
30.020	26.87	0.7024	2.614	-1.298	13	5	clayey silt to silty clay
30.184	24.10	0.6654	2.761	-0.933	12	5	clayey silt to silty clay
30.348	21.54	0.3429	1.591	-0.969	8	6	sandy silt to clayey silt
30.512	16.62	0.2593	1.560	-0.816	6	6	sandy silt to clayey silt
30.676	15.58	0.5606	3.597	-0.670	10	4	silty clay to clay
30.840	38.40	0.5080	1.323	-0.389	12	7	silty sand to sandy silt
31.004	19.87	0.3514	1.768	-1.004	8	6	sandy silt to clayey silt
31.168	13.87	0.1656	1.194	-0.964	5	6	sandy silt to clayey silt
31.332	12.66	0.2345	1.852	-0.778	6	5	clayey silt to silty clay
31.496	15.40	0.3281	2.130	-0.499	7	5	clayey silt to silty clay
31.660	22.37	0.3540	1.582	-0.432	9	6	sandy silt to clayey silt
31.824	23.12	0.4856	2.100	-0.675	9	6	sandy silt to clayey silt
31.988	17.85	0.4148	2.323	-0.756	9	5	clayey silt to silty clay
32.152	16.13	0.2985	1.851	-0.518	8	5	clayey silt to silty clay
32.316	26.10	0.4669	1.789	-0.615	10	6	sandy silt to clayey silt
32.480	27.32	0.5922	2.167	-0.563	10	6	sandy silt to clayey silt
32.644	17.75	0.4262	2.401	-0.615	9	5	clayey silt to silty clay
32.808	11.85	0.3140	2.650	-0.429	8	4	silty clay to clay
32.972	12.03	0.3757	3.124	0.346	8	4	silty clay to clay
33.136	26.74	0.7134	2.668	1.007	13	5	clayey silt to silty clay
33.301	40.19	0.7977	1.985	0.608	15	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
33.465	55.72	0.8002	1.436	-0.239	18	7	silty sand to sandy silt
33.629	69.87	0.9174	1.313	-1.229	22	7	silty sand to sandy silt
33.793	73.78	1.1441	1.551	-1.481	24	7	silty sand to sandy silt
33.957	72.30	1.1919	1.649	-1.594	23	7	silty sand to sandy silt
34.121	67.30	1.1344	1.686	-1.658	21	7	silty sand to sandy silt
34.285	57.30	1.2234	2.135	-1.508	22	6	sandy silt to clayey silt
34.449	48.26	1.3049	2.704	-1.345	18	6	sandy silt to clayey silt
34.613	32.22	1.3293	4.126	-1.291	21	4	silty clay to clay
34.777	24.83	0.9484	3.820	-1.083	16	4	silty clay to clay
34.941	42.95	1.0137	2.360	-0.499	16	6	sandy silt to clayey silt
35.105	55.80	1.4088	2.525	-0.840	21	6	sandy silt to clayey silt
35.269	58.66	1.4897	2.540	-1.355	22	6	sandy silt to clayey silt
35.433	46.94	1.1250	2.397	-1.543	18	6	sandy silt to clayey silt
35.597	26.95	0.8109	3.009	-1.811	13	5	clayey silt to silty clay
35.761	14.46	0.3781	2.615	-2.030	7	5	clayey silt to silty clay
35.925	14.41	0.2454	1.703	-1.722	7	5	clayey silt to silty clay
36.089	14.08	0.4104	2.915	-1.241	7	5	clayey silt to silty clay
36.253	18.07	0.7063	3.909	-0.592	12	4	silty clay to clay
36.417	29.33	1.2077	4.118	-0.036	19	4	silty clay to clay
36.581	34.54	1.1805	3.418	-0.129	17	5	clayey silt to silty clay
36.745	48.76	1.0733	2.201	-0.363	19	6	sandy silt to clayey silt
36.909	58.52	0.7415	1.267	-1.143	19	7	silty sand to sandy silt
37.073	62.61	0.8821	1.409	-1.970	20	7	silty sand to sandy silt
37.238	63.10	1.2851	2.037	-2.176	20	7	silty sand to sandy silt
37.402	60.12	1.3359	2.222	-2.183	23	6	sandy silt to clayey silt
37.566	51.89	1.3458	2.594	-1.942	20	6	sandy silt to clayey silt
37.730	42.25	1.3583	3.215	-1.925	20	5	clayey silt to silty clay
37.894	31.09	1.1687	3.759	-1.727	15	5	clayey silt to silty clay
38.058	17.24	0.6329	3.671	-1.481	11	4	silty clay to clay
38.222	13.15	0.5965	4.535	-0.208	13	3	clay
38.386	20.99	1.4438	6.879	6.203	20	3	clay
38.550	59.11	2.4877	4.209	13.443	28	5	clayey silt to silty clay
38.714	57.27	3.2200	5.622	8.676	55	3	clay
38.878	63.74	3.3161	5.203	8.879	61	11	very stiff fine grained (*)
39.042	58.83	2.9721	5.052	5.332	38	4	silty clay to clay
39.206	64.41	2.4638	3.825	3.395	31	5	clayey silt to silty clay
39.370	67.76	2.0729	3.059	-0.448	26	6	sandy silt to clayey silt
39.534	74.07	1.2450	1.681	-5.859	24	7	silty sand to sandy silt
39.698	83.32	1.2075	1.449	-7.324	27	7	silty sand to sandy silt
39.862	90.38	1.3784	1.525	-7.286	29	7	silty sand to sandy silt
40.026	89.85	1.6360	1.821	-7.286	29	7	silty sand to sandy silt
40.190	88.67	1.8123	2.044	-7.092	28	7	silty sand to sandy silt
40.354	85.42	1.7939	2.100	-6.954	27	7	silty sand to sandy silt
40.518	81.86	1.8000	2.199	-6.770	26	7	silty sand to sandy silt
40.682	77.30	1.9106	2.472	-6.389	30	6	sandy silt to clayey silt
40.846	44.11	1.7919	4.062	-6.088	21	5	clayey silt to silty clay
41.011	28.17	1.6981	6.029	-5.687	27	3	clay
41.175	24.79	1.9524	7.875	-1.491	24	3	clay
41.339	78.77	3.2032	4.067	3.316	38	5	clayey silt to silty clay
41.503	105.42	4.9791	4.723	2.495	101	11	very stiff fine grained (*)
41.667	113.31	5.5155	4.868	0.396	109	11	very stiff fine grained (*)
41.831	89.34	5.0338	5.634	-0.685	86	11	very stiff fine grained (*)
41.995	93.38	3.6769	3.937	-0.897	45	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
42.159	87.50	2.1952	2.509	-1.932	34	6	sandy silt to clayey silt
42.323	58.24	1.8486	3.174	-2.920	22	6	sandy silt to clayey silt
42.487	35.98	2.0145	5.599	-3.159	34	3	clay
42.651	92.29	2.3604	2.558	-2.603	35	6	sandy silt to clayey silt
42.815	153.20	2.4998	1.632	-2.698	37	8	sand to silty sand
42.979	160.44	2.3360	1.456	-3.624	38	8	sand to silty sand
43.143	140.78	2.2298	1.584	-3.979	34	8	sand to silty sand
43.307	97.58	2.3884	2.448	-4.342	31	7	silty sand to sandy silt
43.471	57.50	2.5248	4.391	-4.270	37	4	silty clay to clay
43.635	40.57	2.0766	5.119	-4.020	39	3	clay
43.799	52.90	3.0128	5.695	-3.213	51	3	clay
43.963	71.07	3.4163	4.807	-2.550	68	11	very stiff fine grained (*)
44.127	79.17	2.9161	3.683	-2.531	38	5	clayey silt to silty clay
44.291	61.72	1.8044	2.924	-3.244	24	6	sandy silt to clayey silt
44.455	29.86	1.0312	3.453	-4.039	14	5	clayey silt to silty clay
44.619	19.27	0.2954	1.533	-4.571	7	6	sandy silt to clayey silt
44.783	12.70	0.4616	3.634	-3.993	8	4	silty clay to clay
44.948	23.01	0.8302	3.608	-3.068	15	4	silty clay to clay
45.112	42.55	1.4290	3.358	-2.677	20	5	clayey silt to silty clay
45.276	49.86	1.5868	3.183	-3.113	24	5	clayey silt to silty clay
45.440	48.55	1.9701	4.058	-3.445	23	5	clayey silt to silty clay
45.604	49.96	2.0537	4.110	-3.213	24	5	clayey silt to silty clay
45.768	53.59	1.8214	3.399	-3.199	26	5	clayey silt to silty clay
45.932	56.74	1.1899	2.097	-3.359	22	6	sandy silt to clayey silt
46.096	59.41	0.6959	1.171	-4.327	19	7	silty sand to sandy silt
46.260	60.47	0.6512	1.077	-4.714	19	7	silty sand to sandy silt
46.424	57.90	0.8463	1.462	-4.671	18	7	silty sand to sandy silt
46.588	44.78	1.1633	2.598	-4.628	17	6	sandy silt to clayey silt
46.752	27.49	1.0975	3.993	-4.256	18	4	silty clay to clay
46.916	17.75	0.5651	3.183	-3.803	8	5	clayey silt to silty clay
47.080	15.45	0.1181	0.764	-1.639	6	6	sandy silt to clayey silt
47.244	16.96	0.4103	2.420	-0.654	8	5	clayey silt to silty clay
47.408	26.59	1.0806	4.064	3.123	17	4	silty clay to clay
47.572	51.03	1.9474	3.816	4.394	24	5	clayey silt to silty clay
47.736	52.71	2.3855	4.526	5.198	34	4	silty clay to clay
47.900	53.55	1.9617	3.663	4.473	26	5	clayey silt to silty clay
48.064	51.31	1.5884	3.096	-0.146	20	6	sandy silt to clayey silt
48.228	44.58	1.2232	2.744	-2.080	17	6	sandy silt to clayey silt
48.392	35.65	0.7900	2.216	-2.536	14	6	sandy silt to clayey silt
48.556	27.26	0.4202	1.541	-2.142	10	6	sandy silt to clayey silt
48.720	21.69	0.3138	1.447	-1.539	8	6	sandy silt to clayey silt
48.885	16.81	0.4609	2.743	-0.258	8	5	clayey silt to silty clay
49.049	22.06	0.7511	3.404	1.684	11	5	clayey silt to silty clay
49.213	25.52	0.8178	3.205	3.397	12	5	clayey silt to silty clay
49.377	21.05	0.8227	3.908	3.545	13	4	silty clay to clay
49.541	22.02	0.7556	3.432	4.392	11	5	clayey silt to silty clay
49.705	18.78	0.4607	2.453	4.843	9	5	clayey silt to silty clay
49.869	17.62	0.4247	2.410	5.255	8	5	clayey silt to silty clay
50.033	23.46	0.8705	3.711	8.051	15	4	silty clay to clay
50.197	39.12	1.2815	3.275	8.245	19	5	clayey silt to silty clay
50.361	42.15	1.1446	2.716	6.727	16	6	sandy silt to clayey silt
50.525	41.67	0.9145	2.194	2.197	16	6	sandy silt to clayey silt
50.689	17.06	0.6402	3.752	3.481	11	4	silty clay to clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
50.853	22.18	0.4588	2.069	5.255	8	6	sandy silt to clayey silt
51.017	17.25	0.3303	1.915	5.833	8	5	clayey silt to silty clay
51.181	15.96	0.2333	1.462	7.558	6	6	sandy silt to clayey silt
51.345	13.78	0.2298	1.668	9.523	7	5	clayey silt to silty clay
51.509	17.88	0.1818	1.017	11.699	7	6	sandy silt to clayey silt
51.673	15.32	0.2272	1.483	14.490	6	6	sandy silt to clayey silt
51.837	18.92	0.2465	1.303	17.040	7	6	sandy silt to clayey silt
52.001	18.19	0.2900	1.594	18.233	7	6	sandy silt to clayey silt
52.165	15.09	0.2996	1.985	22.424	7	5	clayey silt to silty clay
52.329	14.54	0.2574	1.770	28.844	7	5	clayey silt to silty clay
52.493	20.00	0.4255	2.127	34.892	10	5	clayey silt to silty clay
52.657	31.16	1.0568	3.392	43.797	15	5	clayey silt to silty clay
52.822	44.04	1.5819	3.592	50.527	21	5	clayey silt to silty clay
52.986	45.25	1.8241	4.031	39.667	22	5	clayey silt to silty clay
53.150	36.51	1.3890	3.805	28.357	17	5	clayey silt to silty clay
53.314	25.80	1.0815	4.191	22.205	16	4	silty clay to clay
53.478	22.82	0.7928	3.475	32.721	11	5	clayey silt to silty clay
53.642	32.53	1.1113	3.416	44.474	16	5	clayey silt to silty clay
53.806	38.35	1.1646	3.037	43.542	18	5	clayey silt to silty clay
53.970	31.35	1.2541	4.000	20.304	20	4	silty clay to clay
54.134	45.17	1.7139	3.795	20.132	22	5	clayey silt to silty clay
54.298	36.31	1.3244	3.648	8.633	17	5	clayey silt to silty clay
54.462	24.43	0.8072	3.305	7.980	12	5	clayey silt to silty clay
54.626	20.36	0.6445	3.166	11.825	10	5	clayey silt to silty clay
54.790	24.83	0.5956	2.399	15.103	10	6	sandy silt to clayey silt
54.954	22.14	0.6474	2.924	15.762	11	5	clayey silt to silty clay
55.118	22.97	0.4324	1.882	18.848	9	6	sandy silt to clayey silt
55.282	18.41	0.4474	2.430	20.590	9	5	clayey silt to silty clay
55.446	20.93	0.4243	2.027	28.002	8	6	sandy silt to clayey silt
55.610	21.30	0.5372	2.522	30.850	10	5	clayey silt to silty clay
55.774	20.95	0.4946	2.361	30.674	10	5	clayey silt to silty clay
55.938	23.98	0.4818	2.009	39.348	9	6	sandy silt to clayey silt
56.102	26.86	0.4152	1.546	36.976	10	6	sandy silt to clayey silt
56.266	21.00	0.3547	1.689	38.811	8	6	sandy silt to clayey silt
56.430	17.77	0.1508	0.848	46.734	7	6	sandy silt to clayey silt
56.594	14.89	0.1039	0.698	50.772	6	6	sandy silt to clayey silt
56.759	17.39	0.2993	1.721	69.418	7	6	sandy silt to clayey silt
56.923	31.53	1.1767	3.732	81.103	15	5	clayey silt to silty clay
57.087	41.23	1.1449	2.777	73.862	16	6	sandy silt to clayey silt
57.251	38.75	0.9680	2.498	89.757	15	6	sandy silt to clayey silt
57.415	38.70	0.9807	2.534	95.478	15	6	sandy silt to clayey silt
57.579	41.23	1.1432	2.773	116.364	16	6	sandy silt to clayey silt
57.743	49.54	1.4528	2.932	93.789	19	6	sandy silt to clayey silt
57.907	47.72	1.8471	3.871	66.283	23	5	clayey silt to silty clay
58.071	42.13	1.9317	4.585	54.024	27	4	silty clay to clay
58.235	38.13	1.9902	5.220	45.185	37	3	clay
58.399	36.42	2.0816	5.716	45.574	35	3	clay
58.563	37.27	2.0405	5.475	39.505	36	3	clay
58.727	36.38	1.9695	5.414	38.060	35	3	clay
58.891	36.74	1.8407	5.011	45.157	35	3	clay
59.055	37.13	1.7896	4.820	44.343	36	3	clay
59.219	34.94	1.8002	5.153	43.919	33	3	clay
59.383	32.51	1.5375	4.730	44.474	31	3	clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) (tsf)	FR (Fs/Qt) (%)	PP (U2) (psi)	SPT N60 (UNITLESS)	Zone	Soil Behavior Type UBC-1983
59.547	31.86	1.5373	4.825	44.377	31	3	clay
59.711	32.03	1.5654	4.887	42.800	31	3	clay
59.875	30.88	1.4569	4.717	41.531	30	3	clay
60.039	31.57	1.4089	4.462	42.840	20	4	silty clay to clay
60.203	32.41	1.2831	3.958	44.021	21	4	silty clay to clay
60.367	34.42	1.3197	3.834	43.737	16	5	clayey silt to silty clay
60.532	33.65	1.3438	3.994	54.332	21	4	silty clay to clay
60.696	35.37	1.3642	3.856	54.651	17	5	clayey silt to silty clay
60.860	33.90	1.3197	3.893	58.740	16	5	clayey silt to silty clay
61.024	33.23	1.3337	4.014	61.875	21	4	silty clay to clay
61.188	35.98	1.3336	3.707	61.581	17	5	clayey silt to silty clay
61.352	34.31	1.3790	4.020	62.607	22	4	silty clay to clay
61.516	34.52	1.3187	3.820	64.141	17	5	clayey silt to silty clay
61.680	34.30	1.3584	3.960	60.830	22	4	silty clay to clay
61.844	34.64	1.5718	4.538	48.434	22	4	silty clay to clay
62.008	35.15	1.5636	4.449	39.279	22	4	silty clay to clay
62.172	31.62	1.3043	4.125	42.122	20	4	silty clay to clay
62.336	30.82	1.1413	3.704	44.656	15	5	clayey silt to silty clay
62.500	31.06	1.2667	4.079	47.771	20	4	silty clay to clay
62.664	30.45	1.2851	4.220	50.524	19	4	silty clay to clay
62.828	32.01	1.3000	4.062	53.902	20	4	silty clay to clay
62.992	34.17	1.3534	3.961	56.927	22	4	silty clay to clay
63.156	35.85	1.4993	4.182	62.576	23	4	silty clay to clay
63.320	34.85	1.5813	4.537	65.625	22	4	silty clay to clay
63.484	36.99	1.4635	3.956	64.470	18	5	clayey silt to silty clay
63.648	34.83	1.3150	3.776	64.921	17	5	clayey silt to silty clay
63.812	35.88	1.2788	3.565	68.232	17	5	clayey silt to silty clay
63.976	36.02	1.3100	3.636	62.288	17	5	clayey silt to silty clay
64.140	36.57	1.3685	3.742	66.441	18	5	clayey silt to silty clay
64.304	35.69	1.4965	4.193	66.765	23	4	silty clay to clay
64.469	35.84	1.4792	4.127	62.452	23	4	silty clay to clay
64.633	37.04	1.5192	4.102	59.771	24	4	silty clay to clay
64.797	37.21	1.4105	3.791	60.563	18	5	clayey silt to silty clay
64.961	37.69	1.5462	4.103	64.277	24	4	silty clay to clay
65.125	42.07	1.7310	4.115	63.633	20	5	clayey silt to silty clay
65.289	44.24	1.8263	4.128	54.508	21	5	clayey silt to silty clay
65.453	45.84	1.8815	4.104	52.674	22	5	clayey silt to silty clay
65.617	46.29	1.9723	4.261	54.310	30	4	silty clay to clay
65.781	44.98	1.9784	4.399	64.866	29	4	silty clay to clay
65.945	46.04	1.9568	4.251	71.047	29	4	silty clay to clay
66.109	49.77	2.1048	4.229	79.912	24	5	clayey silt to silty clay
66.273	55.05	2.4558	4.461	81.813	35	4	silty clay to clay
66.437	58.50	2.7750	4.744	84.719	37	4	silty clay to clay
66.601	62.41	2.7191	4.357	106.631	30	5	clayey silt to silty clay
66.765	58.47	2.0453	3.498	114.861	28	5	clayey silt to silty clay
66.929	50.00	1.8587	3.718	90.161	24	5	clayey silt to silty clay
67.093	38.51	1.5425	4.006	65.401	18	5	clayey silt to silty clay
67.257	37.38	1.3676	3.659	74.392	18	5	clayey silt to silty clay
67.421	37.17	1.2422	3.342	78.311	18	5	clayey silt to silty clay
67.585	41.14	1.2265	2.981	84.784	16	6	sandy silt to clayey silt
67.749	43.23	1.2056	2.789	87.288	17	6	sandy silt to clayey silt
67.913	41.93	1.2003	2.863	81.131	16	6	sandy silt to clayey silt
68.077	40.50	1.2603	3.112	82.193	19	5	clayey silt to silty clay

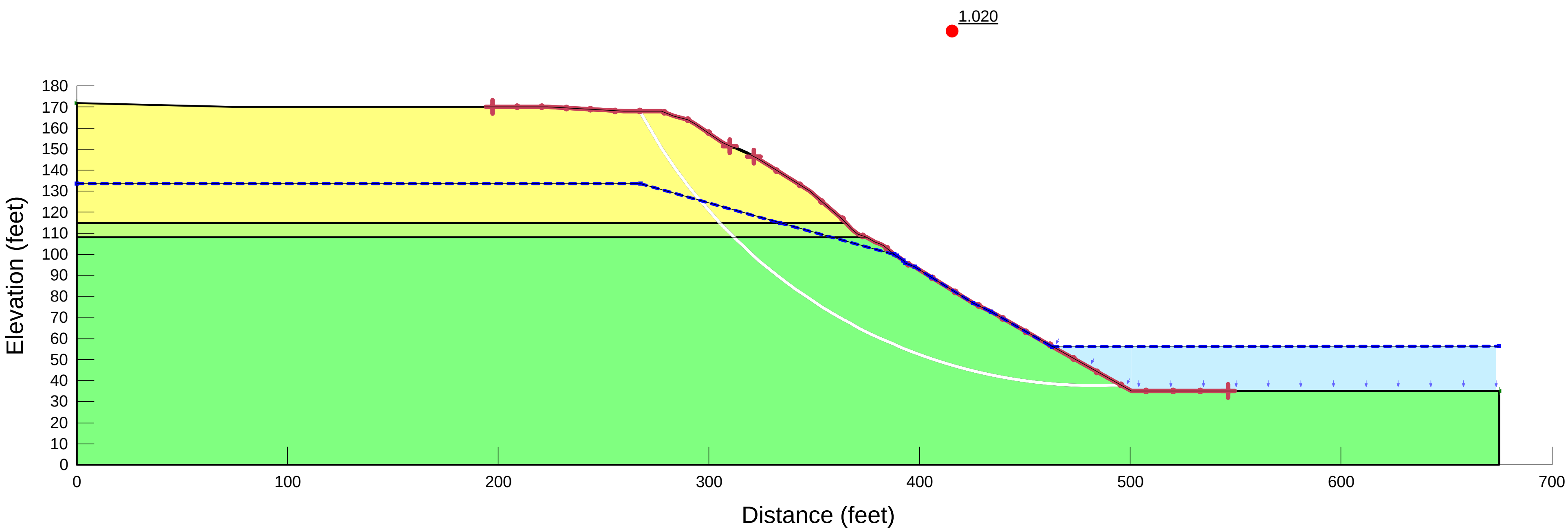
APPENDIX B: SLOPE STABILITY SUMMARY RESULTS

Appendix B

Slope Stability Summary Results

Figures

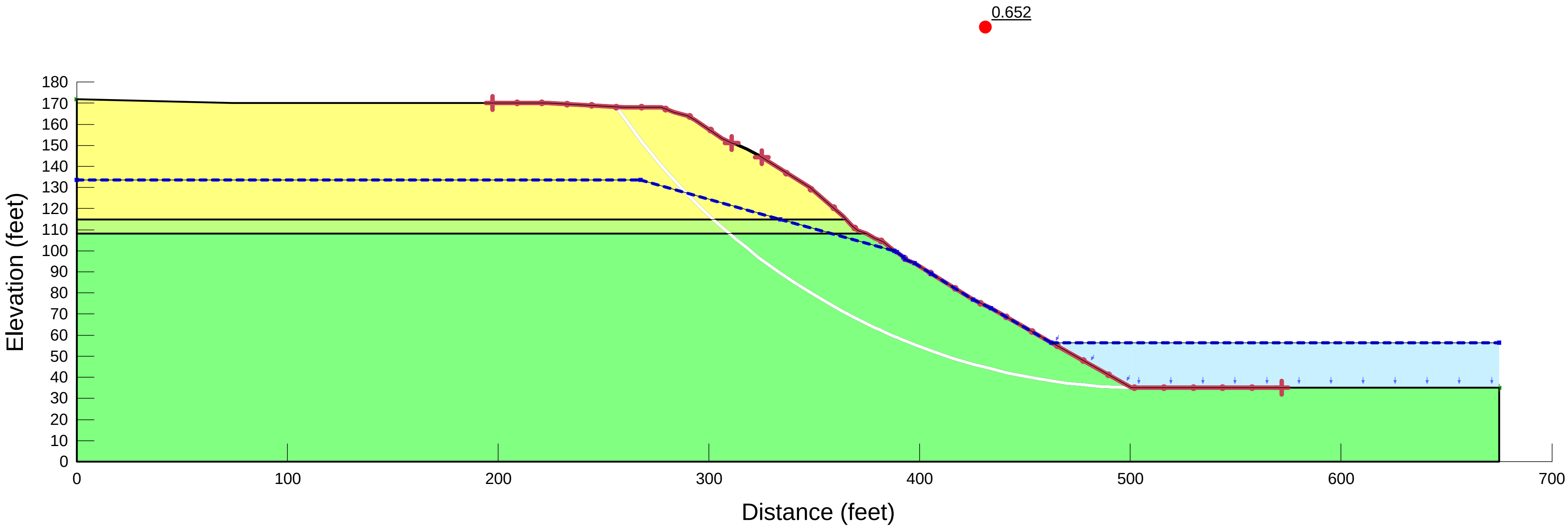
101895 - City of Newberg Water System Resilience
Figure B-1 - Static Slope Stability



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	FG-MFD	Mohr-Coulomb	110	100	28	0	1
	FG-MFD_Clay	Mohr-Coulomb	110	200	30	0	1
	Hillsboro	Mohr-Coulomb	120	600	32	0	1

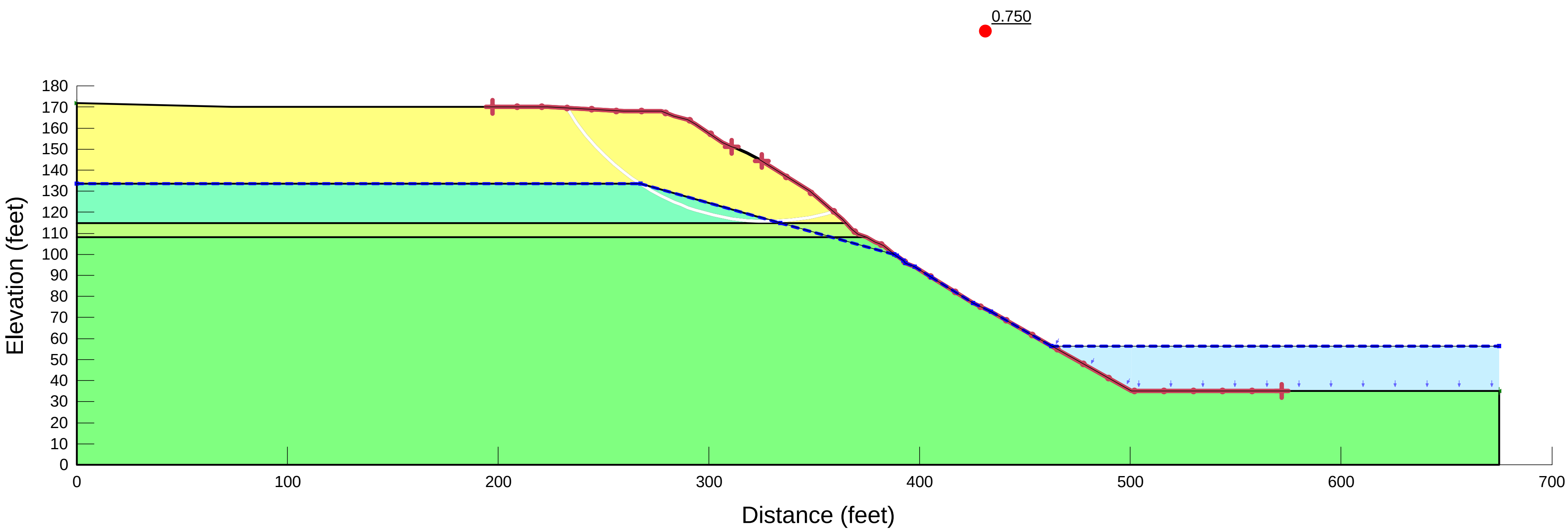
101895 - City of Newberg Water System Resilience
Figure B-2 - Seismic Slope Stability

Horz Seismic Coef.: 0.237



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	FG-MFD	Mohr-Coulomb	110	100	28	0	1
	FG-MFD_Clay	Mohr-Coulomb	110	200	30	0	1
	Hillsboro	Mohr-Coulomb	120	600	32	0	1

101895 - City of Newberg Water System Resilience
Figure B-3 - Post-Seismic Slope Stability



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	FG-MFD	Mohr-Coulomb	110	100	28	0	1
	FG-MFD_Clay	Mohr-Coulomb	110	200	30	0	1
	FG-MFD_Liquefied	Mohr-Coulomb	110	10	4	0	1
	Hillsboro	Mohr-Coulomb	120	600	32	0	1

IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

IMPORTANT INFORMATION

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining

IMPORTANT INFORMATION

your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Appendix C:
Vulnerability Assessments

WATER SYSTEM SEISMIC RESILIENCE STUDY

CITY OF NEWBERG PUBLIC WORKS DEPARTMENT
NEWBERG, OREGON

Final Technical Memorandum: Seismic Vulnerability Assessment of Water System

July 2nd, 2020
SEFT Project Number: B19009.00

SEFT Consulting Group
4800 SW Griffith Drive, Suite 100
Beaverton, OR 97005

Table of Contents

List of Figures

List of Tables

1.0 Introduction and Background

1.1 City of Newberg Water System Description

The City of Newberg water system currently consists of the City's wellfield, raw water transmission pipelines, water treatment plant, three water storage reservoirs, one pump station, and distribution system pipelines. The entire water service area is one pressure zone, except for approximately 40 customers that are served by the Oak Knoll booster pump station. The system uses approximately 56 miles of distribution pipelines to provide water to business and residential customers within the City of Newberg service area and six small water district wholesale customers. The primary water supply is the City's well field located on the south side of the Willamette River in Marion County. Two raw water transmission mains cross the river to the treatment plant. An under river 30-inch diameter high density polyethylene transmission main can supply 100% of the treatment plant capacity. An older 24-inch diameter cast iron transmission main is supported by a decommissioned highway bridge. The City's water treatment plant is a conventional filtration facility with a nominal capacity of 9 million gallons per day (MGD). The current average day demand for the water system is approximately 2.4 MGD and summertime demands can increase to approximately 4.5 MGD.

1.2 Seismic Resilience Study

Based on recommendations contained in the 2017 City of Newberg Water Master Plan and requirements of the Oregon Health Authority, the City of Newberg is conducting a water system seismic resilience study. This study will evaluate the expected performance of the City water system following a Magnitude 9.0 (M9.0) Cascadia Subduction Zone (CSZ) earthquake and identify preliminary recommendations for improvements that should be implemented to enable the City to more rapidly restore water service after a major earthquake, to meet community social and economic needs. The scope of this seismic resilience study includes:

1. Define water system level of service (LOS) goals for the City water system following a major seismic event;
2. Identify key backbone system components that are required to achieve these LOS goals, including the locations of key supply points for water for fire suppression and community water distribution;
3. Define performance criteria for individual system components that are required to achieve these LOS goals;
4. Conduct a limited geotechnical seismic hazards evaluation for the City water system and slope stability analysis at the water treatment plant site (Shannon & Wilson);
5. Conduct a limited well/pipeline (HDR), and structural/nonstructural (SEFT/HDR) vulnerability assessment to determine estimated system performance following a M9.0 CSZ earthquake;

6. Identify gaps between the LOS goals and current performance estimates; and
7. Develop preliminary mitigation recommendations to close these gaps utilizing new or retrofit infrastructure, changes to design standards, enhancements in emergency response planning, and recommendations for further study.

This Technical Memorandum (TM) presents SEFT's findings related to scope item 5. The components of the water system that have been evaluated by SEFT as part of this effort are summarized in Table 1.1. The locations of these components are illustrated in Figure 1.1. To complete this scope of work, SEFT utilized the Task 2 TM (Seismic Recovery Goals) and Task 3 TM (Seismic Hazards Summary), completed as part of this project, and the as-built drawings indicated in Table 1.2.

Table 1.1 – Summary of Water System Components Evaluated by SEFT

Water System Component	Structure Type	Year of Original Construction
Corral Creek Road Reservoir		
4.0 MG Reservoir	Strand-Wound Circular Prestressed Concrete	2004
North Valley Reservoirs		
4.0 MG Reservoir No.1	Strand-Wound Circular Prestressed Concrete	1961
4.0 MG Reservoir No.2	Strand-Wound Circular Prestressed Concrete	1977
Water Treatment Plant		
Original Treatment/Control Building	Reinforced concrete	pre-1961
1961 Treatment/Control Building Addition	Reinforced concrete	1961
1970 Treatment/Control Building Addition	Reinforced concrete	1970
Sedimentation Basin No.1	Reinforced concrete	1961
Filters No.1 and 2, Filter Gallery, Pump Room, Clearwell, and Filters No. 3 and 4 Addition	Reinforced concrete	1970 1980 (Filters No. 3 and 4)
Sodium Hypochlorite Generation Building	Steel Moment Resisting Frame (North-South) and Steel Brace Frame (East-West)	2005

Table 1.2 – Evaluation Documents

As-Built Drawings	Water System Component
Corral Creek Road Reservoir	
"4.0 Million Gallon Corral Creek Road Reservoir (A2004001)" prepared by CH2MHill, dated April 2002	• Corral Creek Road Reservoir
North Valley Reservoirs	
"North Valley 4.0 MG West Reservoir (A600001)" prepared by Carl E. Green & Associates Consulting Engineers, dated August 1960	• North Valley Reservoir No.1
"Site Work For Reservoir No.2 (A770016)" prepared by Robert E. Meyer Engineers Inc., dated November 1977	• North Valley Reservoir No.2
"North Valley and Corral Creek Reservoirs Seismic Upgrades (A2016007)" prepared by Kennedy/Jenks Consultants, dated September 2015	• Modifications in North Valley Reservoir No.1 • Modifications and seismic upgrade of North Valley Reservoir No.2
Water Treatment Plant	
"Water Treatment Plant (A500002)" prepared by John Cunningham & Associates Consulting Engineers, dated December 1950	• Not applicable (1)
"Water Treatment Plant Addition (A610001)" prepared by Carl E. Green & Associates Consulting Engineers, dated April 1961	• Treatment/Control Building (1961 Addition) • Sedimentation Basin No.1
"Water Treatment Plant (A700004)" prepared by CH2M, dated July 1970	• Treatment/Control Building (1970 Addition) • Filters No.1 and 2, Filter Gallery, Pump Room, and Clearwell
"Water Treatment Plant Expansion (A800027)" prepared by Kramer, Chin & Mayo, Inc. Consulting Engineers, dated July 1980	• Filters No. 3 and 4
"Water Treatment Plant Improvements Project (A2002014)" prepared by MWH, dated September 2002	• Modifications to Filters No. 1 to 4 and Filter Gallery
"Water Treatment Plant Expansion to 9.5 MGD (A2007005)" prepared by CH2MHill, dated March 2005	• Sodium Hypochlorite Generation Building • Modifications to Filters No. 1 to 4, Treatment/ Control Building, and Sedimentation Basin No.1

Notes:
(1) The geometry and location of the structures shown in these drawings are inconsistent with current plant layout.

Figure 1.1 – City of Newberg Water System General Location Map

2.0 Evaluation Methodology and Seismic Performance Objectives

2.1 Seismic Hazard

This evaluation considered a single seismic hazard level associated with a M9.0 scenario earthquake originating on the Cascadia Subduction Zone (CSZ). As part of this project, Shannon and Wilson, Inc. conducted a geotechnical seismic hazard assessment (Shannon & Wilson, 2019). In their report, Shannon & Wilson provided estimates of the spectral acceleration and permeant ground deformation (PGD) for liquefaction-induced settlement, liquefaction-induced lateral spreading, and earthquake-induced landslide associated with the M9.0 CSZ scenario earthquake. This geotechnical data was used as the basis for SEFT's structural evaluation.

2.2 Seismic Performance Objectives

In the initial phase of this project, the HDR/SEFT team worked with the City of Newberg to establish proposed level of service (LOS) goals for the City of Newberg water system following a major earthquake as described in SEFT (2019). The structural and nonstructural performance objectives used for evaluation of water system components for the M9.0 CSZ scenario earthquake were based on these LOS goals and are described in Sections 2.2.1 and 2.2.2.

2.2.1 Structural Performance Objective

Immediate Occupancy: "Immediate Occupancy" refers to the post-earthquake damage state in which only very limited structural damage has occurred. The basic vertical- and lateral-force-resisting systems of the building retain almost all their pre-earthquake strength and stiffness. The risk of life-threatening injury from structural damage is very low, and although some minor structural repairs might be appropriate, these repairs would generally not be required before re-occupancy. Continued use of the building is not limited by its structural condition but might be limited by damage or disruption to nonstructural elements of the building, furnishings, or equipment and availability of external utility services.

2.2.2 Nonstructural Performance Objectives

Operational: "Operational" refers to the performance level where most nonstructural systems required for normal use of the building are functional, although minor cleanup and repair of some items might be required. Achieving the Operational nonstructural performance level requires considerations of many elements beyond those that are normally within the sole province of the structural engineer's responsibilities. For Operational nonstructural performance, in addition to ensuring that nonstructural components are properly mounted and braced within the structure, it is often necessary to provide emergency standby equipment to provide utility services from external sources that might be disrupted. It might also be necessary to perform qualification testing to ensure that all necessary equipment will function during or after strong shaking.

2.3 Water System Evaluation Methodology

The seismic structural evaluation of components within the City of Newberg water system was completed using the Tier 1 procedure of ASCE 41-17, *Seismic Evaluation and Retrofit of Existing Buildings* (ASCE, 2017b). This Tier 1 procedure uses a checklist-based approach to identify potential seismic structural deficiencies that have been commonly observed in past earthquakes. The Tier 1 procedure also uses quick-check calculations to evaluate potential deficiencies in the primary components of the seismic load resisting system.

However, ASCE 41-17 does not include quick-check calculations and acceptance criteria that are directly applicable to the reservoirs evaluated as part of this study. Therefore, in place of these quick-check calculations, American Water Works Association (AWWA) standard design checks were evaluated for primary components of the seismic load path (circumferential strand, seismic cables, etc.). The calculation of seismic forces acting on the reservoirs has been based on the applicable AWWA standard. Concrete tank seismic loads were based on AWWA D110-13, *Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks* (AWWA, 2013).

Freeboard calculations where completed based on both the applicable AWWA design standard and ASCE 7-16, *Minimum Design Loads for Buildings and Other Structures* (ASCE, 2017a). The required freeboard calculated using ASCE 7-16 varies from that calculated using the AWWA standards. This study used the more conservative of the freeboard estimates calculated using both methods. The recommended freeboard calculations used a seismic importance factor equal to 1.0, as indicated in the applicable standards. In order to ensure Immediate Occupancy structural performance for the M9.0 CSZ event, we have increased the calculated freeboard values by a factor equal to 1.5.

The seismic nonstructural evaluation of components within the City of Newberg water system was completed using the nonstructural seismic evaluation checklists presented in ASCE 41-17 supplemented by TCLEE Monograph No. 22, *Seismic Screening Checklists for Water and Wastewater Facilities* (TCLEE, 2002). Similar to the ASCE 41 Tier 1 structural evaluation procedure, this checklist-based evaluation approach is used to identify potential seismic nonstructural deficiencies that have been commonly observed in past earthquakes.

3.0 Expected Seismic Structural and Nonstructural Performance

The expected structural and nonstructural seismic performance of the City of Newberg water system components has been evaluated for a M9.0 CSZ scenario earthquake. Sections 3.1 through 3.4 provide a short narrative description of the water system component evaluated, followed by a table that summarizes the potential seismic structural and nonstructural deficiencies identified by the seismic evaluation using the ASCE 41-17 Tier 1 and TCLEE Monograph No. 22 checklist-based procedures. These sections also include images from the as-built drawings where structural deficiencies are identified and selected photos taken during site visits conducted on August 9th and 16th, 2019.

3.1 Corral Creek Road Reservoir

The Corral Creek Road Reservoir, built in 2004, is a partially buried 4 million-gallon (MG) strand-wound circular prestressed concrete water tank with a nearly flat roof (see Figure 3.1). The tank is 138 ft. in diameter and approximately 40 ft. tall. The roof of the reservoir is supported by circular concrete columns. It is one of the three reservoirs that provide water storage for the city.

The circular concrete wall is reinforced with a combination of mild steel reinforcement, vertical post-tensioning bars and horizontal prestressing strands around the exterior surface to resist internal hydrostatic pressure and seismic forces. A continuous strip footing supports the exterior walls. The connection between the walls and footings is typically composed of a bearing pad and diagonal seismic cables that are anchored into the tank wall and foundation. The seismic cables are de-bonded at the wall to foundation interface. This connection allows the tank to shrink and swell radially, as needed to accommodate varying internal pressure due to changes in the water level inside the tank. The roof is connected to the walls using a series of shear keys constructed using vertical HSS posts designed to prevent the roof from sliding off the structure in an earthquake, but also allows the tank to shrink and swell radially.

An electrical panelboard and SCADA equipment is located adjacent to the reservoir in a metal electrical enclosure. The enclosure is covered by a canopy that is supported by steel tube section cantilever posts, as shown in Figure 3.2.

Table 3.1 presents a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.1, the Corral Creek Road Reservoir is currently expected to achieve Immediate Occupancy structural performance but is not currently expected to achieve Operational nonstructural performance for a M9.0 CSZ earthquake.

Table 3.1 – Corral Creek Road Reservoir Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Per Shannon & Wilson Report, minimal permanent ground deformation (PGD) is anticipated at the reservoir: 0 inches liquefaction induced settlement, 0-0.1 inches liquefaction-induced lateral spreading, and approximately 0.5 feet earthquake-induced landslide PGD near slope 100 feet from reservoir. This level of PGD is not anticipated to cause significant structural damage to the reservoir. However, the impact of earthquake-induced landslide PGD should be considered as a potential hazard for the buried pipelines that connect to the reservoir and are located in the potential landslide zone. • None Identified.
Nonstructural	• SCADA system backup batteries inside metal enclosure are not restrained. See Figure 3.3.

Figure 3.1 – Corral Creek Road Reservoir

Figure 3.2 – Electrical Panelboard and SCADA Equipment Enclosure and Canopy

Figure 3.3 – Unrestrained Backup Batteries

3.2 North Valley Reservoir No. 1

North Valley Reservoir No. 1, built in 1960, is a partially buried 4 MG strand-wound circular prestressed concrete water tank with a concrete dome roof, as shown in Figure 3.4. The tank is 144 ft. in diameter by approximately 52 ft. tall (at the dome center). At the middle of the reservoir, there is a 90 ft. diameter flat bottom slab that transitions to a sloped reservoir bottom (2 horizontal to 1 vertical) up to the top of the wall footing, approximately 13.5 ft. above the flat slab elevation, as can be observed in Figure 3.5. The maximum water surface is approximately 17 ft below the center of the dome, and 1 ft above the top of the walls. It is one of the three reservoirs that provide water storage for the city.

The circular concrete wall is reinforced with a combination of mild steel reinforcement, vertical post-tensioning bars and horizontal prestressing strand around the exterior surface to resist internal pressure. A continuous strip footing supports the exterior walls. The connection between the wall and footing is typically composed of a bearing pad and diagonal seismic cables that are anchored into the tank wall and foundation. The seismic cables are de-bonded at the wall to foundation interface. This connection allows the tank to shrink and swell radially, as needed to accommodate varying internal pressure due to changes in the water level inside the tank. The dome is anchored to the wall by 1 in diameter galvanized bolts (eight, equally spaced) with rubber pads in the interface.

An electrical panelboard, SCADA equipment, and analyzer equipment are located in the former Chlorination Building at the site, as shown in Figure 3.6. The building is a single-story minimally reinforced masonry wall structure with a straight-sheathed wood roof diaphragm.

Table 3.2 presents a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.2, the North Valley Reservoir No.1 is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake. Additionally, based on the potential deficiencies identified in this assessment, the former Chlorination Building is not currently expected to achieve Life Safety performance and represents a safety hazard to City staff and contractors.

Table 3.2 – North Valley Reservoir No. 1 Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Per Shannon & Wilson Report, minimal permanent ground deformation (PGD) is anticipated at the reservoir: 0.5-1.5 inches liquefaction induced settlement, 0-0.1 inches liquefaction-induced lateral spreading, and approximately 2 feet earthquake-induced landslide PGD near slope 150 feet from reservoir. This level of PGD may cause structural damage to and/or leaking of the reservoir. Additionally, the impact of earthquake-induced landslide PGD should be considered as a potential hazard for the buried pipelines that connect to the reservoir and are located in the potential landslide zone. • The number of dome anchors (8 anchors) is insufficient to transfer the expected seismic forces from the dome to the reservoir walls. See Figure 3.7. • The existing capacity of the horizontal prestressing on the wall of the reservoir is insufficient to resist the combination of hydrostatic and expected hydrodynamic hoop forces during the earthquake. • The seismic cables provided at the base of the wall are insufficient to resist the expected hydrodynamic forces at the base of the reservoir during an earthquake.
Nonstructural	• Reservoir vertical inlet nozzles are not braced and may not be adequate to resist earthquake-induced hydrodynamic forces. See Figure 3.8. • SCADA system and chemical analyzer equipment that is used for monitoring of reservoirs is located in the former Chlorination Building that would likely not perform well during an earthquake. • SCADA system backup batteries in the former Chlorinator Building are not adequately restrained to prevent movement during an earthquake. See Figure 3.9. • Friction Clips are used to restrain the SCADA antenna, see Figure 3.10. However, friction clips are generally not considered to be reliable to resist earthquake-induced forces.

Figure 3.4 – North Valley Reservoir No. 1

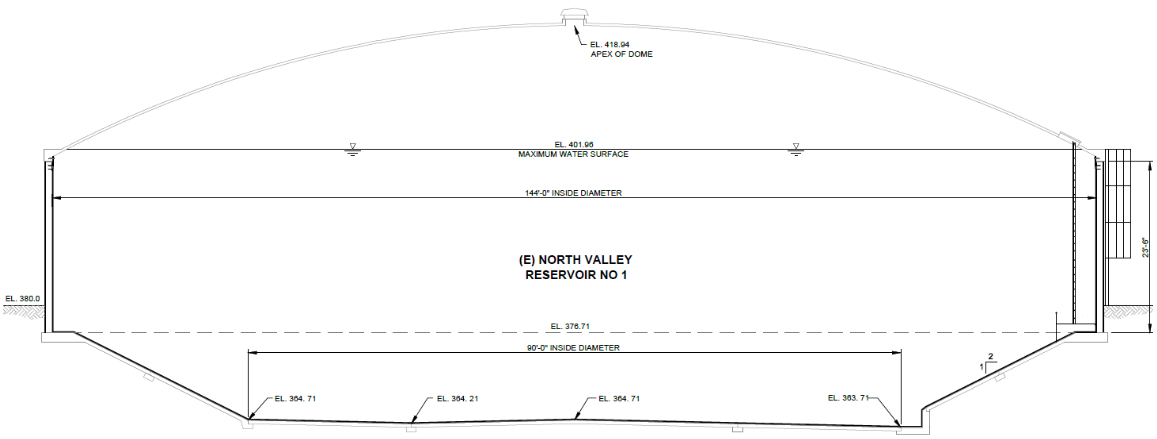


Figure 3.5 – North Valley Reservoir No. 1 Cross-Section (Source Drawings: "North Valley and Corral Creek Reservoirs Seismic Upgrades (A2016007)")

Figure 3.6 – Former Chlorination Building

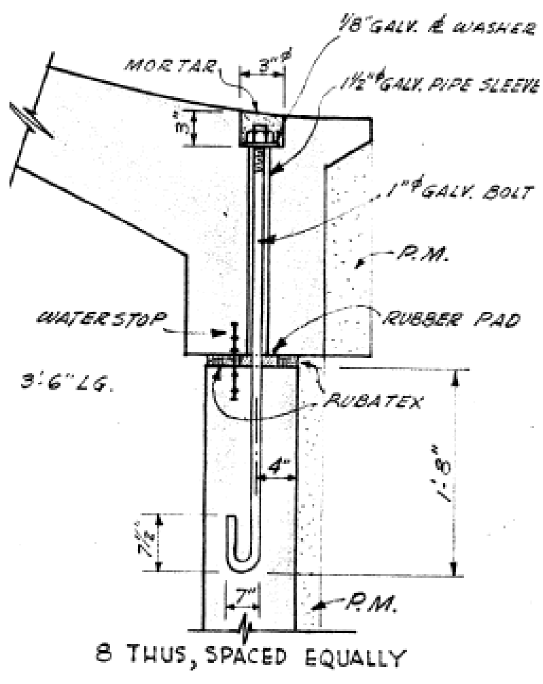


Figure 3.7 – Dome Anchor Detail
(Source Drawings: "North Valley 4.0 MG West Reservoir (A600001)")

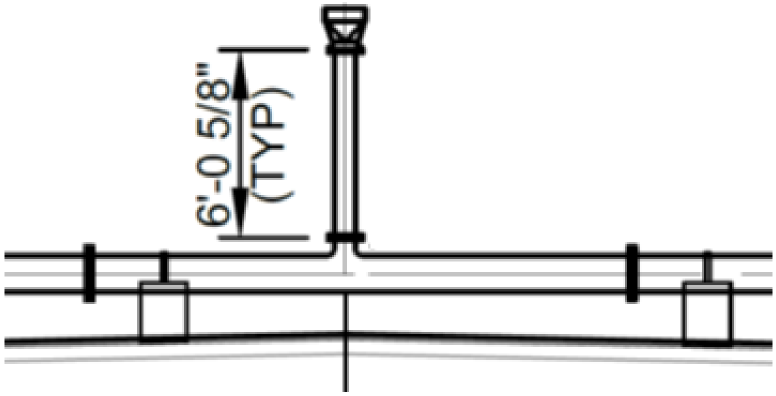


Figure 3.8 – Reservoir No. 1 Vertical Inlet Nozzles not Braced to Structure (Source Drawings: "North Valley and Corral Creek Reservoirs Seismic Upgrades (A2016007)")

Figure 3.9 – Backup Batteries not Adequately Restrained

Figure 3.10 – SCADA Antenna Supported with Friction Clips

3.3 North Valley Reservoir No. 2

North Valley Reservoir No. 2 is a partially buried 4 MG strand-wound circular prestressed concrete water tank with a concrete dome roof (see Figure 3.11). The reservoir was originally constructed in 1977 and seismically upgraded in 2015. The tank is 151 ft. in diameter by approximately 47 ft. tall (by the dome center). The maximum water surface is approximately 17 ft below the center of the dome. It is one of the three reservoirs that provide water storage for the city.

The circular concrete wall is reinforced with a combination of mild steel reinforcement, vertical post-tensioning bars and horizontal prestressing strand around the exterior surface to resist internal pressure. A continuous strip footing supports the exterior walls. The connection between the wall and footing is typically composed of a bearing pad and diagonal seismic cables that are anchored into the tank wall and foundation. The seismic cables are de-bonded at the wall to foundation interface. This connection allows the tank to shrink and swell radially, as needed to accommodate varying internal pressure due to changes in the water level inside the tank. The dome is connected to the walls through a continuous shear key to prevent the roof from sliding off the structure.

The recent seismic upgrade included providing additional horizontal prestress strands over the height of the ring beam at the top of the reservoir wall and strengthening the wall to foundation connection at 148 locations around the inside perimeter of the tank to prevent the reservoir from sliding during an earthquake. Design calculations from this 2015 seismic upgrade by Kennedy/Jenks were not available for SEFT's review as part of this seismic vulnerability assessment.

Table 3.3 presents a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.3, the North Valley Reservoir No. 2 is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake.

Table 3.3 – North Valley Reservoir No. 2 Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Per Shannon & Wilson Report, minimal permanent ground deformation (PGD) is anticipated at the reservoir: 0.5-1.5 inches liquefaction induced settlement, 0-0.1 inches liquefaction-induced lateral spreading, and approximately 2 feet earthquake-induced landslide PGD near slope 150 feet from reservoir. This level of PGD may cause structural damage to and/or leaking of the reservoir. Additionally, the impact of earthquake-induced landslide PGD should be considered as a potential hazard for the buried pipelines that connect to the reservoir and are located in the potential landslide zone. • The existing capacity of the horizontal prestressing on the wall of the reservoir is insufficient to resist the combination of hydrostatic and expected hydrodynamic hoop forces during the earthquake, when neglecting the contribution of the soil passive earth pressure.
Nonstructural	• Same as North Valley Reservoir No. 1, see Table 3.2. See Figure 3.12 related to the unbraced inlet nozzles inside the reservoir.

Figure 3.11 – North Valley Reservoir No.2

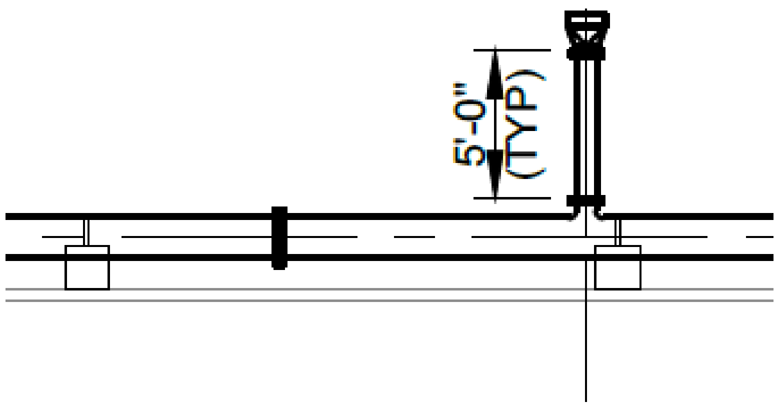


Figure 3.12 – Reservoir No. 2 Vertical Inlet Nozzles not Braced to Structure (Source Drawings: "North Valley and Corral Creek Reservoirs Seismic Upgrades (A2016007)")

3.4 Water Treatment Plant

The City of Newberg Water Treatment Plant (WTP) receives raw water from the well field located across the Willamette River, and after treatment, finished water is pumped to the distribution system and the City's three finished water reservoirs. The WTP is located approximately 2.5 miles southwest of Corral Creek Road Reservoir and approximately 3.4 miles south-southeast of North Valley Reservoirs.

The WTP consists of the following buildings and process units (those shown in bold text were included in the scope of the current seismic vulnerability assessment), as illustrated in Figure 3.13:

- **Original Treatment/Control Building (pre-1961)**
- **1961 Treatment/Control Building Addition**
- **1970 Treatment/Control Building Addition**
- **Sedimentation Basin No. 1 (North)**
- Sedimentation Basin No. 2 (South)
- **Filters No. 1 to 4, Filter Gallery, Pump Room, and associated Clearwell**
- Filter No. 5 and 6, and associated Clearwell
- **Sodium Hypochlorite Generation Building**
- Sodium Hydroxide Building
- Backwash Basin

The City of Newberg WTP was originally built prior to 1961. Available drawings from 1950 show structures with a geometry and layout that is inconsistent with the current plant configuration. Drawings from 1961 show a portion of the Treatment/Control Building and Sedimentation Basin No. 2 (south basin) as existing structures. It is assumed that these structures were constructed after 1950 and prior to 1961. The original plant had a capacity of approximately 1 MGD. Several plant upgrades and expansions have occurred since original construction to increase the plant capacity to 9.5 MGD. These upgrade and expansion projects have included:

- Treatment/Control Building Addition and Sedimentation Basin No. 1 (north basin) were constructed in 1961;
- A second Treatment/Control Building Addition, Filters No.1 and 2, Filter Gallery, Pump Room, and Clearwell were constructed in 1970;
- Filters No. 3 and 4 were constructed in 1980;
- Sodium Hydroxide Building was constructed in 2002; and
- Sodium Hypochlorite Generation Building and Filters No. 5 and 6 (with associated expansion of the Clearwell and Filter Gallery) were constructed in 2005.

A number of these treatment plant structures were constructed in close proximity to other structures and lack an adequate seismic joint (i.e., gap) to prevent potential pounding between the adjacent structures. Differential response of the adjacent structures during an earthquake would likely result in pounding between the structures that would cause localized damage to one or both adjacent structures. The seismic vulnerability assessment summaries in the following sections indicate where lack of an adequate seismic joint between adjacent structures has been identified as a potential deficiency.

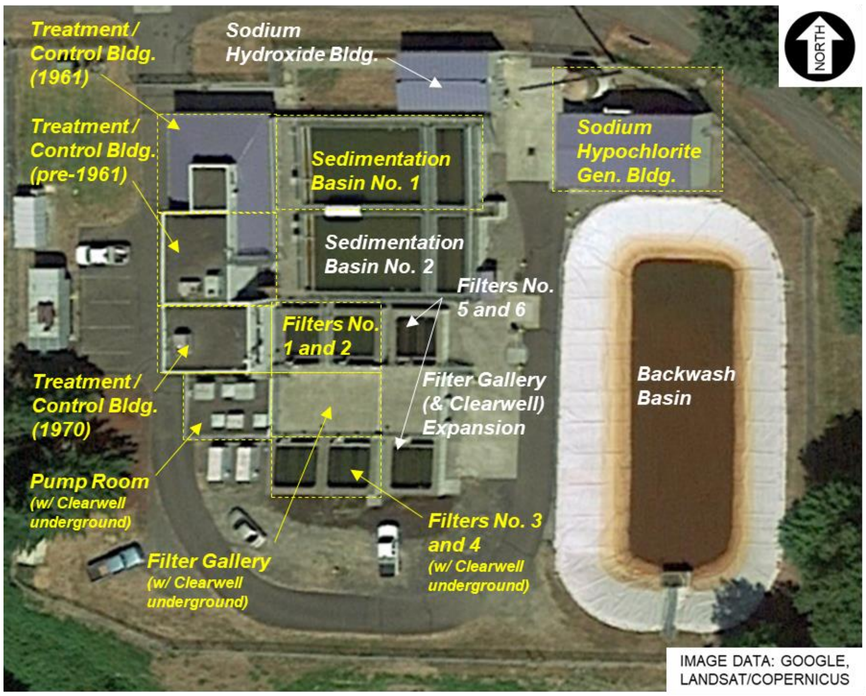


Figure 3.13 – Newberg Water Treatment Plant Location Map

3.4.1 Original Treatment/Control Building (pre-1961)

The Treatment/Control Building was originally constructed prior to 1961 and is located on the west side of the treatment plant. The Original Treatment/Control Building (pre-1961), is shown in Figure 3.14. The building is a two-story reinforced concrete shear wall building with reinforced concrete floor and roof diaphragms.

In 1961, an addition was constructed on the north side of the Original Treatment/Control Building (pre-1961). In 1970, a second addition was constructed, this time on the south side of the Original Treatment/Control Building (pre-1961). Both additions were constructed to be seismically independent of the Original Treatment/Control Building (pre-1961), however the joint width was specified to be ¾ inch or less.

Currently the ground level of the Original Treatment/Control Building (pre-1961) is used to house the polymer feed system, a pipe gallery for the raw water pipeline feeding Sedimentation Basin No. 2, and miscellaneous storage. The second level contains electrical equipment and motor control centers for the majority of the plant.

Structural drawings were not available for the Original Treatment/Control Building and development of as-built drawings was beyond the scope of this study. Potential structural deficiencies identified by this assessment have been based on field observations and general knowledge of typical construction practices during the era of original construction. Table 3.4 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.4, the Original Treatment/Control Building (pre-1961) is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake. Additionally, based on the potential deficiencies identified in this assessment, the Original Treatment/Control Building (pre-1961) is not currently expected to achieve Life Safety performance and represents a safety hazard to City staff and contractors.

Table 3.4 – Original Treatment/Control Building (pre-1961) Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Per Shannon & Wilson Report, significant permanent ground deformation (PGD) is anticipated near the WTP: 0.5-1.5 inches liquefaction induced settlement, approximately 16 inches liquefaction-induced lateral spreading near slope 120 feet from plant, approximately 20 feet earthquake-induced landslide PGD near slope 120 feet from plant. This level of PGD could potentially cause structural damage to WTP buildings and process units and also damage associated buried piping. Additional geotechnical and structural assessment is recommended to more accurately characterize the level of PGD anticipated to occur at the WTP and evaluate the ability of structures and buried pipelines to accommodate this level of PGD. • A large L-shaped diaphragm opening (stairs) is located at the northwest corner of the building adjacent to both the north and west shear walls. This opening significantly reduces the ability of the diaphragm to transfer seismic forces to the walls. See Figure 3.15. • Concrete columns are not likely to satisfy deformation compatibility requirements due to inadequate tie spacing. • It is likely that the diaphragm to shear wall connection does not have adequate capacity to develop the lesser of the shear strength of the walls or diaphragms. • Several potential deficiencies are likely that are associated with detailing requirements for reinforcing steel (reinforcing ratio, foundation dowels, and wall and diaphragm reinforcing at openings). • The width of the seismic joints between the Original Treatment/Control Building, and the 1961 and 1970 Additions are not adequate to prevent potential pounding between these adjacent structures. See Figure 3.16.

Table 3.4 – Original Treatment/Control Building (pre-1961) Seismic Evaluation Summary (cont.)

Potential Deficiencies	Description
Nonstructural	• Pipes that penetrate concrete walls do not have adequate flexibility through the wall to accommodate the relative movement between the wall and the pipes. See Figure 3.17. • The raw water piping and valves are not adequately seismically braced. See Figure 3.18. • Vertical pipes are not adequately braced to the structure to resist seismic forces and do not have adequate flexibility to accommodate inter-story drift. See Figure 3.19. • Large chemical storage containers/drums are not restrained. See Figure 3.20. • Rolling carts are not restrained. See Figure 3.21. • A cabinet is improperly anchored to an electrical conduit with a U-bolt. See Figure 3.22. • Storage racks are not restrained. See Figure 3.23. • Mechanical ducts are unbraced. See Figure 3.24. • In-line fan unit is not braced in the direction parallel to the wall. See Figure 3.25. • It is unknown if adequate dowels are provided between the electrical cabinet housekeeping pads and floor slab. • Large diameter electrical conduits are not braced and flexible connections are not provided between the conduit and the top of the electrical cabinets. See Figure 3.26. • At least one of the electrical cabinets appears to be missing anchors at the base of the cabinet. See Figure 3.27. • Vertical cast iron roof drain in Electrical Room is not braced to structure and does not have adequate flexibility to accommodate inter-story drift. Potential failure could cause water intrusion and consequent damage to electrical equipment. See Figure 3.28. • Lights on pendant supports are not braced and may potentially swing and cause damage to other components. Some light fixtures do not include lens covers to prevent the light tubes from falling. See Figure 3.29. • Refrigerator and filing cabinets adjacent to walkway are not restrained. See Figure 3.30.

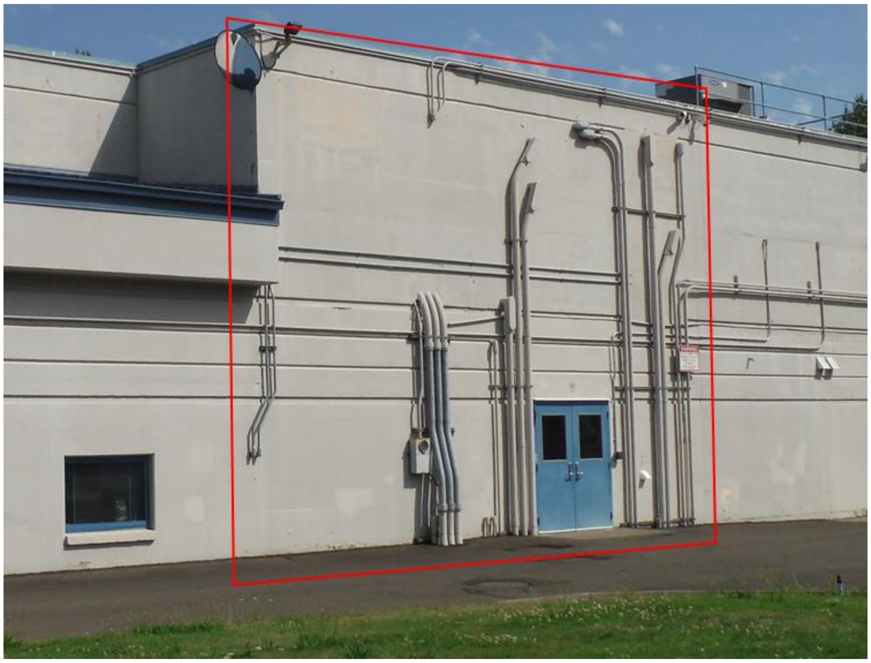


Figure 3.14 – Original Treatment/Control Building (pre-1961)

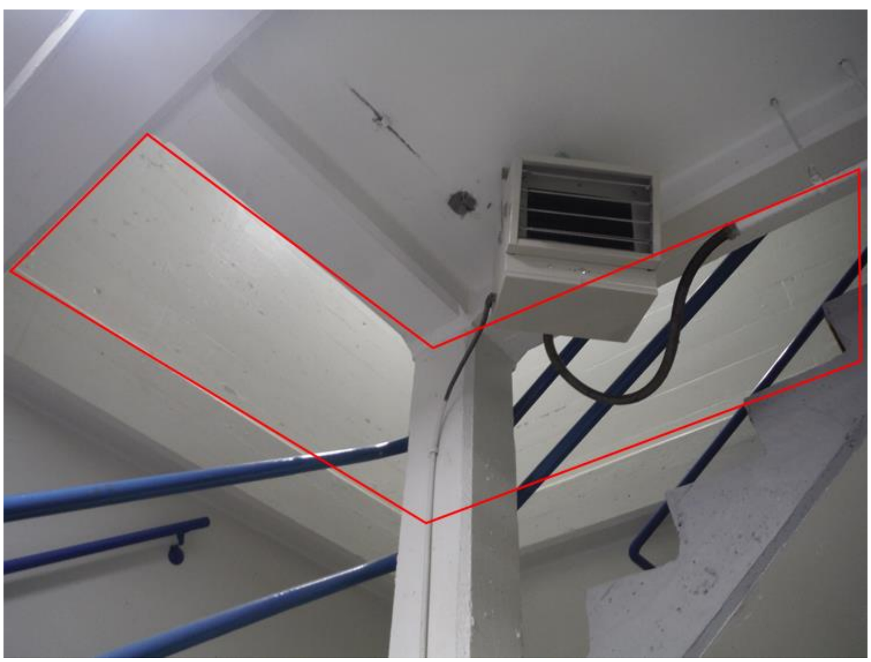


Figure 3.15 – Large Diaphragm Opening Adjacent to Shear Walls

Figure 3.16 – Seismic Joint Between Original Treatment/Control Building (pre-1961) and 1961 Addition

Figure 3.17 – Concrete Wall Penetration by Raw Water Pipe

Figure 3.18 – Raw Water Piping System without Adequate Bracing

Figure 3.19 – Vertical Pipe without Lateral Restraint

Figure 3.20 – Unrestrained Chemical Storage Containers

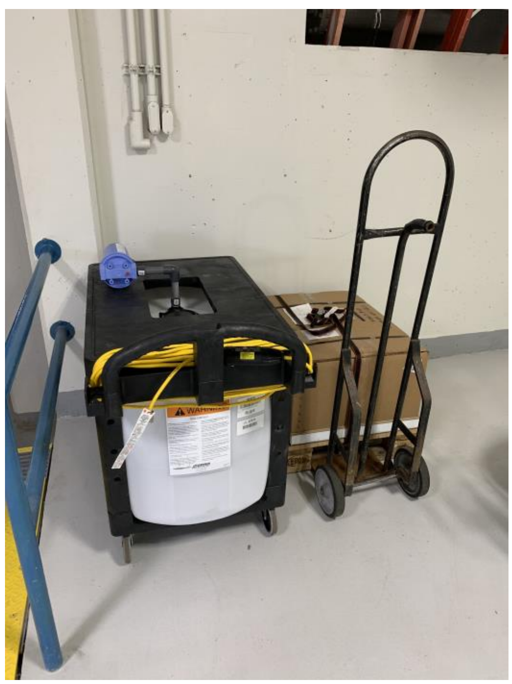


Figure 3.21 – Unrestrained Rolling Carts

Figure 3.22 – Storage Cabinet Restrained with U-Bolt to Electrical Conduits

Figure 3.23 – Unrestrained Storage Rack

Figure 3.24 – Mechanical Ducts not Braced to Structure

Figure 3.25 – In-Line Fan Unit Unrestrained to Movement Parallel to Wall

Figure 3.26 – Electrical Conduits not Seismically Braced and without Flexible Connections to Cabinets

Figure 3.27 – Electrical Cabinets with Missing Anchor at the Base

Figure 3.28 – Unbraced Cast Iron (Brittle) Vertical Pipe next to Electrical Cabinet

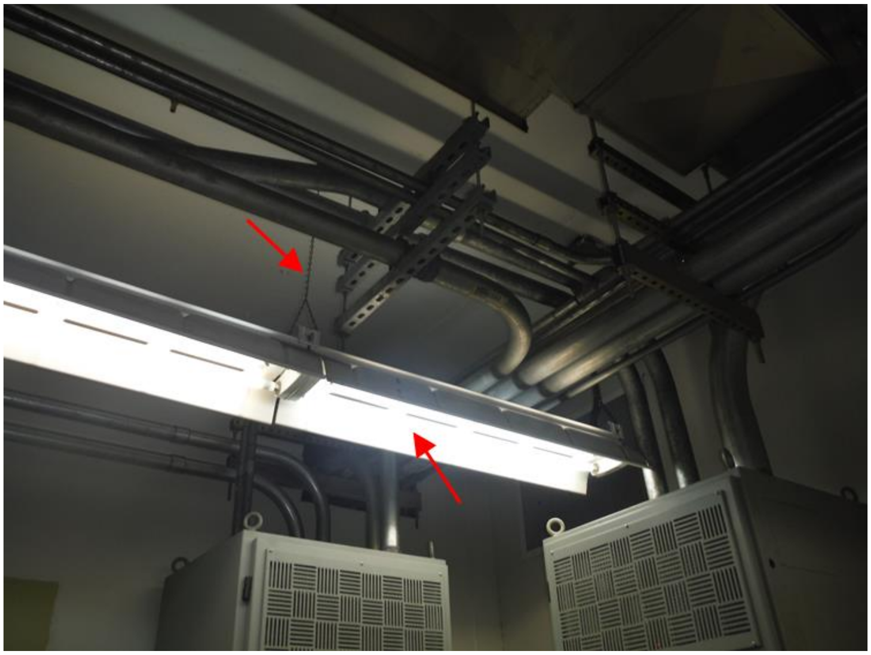


Figure 3.29 – Lights on Pendant Supports not Restrained and without Lens Covers

Figure 3.30 – Unrestrained Refrigerator and Filing Cabinets Adjacent to Walkway

3.4.2 1961 Treatment/Control Building Addition

In 1961, a Treatment/Control Building Addition was constructed on the north side of the Original Treatment/Control Building and west of Sedimentation Basin No. 1 (see Figure 3.31). The 1961 Treatment/Control Building Addition is a two-story reinforced concrete shear wall structure with reinforced concrete floor and roof diaphragms. The lower level of the structure is partially buried and supports abandoned coke beds (formerly used as part of the treatment process).

This 1961 Addition was constructed on the north side of the Original Treatment/Control Building (pre-1961). The addition was constructed to be seismically independent of the Original Treatment/Control Building (pre-1961), however the joint width was specified to be ¾ inch or less.

Currently the 1961 Treatment/Control Building Addition is used as a storage room/shop on the ground level, and an office area on the second floor.

Table 3.5 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.5, the 1961 Treatment/Control Building Addition is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake. Additionally, based on the potential deficiencies identified in this assessment, the 1961 Treatment/Control Building Addition is not currently expected to achieve Life Safety performance and represents a safety hazard to City staff and contractors.

Table 3.5 – 1961 Treatment/Control Building Addition Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4. • Second story concrete shear walls are not continuous to the foundation. See Figure 3.32 • Concrete columns do not satisfy deformation compatibility requirements due to inadequate tie spacing. • There is only one shear wall line in the east-west direction that is continuous to the foundation (Figure 3.32) resulting in deficient load path, lack of redundancy, potential torsional issues, and lack of adequate diaphragm chords. • The second floor level is comprised of a split-level diaphragm. See Figure 3.32. • The width of the seismic joint between the Original Treatment/Control Building and the 1961 Addition is not adequate to prevent potential pounding between these adjacent structures.
Nonstructural	• Storage racks and shelves are not anchored or braced. See Figure 3.33. • Heavy contents (porta-torch gas cylinders and small air compressor) are stored on top shelves (more than 4 feet above floor level) without restraint. See Figure 3.34. • Computer equipment is unrestrained. See Figure 3.35.

Figure 3.31 – 1961 Treatment/Control Building Addition

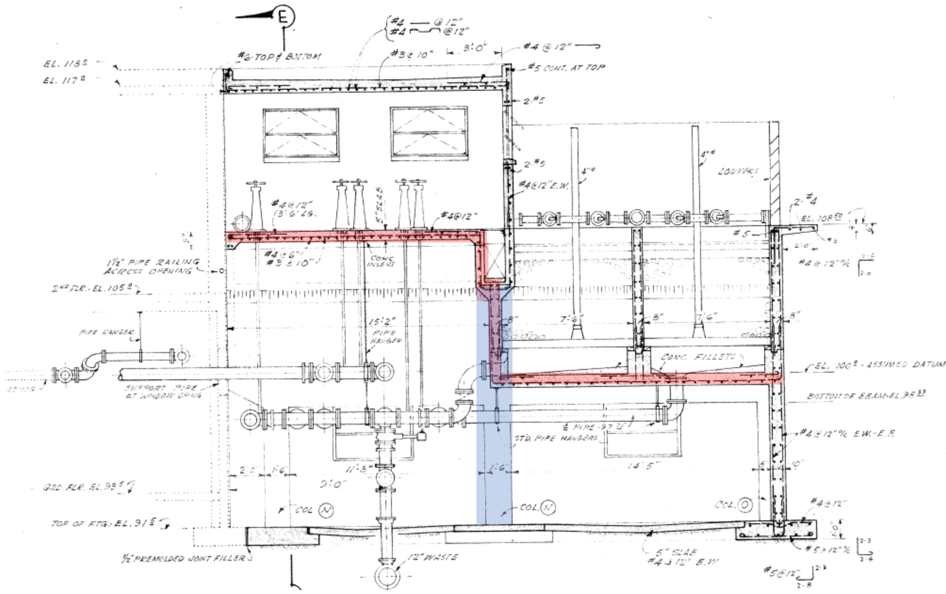


Figure 3.32 – Shear Wall not Continuous to Foundation (Blue Shaded) and with Split Level Diaphragms (Red Shaded)
(Source Drawings: "Water Treatment Plant Addition (A610001)")

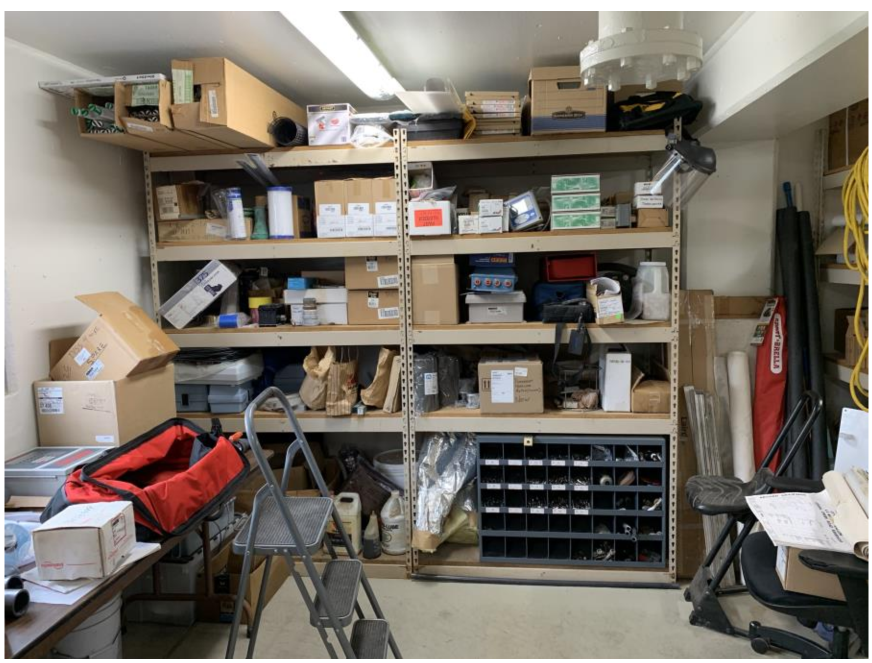


Figure 3.33 – Unrestrained Storage Rack

Figure 3.34 – Porta-Torch Gas Cylinders and Air compressor Stored on Top Shelf

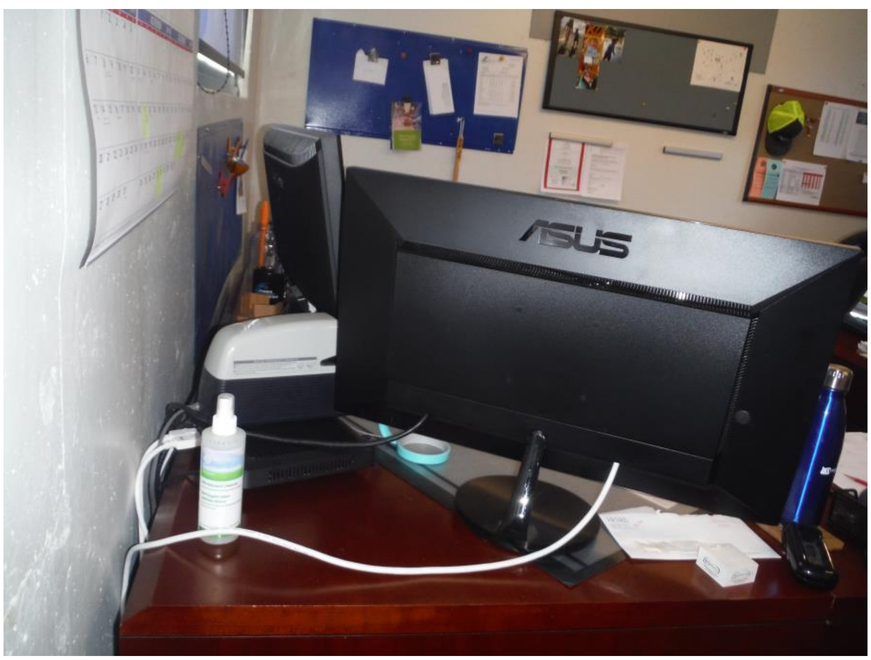


Figure 3.35 – Unrestrained Computer Equipment

3.4.3 1970 Treatment/Control Building Addition

In 1970, a Treatment/Control Building Addition was constructed on the south side of the Original Treatment/Control Building and west of Filters No. 1 and 2 (see Figure 3.36). The south wall of the 1970 Treatment/Control Building Addition is shared by the Pump Room, that was also constructed at the same time. The 1970 Treatment/Control Building Addition is a two-story reinforced concrete shear wall structure with a reinforced concrete diaphragm at the second floor level and a wood (straight-sheathed) roof diaphragm.

This 1970 Addition was constructed on the south side of the Original Treatment/Control Building (pre-1961). The addition was constructed to be seismically independent of the Original Treatment/Control Building (pre-1961), however the joint width was specified to be ¾ inch or less.

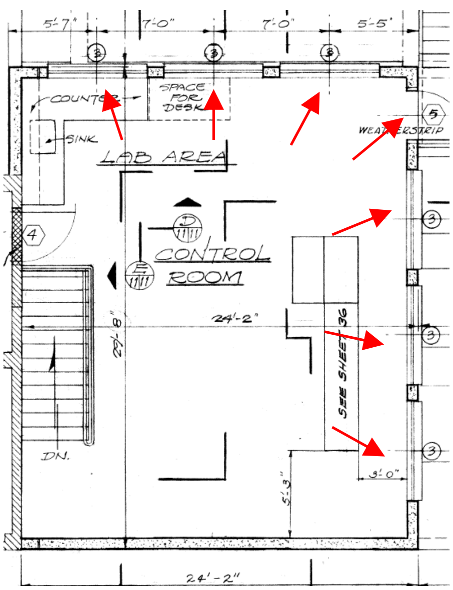
Currently the 1970 Treatment/Control Building Addition contains restrooms, and a hallway at the ground level and plant control room, office and laboratory spaces on the second floor.

Table 3.6 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.6, the 1970 Treatment/Building Addition is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake. Additionally, based on the potential deficiencies identified in this assessment, the 1970 Treatment/Control Building Addition is not currently expected to achieve Life Safety performance and represents a safety hazard to City staff and contractors.

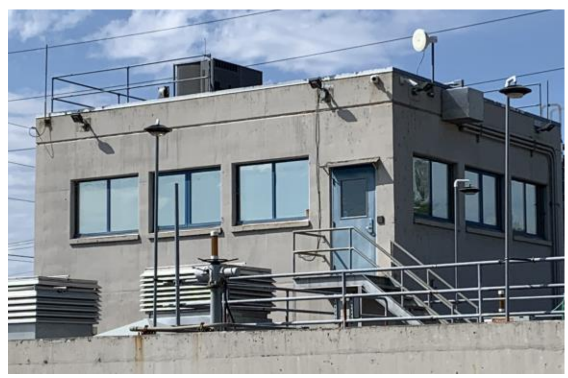
Table 3.6 – 1970 Treatment/Control Building Addition Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4. • Concrete columns do not satisfy deformation compatibility requirements due to inadequate tie spacing. • There is only one shear wall line in the east-west direction, resulting in a deficient load path, lack of redundancy, potential torsional issues, and lack of adequate diaphragm chords. • Between the second floor and the roof there is a significant reduction in the cross-sectional area of the south and east shear walls due to the existing windows and door. See Figure 3.37. • The roof diaphragm lacks adequate cross ties between flexible diaphragm chords. See Figures 3.38. • In the north-south direction (perpendicular to glulam members) there does not appear to be an adequate load path to transfer seismic forces from the roof diaphragm to the concrete shear walls. See Figure 3.39. • The roof diaphragm is not attached to the concrete shear walls with connections that are adequate to resist the expected out-of-plane forces. Additionally, the ledgers that supports the roof straight sheathing on the north and south sides of the buildings are potentially subjected to cross grain bending when resisting wall out-of-plane anchorage forces. See Figure 3.40. • The width of the seismic joint between the Original Treatment/Control Building and the 1970 Addition is not adequate to prevent potential pounding between these adjacent structures.
Nonstructural	• The CMU partition walls around the restrooms are constructed tight to the adjacent concrete beams and walls without an adequate separation to prevent them from unintentionally participating in resisting seismic loads. See Figure 3.41. • Computer equipment is unrestrained. See Figure 3.42. • Several pieces of equipment on the lab counter are unrestrained. See Figure 3.43. • Chemical cabinets doors are not properly latched to prevent accidental opening during an earthquake. See Figure 3.44. • Water heater is not adequately restrained. See Figure 3.45. • Light fixtures are supported by the ceiling grid and lack proper independent support. See Figure 3.46. • The suspended ceiling system is not adequately braced to the structure. See Figure 3.46.

Figure 3.36 – 1970 Treatment/Control Building Addition



(a) Architectural Plan View of Control Room (Source Drawings: "Water Treatment Plant (A700004)"



(b) Outside View of Control Room East and South Walls

Figure 3.37 – Reduction of Shear Walls Cross Section Due to Presence of Windows and Door

Figure 3.38 – Flexible Diaphragm Chords without Cross Ties

Figure 3.39 – Joist to Perpendicular Wall Connection

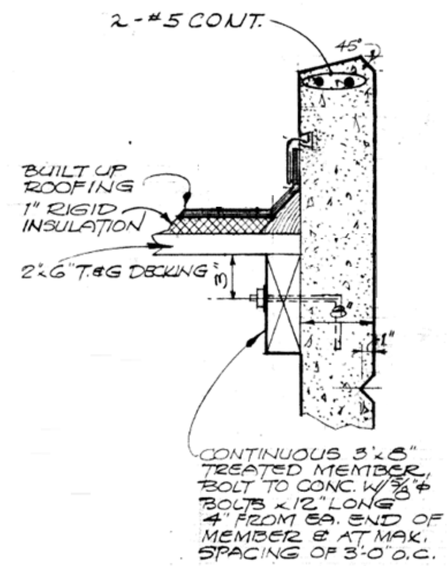
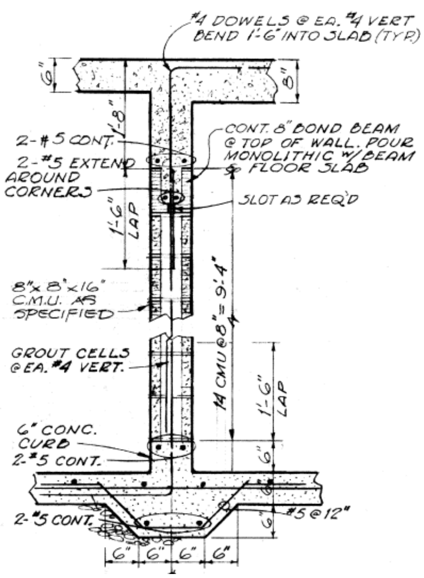
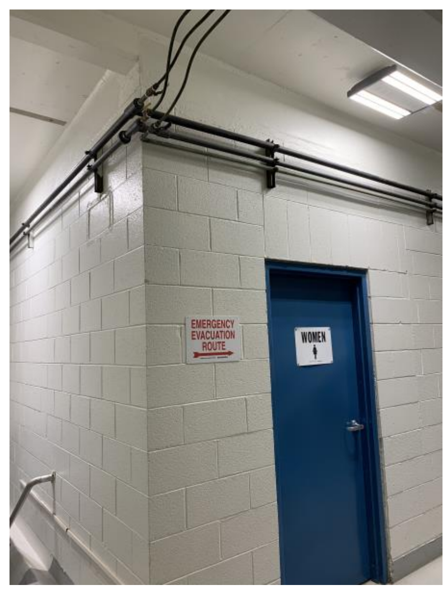


Figure 3.40 – Detail of Joist to Adjacent Wall Connection (Source Drawings: "Water Treatment Plant (A700004)")



(a) Detail of CMU Wall to RC Beam Connection (Source Drawings: "Water Treatment Plant (A700004)")



(b) CMU Wall Partitions

Figure 3.41 – CMU Wall Partitions not Isolated from Structure

Figure 3.42 – Unrestrained Computer Equipment

Figure 3.43 – Unrestrained Equipment on Lab Counter

Figure 3.44 – Chemical Cabinet Doors without Proper Latches

Figure 3.45 – Water Heater Tank not Adequately Restrained

Figure 3.46 – Light Fixture Supported by Ceiling Grid

3.4.4 Sedimentation Basin No. 1

Sedimentation Basin No.1, shown in Figure 3.47, was built in 1961 and is located north of Sedimentation Basin No.2. Sedimentation Basin No.1 has reinforced concrete shear walls around the perimeter. The center wall between Sedimentation Basin No. 1 and 2 is shared by both basins. In the basin, there are a wood baffle near the west end to still the flow into the basin and three steel weirs crossing the basin in the north-south direction near the east end to convey water to the collector trough.

Sedimentation Basin No. 1 was constructed around 1970 on the north side of Sedimentation Basin No. 2 (pre-1961). The addition was constructed to be seismically independent of the Original Treatment/Control Building (pre-1961), however the joint width was specified to be ½ inch.

Structural drawings were not available for Sedimentation Basin No. 2 (i.e. the structure that forms the south wall of Sedimentation Basin No. 1) and development of as-built drawings was beyond the scope of this study. Potential structural deficiencies identified by this assessment have been based on field observations and general knowledge of typical construction practices during the era of original construction. Table 3.7 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.7, Sedimentation Basin No.1 is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake.

Table 3.7 – Sedimentation Basin No. 1 Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4. • The width of the seismic joint between Sedimentation Basins No. 1 and 2 is not adequate to prevent potential pounding between these adjacent structures. See Figure 3.48. • Insufficient freeboard (approximately7 in) to accommodate sloshing waves, which may potentially overtop the basin and enter the Sodium Hydroxide Building through air vents in the south wall of the building. See Figure 3.49. • Seismic joints were detailed to include a copper water stop, but potential water leaks may occur due to relative movement between Sedimentation Basins No. 1 and 2, and the effluent structure (built in 1970). See Figure 3.50. • The Basin perimeter walls are potentially overstressed by earthquake-induced hydrodynamic forces and will likely be damaged during an earthquake.
Nonstructural	• Wooden baffles may not have adequate strength to resist hydrodynamic forces. See Figure 3.51. • Small diameter anchors used to connect the weir troughs to the basin walls may not be adequate to resist hydrodynamic forces. See Figure 3.52. • Pipes that penetrate concrete walls may not have adequate flexibility to accommodate the relative movement between the wall and the pipes. See Figure 3.53.

Figure 3.47 – Sedimentation Basin No. 1 Structure

Figure 3.48 – Construction Joint Between Sedimentation Basins No. 1 (1961 Construction) and No. 2 (pre-1961 Construction)

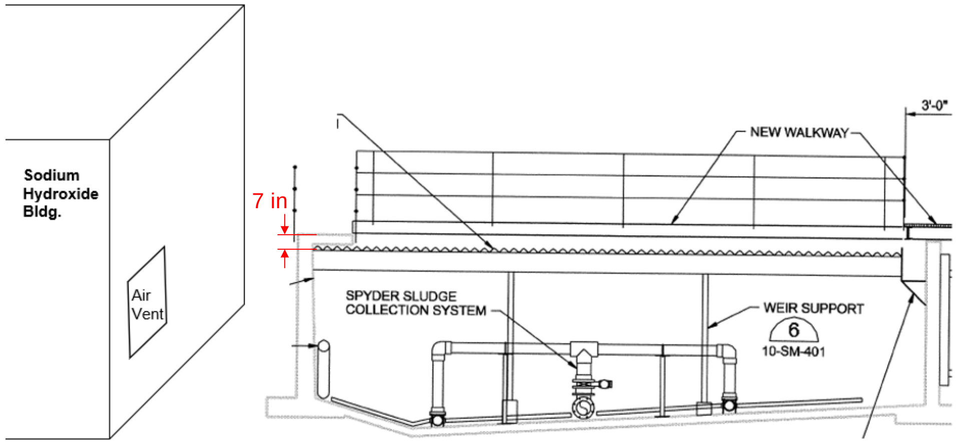


Figure 3.49 – Insufficient Freeboard (~7 in) to Accommodate Sloshing Waves in Sedimentation Basin Near Sodium Hydroxide Building

Figure 3.50 – Sedimentation Basins Effluent Structure (Outlet Basin Structure)

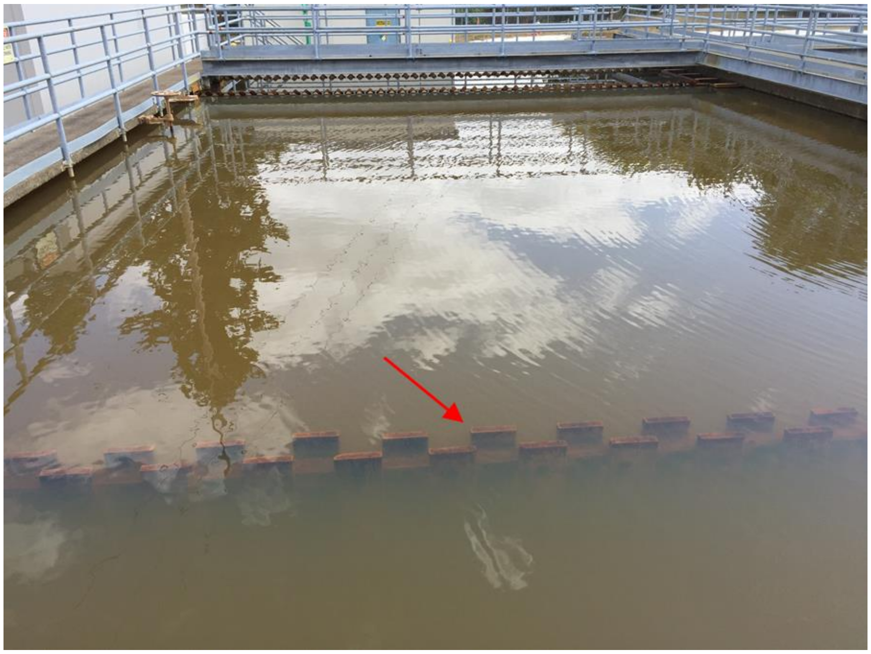


Figure 3.51 – Wooden Baffles in Sedimentation Basin No. 1

Figure 3.52 – Weir Trough to Basin Structure Connection Using Small Diameter Anchors

Figure 3.53 – Raw Water Pipes Penetrating Concrete Wall without Adequate Flexibility Through Wall

3.4.5 Filters No.1 to 4, Filter Gallery, Pump Room, and Associated Clearwell

Filters No.1 and 2, the Filter Gallery, the Pump Room, and the associated Clearwell were constructed in 1970. Filters No. 3 and 4 were added in 1980. Figure 3.54 shows the Filters No. 1 to 4 and the concrete roof slab over the Filter Gallery. Figure 3.55 shows the exterior of the partially buried Pump Room. Filters No. 1 and 2 are located east of the 1970 Treatment/Control Building Addition and south of Sedimentation Basin No. 2. The Filter Gallery is located south of Filters No.1 and 2 and north of Filters No. 3 and 4.

The Filters have reinforced concrete shear walls around their perimeter and reinforced concrete (Filters No. 1 and 2) or steel (Filters No. 3 and 4) wash troughs crossing the filters in the east-west direction. The Filter Gallery and Pump Room are located above the Clearwell and form a two-story reinforced concrete shear wall structure with reinforced concrete diaphragms, except at the Pump Room roof that consists of a wood (straight-sheathed) diaphragm. The Clearwell that was built in 1970 also extends under Filters No. 3 and 4 (which were considered as a future expansion during the 1970 design and construction).

In 2005, the Filter Gallery was extended towards the east, and two new filters (Filters No. 5 and 6) and a Clearwell expansion were constructed approximately 3 ft. east of the existing filters. At the Filter Gallery roof level, the slab for the Filter Gallery expansion extends towards the west to within 1 inch of the roof slab from the original Filter Gallery (1970 construction). Within the Filter Gallery, a short walkway section was added between the original Filter Gallery (1970 construction) and expansion Filter Gallery. A small expansion joint is provided between the walkway and original Filter Gallery. A single short section of 24-inch diameter pipe hydraulically connects the expansion Clearwell to the original Clearwell (1970 construction).

Table 3.8 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.8, the Filters No.1 to 4, Filter Gallery, Pump Room, and associated Clearwell structure is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake. Additionally, based on the potential deficiencies identified in this assessment, the Filters No.1 to 4, Filter Gallery, Pump Room, and associated Clearwell structure is not currently expected to achieve Life Safety performance and represents a safety hazard to City staff and contractors.

Table 3.8 – Filters No. 1 to 4, Filter Gallery, Pump Room, and Associated Clearwell Structure Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4. Filter Gallery and Clearwell • The south shear wall of the Filter Gallery is not continuous to the foundation. It is supported by concrete columns within the Clearwell. See Figure 3.56. • Clearwell concrete columns do not satisfy deformation compatibility requirements due to inadequate tie spacing. • The diaphragm to shear wall connection does not have adequate capacity to develop the lesser of the shear strength of the walls or diaphragms. • The width of the roof slab and walkway seismic joint between Filters No. 2 and 4, and Filters No. 5 and 6 is not adequate to prevent potential pounding between these adjacent structures. See Figure 3.57. • The width of the walkway slab seismic joint between Filters No. 1 and 2, and Sedimentation Basin No. 2 is not adequate to prevent potential pounding between these adjacent structures. Pump Room • The Pump Room is not seismically separated from the 1970 Treatment/Control Building Addition, but these structures are of different heights and their floor/roof levels are not aligned. See Figure 3.58. These split-level diaphragms impose seismic forces in the out-of-plane direction at mid-height of the shared wall. This configuration is not desirable for a structure intended to provide Immediate Occupancy structural performance after a major earthquake. • The roof diaphragm lacks adequate cross ties between flexible diaphragm chords. See Figure 3.59. • In the east-west direction (perpendicular to glulam members) there does not appear to be an adequate load path to transfer seismic forces from the roof diaphragm to the north concrete shear wall. See Figure 3.60. • The roof diaphragm is not attached to the concrete shear walls with connections that are adequate to resist the expected out-of-plane forces.

Table 3.8 – Filters No. 1 to 4, Filter Gallery, Pump Room, and Associated Clearwell Structure Seismic Evaluation Summary (cont.)

Potential Deficiencies	Description
Structural (cont.)	<u>Filters</u> • The Filters are not seismically separated from the 1970 Treatment/Control Building Addition, but these structures are of different heights and their floor/roof levels are not aligned. See Figure 3.61. These split-level diaphragms impose seismic forces in the out-of-plane direction at mid-height of the shared wall. This configuration is not desirable for a structure intended to provide Immediate Occupancy structural performance after a major earthquake.
Nonstructural	<u>Filter Gallery</u> • The finished water, filter backwash, sodium hydroxide, and air scour pipes that cross the seismic joint between the 1970 Filter Gallery and 2005 Filter Gallery Addition do not appear to have adequate flexibility to accommodate potential differential displacements between these adjacent structures. See Figures 3.62 and 3.63. • The finished water, filter backwash, and air scour pipes are not adequately braced to the structure to resist seismic forces. See Figure 3.64. • Valves and valve operators installed in-line with the finished water and backwash pipes are not independently braced (arrows in Figure 3.64). • The air scour piping does not have adequate flexibility to accommodate potential relative movement between the blowers located in soundproofing enclosures outside the building and the Filter Gallery building. See Figure 3.65. • The air vent valve and muffler are not adequately braced to the structure to resist seismic forces. See Figure 3.66. <u>Pump Room</u> • The vertical air relief pipe is not adequately braced to the structure to resist seismic forces. See Figure 3.67. • Pump motors are not braced to the structure above their center of gravity. See Figure 3.68. • Flexible connections are not used between pump casing and piping to accommodate potential differential movement. See Figure 3.68. • The electrical transformer is not adequately braced to prevent movement parallel to the wall. See Figure 3.69. • Anchorage between rooftop HVAC units and roof curbs is potentially inadequate.

Table 3.8 – Filters No. 1 to 4, Filter Gallery, Pump Room, and Associated Clearwell Structure Seismic Evaluation Summary (cont.)

Potential Deficiencies	Description
Nonstructural (cont.)	Filters • Valve operators are not adequately anchored to the Filter structure to resist seismic forces. They are bolted to slotted base plates that appear to have been significantly modified. See Figure 3.70.

Figure 3.54 – Filters No. 1 to 4 and Filter Gallery Roof Slab

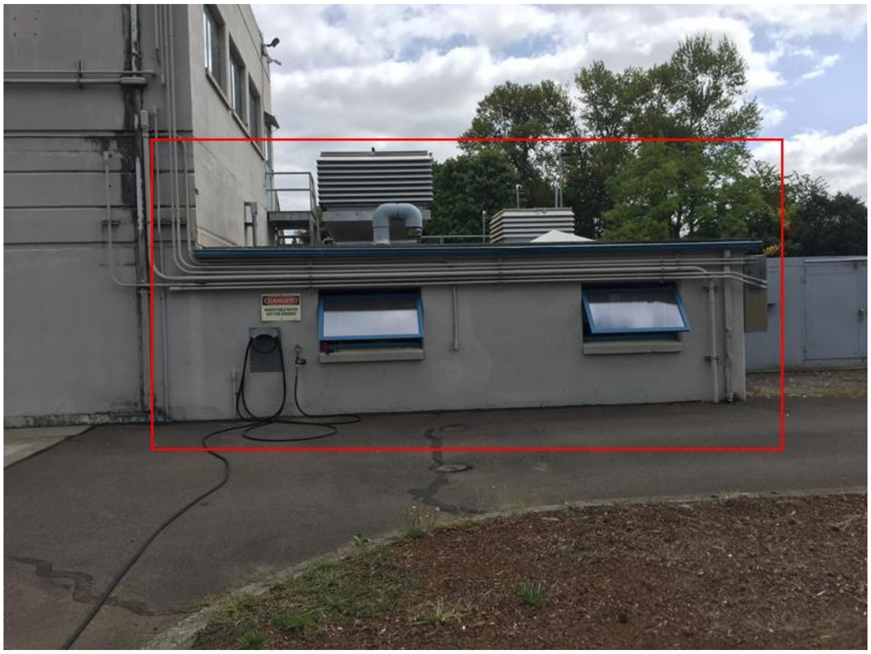


Figure 3.55 – Pump Room

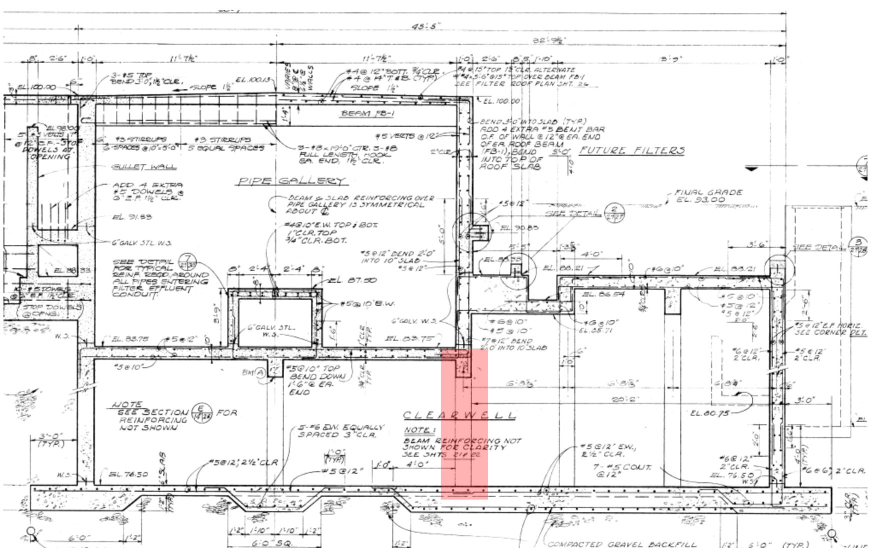


Figure 3.56 – Shear Wall not Continuous to Foundation (Source Drawings: "Water Treatment Plant (A700004)")

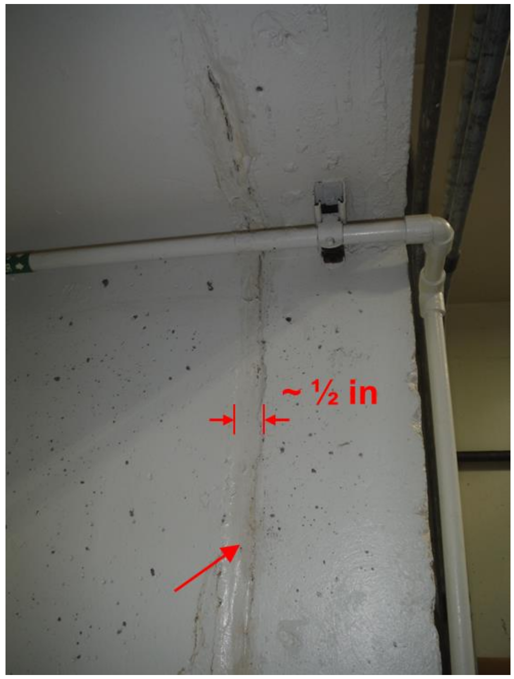


Figure 3.57 – Filter Gallery Seismic Joint (Between 1970 Construction and 2005 Expansion)

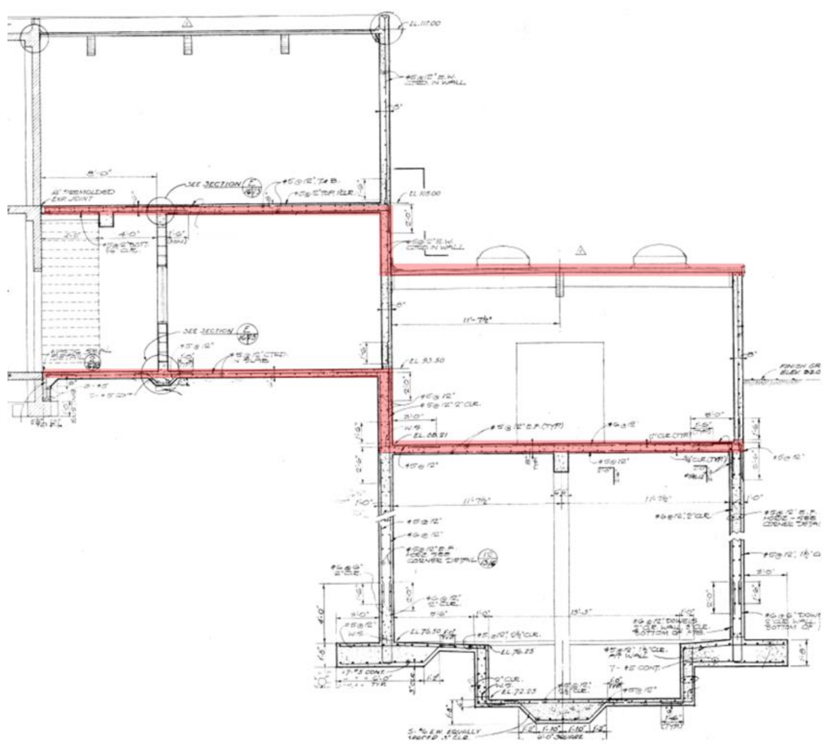


Figure 3.58 – Split Level Diaphragms
(Source Drawings: "Water Treatment Plant(A700004)")

Figure 3.59 – Flexible Diaphragm without Cross Ties

Figure 3.60 – Joist to Perpendicular Wall Connection

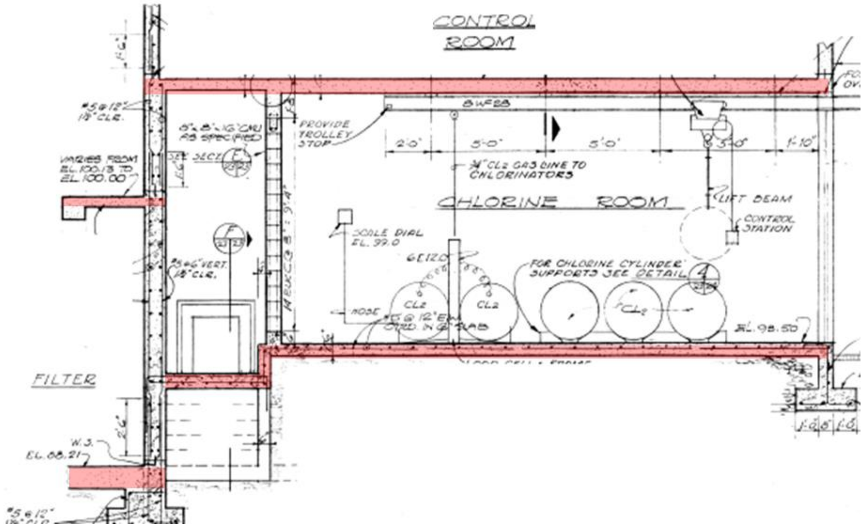


Figure 3.61 – Control/Treatment Building (1970) and Filter Floor/Roof Levels not Aligned (Source Drawings: "Water Treatment Plant (A700004)")

Figure 3.62 – Finished Water Sample Pipe and Filter Backwash Pipe Cross Seismic Joint without Adequate Flexibility

Figure 3.63 – Air Scour Pipe Crosses Seismic Joint without Adequate Flexibility

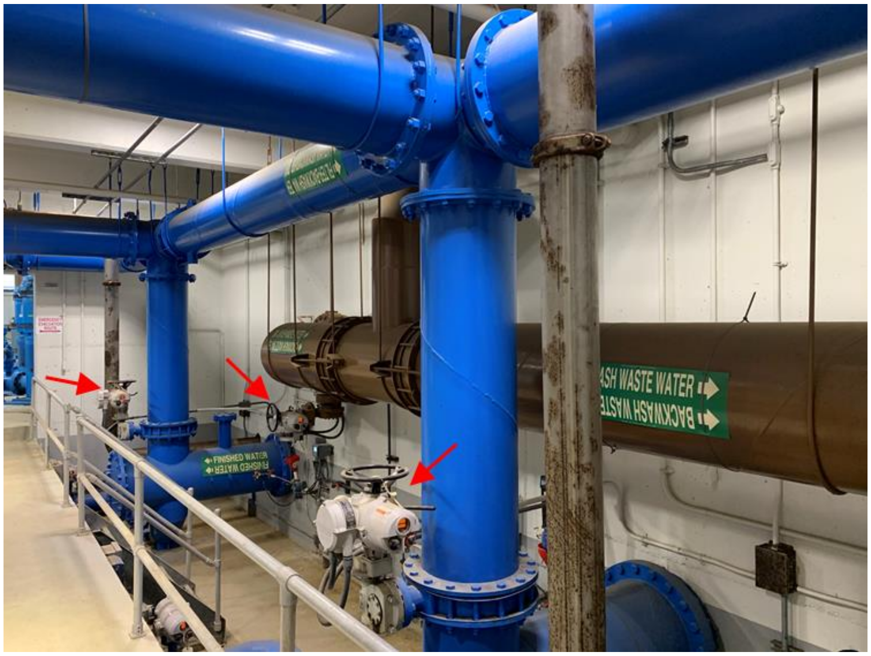


Figure 3.64 – Valves and Valve Actuators Installed In-Line with Piping Systems not Independently Braced

Figure 3.65 – Air Scour Piping from Blowers to Filter Gallery without Adequate Flexibility to Accommodate Differential Movement

Figure 3.66 – Air Vent Valve and Muffler not Adequately Braced

Figure 3.67 – Air Relief Piping Penetrating Laterally Unrestrained

Figure 3.68 – Pump Motors not Braced to Structure Above their Center of Gravity

Figure 3.69 – Electrical Transformer not Adequately Braced Against Movement Parallel to Wall

Figure 3.70 – Valve Actuators Installed on Significantly Modified Base Plates

3.4.6 Sodium Hypochlorite Generation Building

The Sodium Hypochlorite Generation Building is a steel frame metal building system constructed in 2005 (see Figure 3.71). The building is located at the northeast corner of the plant site. Immediately north of the building, there is a tank storing salt brine solution (NaCl) that is used in the generation of sodium hypochlorite.

The Sodium Hypochlorite Generation Building metal building system consists of steel moment resisting frames in the north-south direction and steel braced frames in the east-west direction (see Figure 3.72) and has a bare metal deck and tension rod flexible roof diaphragm.

Structural drawings were not available for the Sodium Hypochlorite Generation Building and development of as-built drawings was beyond the scope of this study. Potential structural deficiencies identified by this assessment have been based on field observations and general knowledge of typical construction practices. Table 3.9 provides a summary of potential seismic structural and nonstructural deficiencies identified by this evaluation. Based on the potential deficiencies identified in Table 3.9, the Sodium Hypochlorite Generation Building is not currently expected to achieve Immediate Occupancy structural performance or Operational nonstructural performance for a M9.0 CSZ earthquake.

Table 3.9 – Sodium Hypochlorite Generation Building Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4. • The lateral force resisting system lacks redundancy in both directions since there is only one lateral force resisting bay per frame line. See Figures 3.73 and 3.74. • The load path to transfer seismic forces from the roof diaphragm to the moment frame beam is not adequate since there is no blocking provided between purlins. See Figure 3.75. • The load path to transfer seismic forces from the roof diaphragm to the braced frame tension rod bracing involves indirect force transfer from the roof diaphragm to the purlins and then out-of-plane bending of the moment frame beam to column connection to transfer forces to the tension rod bracing. This indirect load path is not desirable for a building with an Immediate Occupancy structural performance objective. See Figure 3.76. • Steel beams and columns likely do not meet section compactness requirements for highly ductile member.

Table 3.9 – Sodium Hypochlorite Generation Building Seismic Evaluation Summary (cont.)

Potential Deficiencies	Description
Structural (cont.)	• It is likely that the moment resisting connections do not have adequate capacity to develop the expected strength of the adjoining beam and column members and panel zones may not have adequate capacity to resist expected shear force demands. See Figure 3.77. • Purlin splices may not have adequate capacity to resist cross tie forces. See Figure 3.78. • Grout layer is not provided under column base plates and nuts on anchor rod are not tight. See Figure 3.79.
Nonstructural	• Pipes from the exterior salt brine tank into process equipment inside the building do not have adequate flexibility to accommodate the expected relative movement between the tank and building. See Figure 3.80. • Drain pipe from the exterior salt brine tank through the concrete slab does not have adequate flexibility to accommodate potential relative movement between tank and the slab. See Figure 3.81. • PVC Vent Piping is not braced to the structure either inside or outside the building. See Figure 3.82. • Pipes connecting the two sodium hypochlorite tanks do not have adequate flexibility to accommodate potential relative movement between the tanks. See Figure 3.83. • Piping connected to both the Sodium Hypochlorite Generation skid and the building does not have flexibility to accommodate the expected building movement. See Figure 3.84. • Anchorage of chemical feed pumps is potentially not adequate due to small diameter and missing anchors. See Figure 3.85. • Hot water heater is not adequately braced to the structure as it has only one strap restraining it instead of two. See Figure 3.86. • Storage barrel is not restrained. See Figure 3.86. • Water softener components are not restrained. See Figure 3.87. • Instant hot water heater is not adequately restrained (only restrained against movement in one direction). See Figure 3.88. • Control Panel is not adequately braced to the structure as it is attached only to the relatively flexible fiberglass handrail. See Figure 3.89. • Transformer on strut support is not adequately braced to the structure. See Figure 3.90. • Lights on pendant supports are not braced and may potentially swing and cause damage to other components. See Figure 3.91.

Figure 3.71 – Sodium Hypochlorite Generation Building

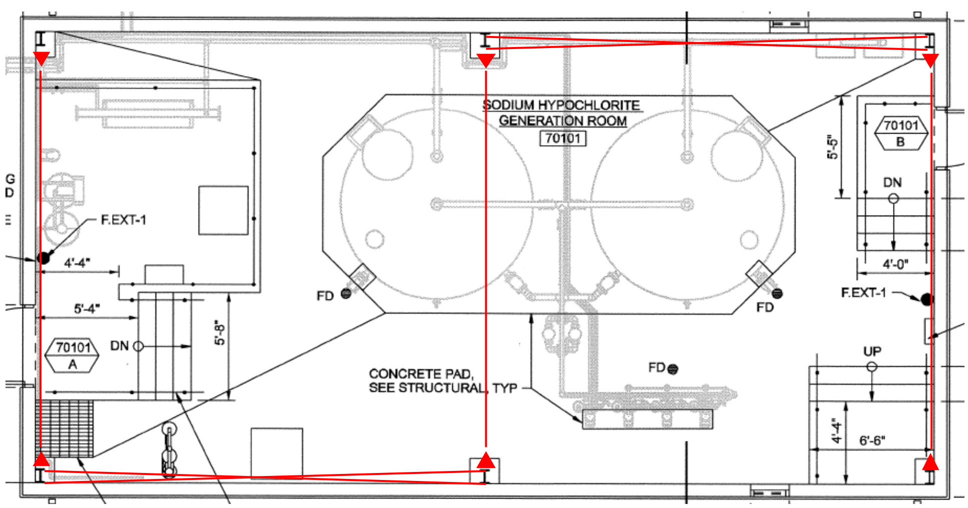


Figure 3.72 – Scheme of Building Lateral Force Resisting Systems (Source Drawings: Water Treatment Plant Expansion to 9.5 MGD (A2007005)")

(a) East Bay without Rod Bracing ***(b) West Bay with Rod Bracing***

Figure 3.73 – Single Lateral Force Resisting Bay in Frame Line along East-West Direction

Figure 3.74 – Single Lateral Force Resisting Bay in Frame Line along North-South Direction

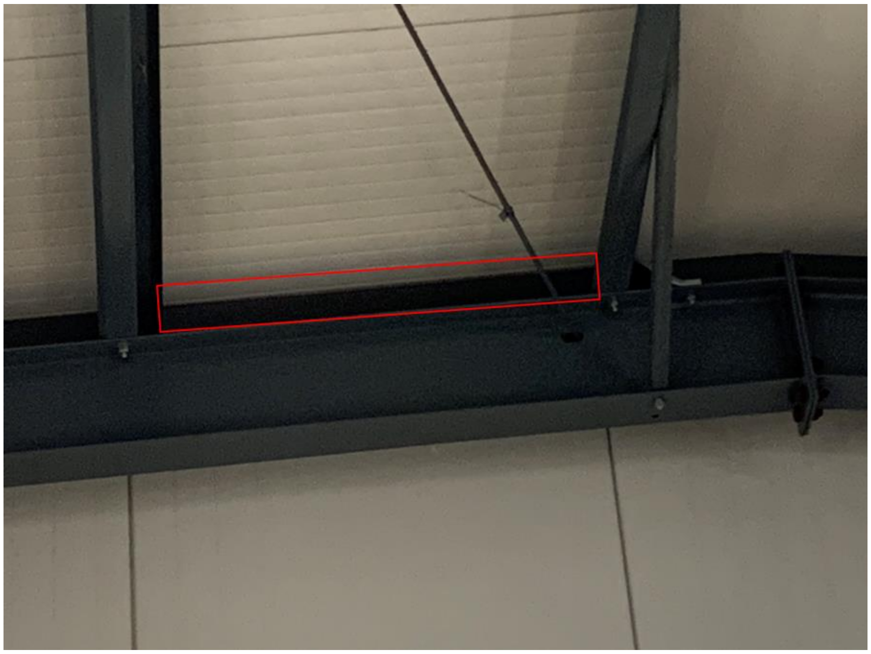


Figure 3.75 – Inadequate Load Path from Roof Diaphragm to Moment Frame Beams (no Blocking between Purlins)

Figure 3.76 – Indirect Load Path from Diaphragm to Brace Frame

Figure 3.77 – View of Moment Frame Connection and Panel Zone

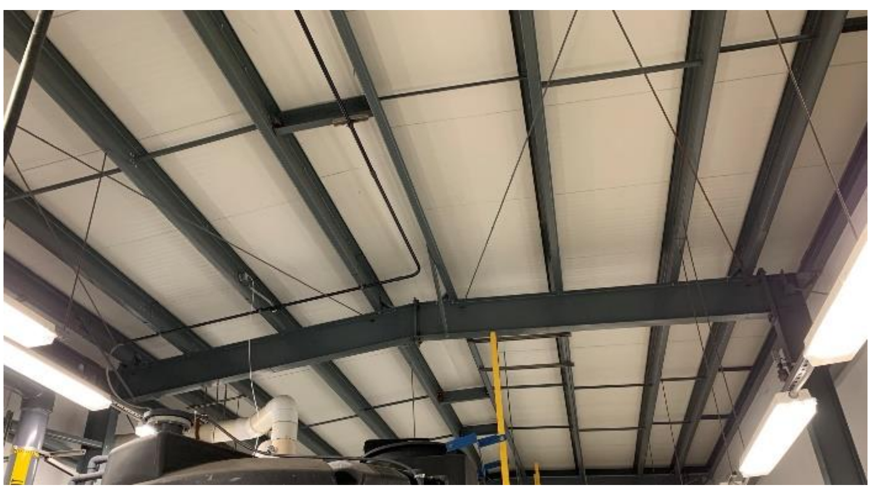


Figure 3.78 – Purlins Between Diaphragm Chords

Figure 3.79 – Ungrouted Base Plate and Nuts on Anchor Rods not Tight

Figure 3.80 – Piping Connecting Salt Brine Tank to Sodium Hypochlorite Generation Building without Adequate Flexibility

Figure 3.81 – Lack of Flexibility in Salt Brine Tank Drain Pipe

(a) Unbraced Piping Outside the Building

(b) Unbraced Piping Inside the Building

Figure 3.82 – Unbraced PVC Vent Piping

Figure 3.83 – Lack of Flexibility of Piping Connecting Sodium Hypochlorite Tanks

Figure 3.84 – Lack of Flexibility in Piping between Sodium Hypochlorite Generator and Attachment to Building

Figure 3.85 – Deficient Anchorage Between Chemical Feed Pumps and Concrete Support

Figure 3.86 – Water Heater not Adequately Restrained and Unrestrained Barrel

Figure 3.87 – Water Softener Components not Restrained

Figure 3.88 – Instant Hot Water Heater not Adequately Restrained

Figure 3.89 – Control Panel not Adequately Braced

Figure 3.90 – Transformer not Adequately Braced

Figure 3.91 – Unrestrained Light Fixtures

3.4.7 On-site Electrical Components

The seismic evaluation performed by SEFT also included consideration of the on-site electrical components that serve the water treatment plant (emergency generator, electrical switchgear and electrical transformer). These components are located west of the Treatment/Control Building and are shown in Figures 3.92 to 3.94. The emergency generator at the water treatment plant is a part of Portland General Electric's (PGE's) dispatchable generation program. PGE is responsible for performing routine maintenance and testing of the generator.

Table 3.10 provides a summary of potential seismic deficiencies identified by this evaluation. Based on the deficiencies identified in Table 3.10, the electrical components identified are not expected to support the Water Treatment Plant achieving Operational nonstructural performance following a M9.0 CSZ earthquake.

Table 3.10 – On-site Electrical Components Seismic Evaluation Summary

Potential Deficiencies	Description
Structural	• Permanent ground deformation – see first bullet of Table 3.4.
Nonstructural	• The stainless steel cabinet adjacent to the electrical switchgear is supported by both the original switchgear concrete pad and a concrete pad extension. This concrete pad extension may not be adequately attached to the original switchgear concrete pad and differential movement between the original pad and extension may damage the stainless steel cabinet. See Figure 3.93 • Electrical switchgear connection to the concrete pad appears to be missing an anchor and may not be adequate to resist the expected seismic loads. See Figure 3.95. • Electrical Transformer does not appear to be anchored to concrete pad. See Figure 3.96. • It is likely that starter batteries for the emergency generator are not adequately restrained.

Figure 3.92 – Emergency Generator

Figure 3.93 – Electrical Switchgear

Figure 3.94 – Electrical Transformer

Figure 3.95 – Missing Anchors on Switchgear to Concrete Pad Connection

Figure 3.96 – Electrical Transformer not Anchored to Concrete Pad

4.0 Next Steps

This report summarizes the results of SEFT's seismic structural and nonstructural evaluation of three reservoirs (Corral Creek Road, North Valley No. 1 and North Valley No. 2), and selected components of the City of Newberg Water Treatment Plant [Original Treatment/Control Building (pre-1961), 1961 Treatment/Control Building Addition, 1970 Treatment/Control Building Addition, Sedimentation Basin No. 1, Filters No.1 to 4, Filter Gallery, Pump Room, and Associated Clearwell Structure, and Sodium Hypochlorite Generation Building]. Based on the potential structural and nonstructural deficiencies observed, none of the evaluated structures are expected to achieve both the Immediate Occupancy structural performance objective and Operational nonstructural performance objective for a M9.0 CSZ scenario earthquake.

In order to continue to advance with City of Newberg water system resilience planning process, we recommend that a follow-up study be conducted that develops retrofit concepts for critical system components and includes consideration of dependency relationships required to sustain water system operation (diesel fuel for generator, salt for generation of sodium hypochlorite, etc.). The City of Newberg should also continue to evaluate and implement alternative options to provide water to customers in the event that the WTP and/or reservoirs are significantly damaged by a major earthquake and could take months to repair for more recently constructed structures to years to rebuild older structures. Additionally, for the safety of City staff and contractors, the City is strongly encouraged to implement a near-term seismic retrofit program to address Life Safety seismic deficiencies for the occupiable water system structures.

If an expansion of the plant is considered in the future to meet water production or operational goals, then there would be an opportunity to build more seismically resilient structures and associated support infrastructure that is capable of meeting the City's post-earthquake LOS goals. The location and foundation design for any new water system structures should include appropriate consideration of potential earthquake-induced permanent ground deformation, especially at the existing treatment plant site because of the steep slope of the riverbank located in close proximity to the plant.

5.0 Limitations

The opinions and recommendations presented in this report were developed with the care commonly used as the state of practice of the profession. No other warranties are included, either expressed or implied, as to the professional advice included in this report. This report has been prepared for the City of Newberg to be used solely in its evaluation of the seismic safety of the water system components referenced. This report has not been prepared for use by other parties and may not contain sufficient information for purposes of other parties or uses.

References

ASCE. (2017a) ASCE 7-16, *Minimum Design Loads for Buildings and Other Structures*, American Society of Civil Engineers, Reston, VA.

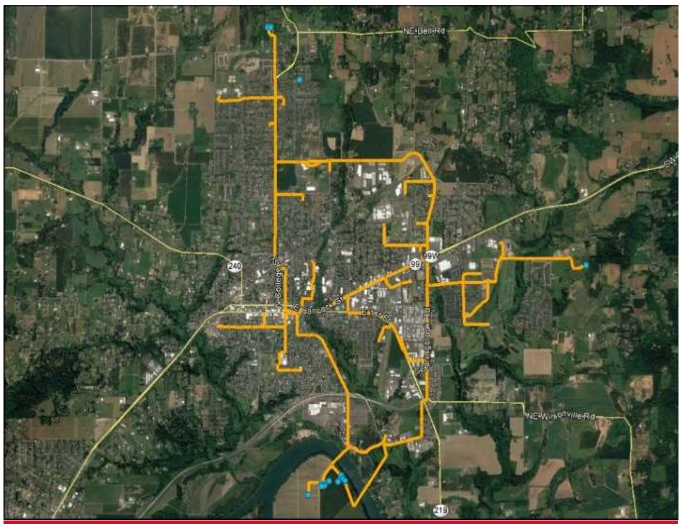
ASCE. (2017b). ASCE 41-17, *Seismic Evaluation and Retrofit of Existing Buildings*. American Society of Civil Engineers, Reston, VA

SEFT. (2019) *Water System Seismic Resilience Study, City of Newberg Public Works Department*, *Final Technical Memorandum: Seismic Recovery Goals*, Beaverton, OR.

Shannon & Wilson. (2019) *Geotechnical Engineering Report, City of Newberg Water System Seismic Resilience Study,* Lake Oswego, OR.

TCLEE. (2002). TCLEE Monograph No. 22, *Seismic Screening Checklists for Water and Wastewater Facilities*. American Society of Civil Engineers, Technical Council on Lifeline Earthquake Engineering, Reston, VA

AWWA. (2013). AWWA D110-13, Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks. American Water Works Association. Denver, CO



Water System Vulnerability Assessment

Water System Seismic Resilience Study

City of Newberg, OR

July 20, 2020

Contents

Tables

Figures

Acronyms

ALA	American Lifelines Alliance
CSZ	Cascadia Subduction Zone
GIS	geographic information system
HDPE	high-density polyethylene
ODOT	Oregon Department of Transportation
PGD	permanent ground displacement
PGV	peak ground velocity
WTP	water treatment plant

1 Vulnerability Assessment

This report is a component of the overall vulnerability assessment that covers the non-structural aspects of the City of Newberg's (City) water system, with the exception of the pipeline bridge. As a subconsultant to HDR, SEFT prepared the vulnerability assessment of the water treatment plant (WTP) and water storage tanks. The following items are included in this report:

- Pipeline bridge
- Wellfield
- 30-inch high-density polyethylene (HDPE) transmission main
- Water system backbone
- Water distribution system
- Yard piping at the WTP and water storage tanks
- Water system operations

Prior to the completion of this vulnerability assessment, Shannon and Wilson completed a geotechnical engineering report summarizing seismic hazards from a Cascadia Subduction Zone (CSZ) magnitude 9.0 event. From this analysis, mapping was generated to identify zones of peak ground velocity, probability of liquefaction, and landslide induced permanent ground deformation. Based on this information, calculations and observations were made with respect to the impact on water system components listed above.

On August 9, 2019, a site visit was conducted to visually inspect the water system infrastructure and interview City operations personnel regarding system components, functionality, operability, and known deficiencies. The site visit focused on the more visible components of the water system such as the WTP, water storage tanks, pipeline bridge, wellfield, and some buried items (e.g., vaults and valves). The operations personnel provided extensive background information about system operations and composition, which is incorporated into this assessment where applicable.

This vulnerability assessment includes a combination of quantitative and qualitative evaluation techniques. American Lifelines Alliance (ALA) methodology was used for the Quantitative analysis to assess damage of buried pipelines. This method incorporates site-specific geotechnical data to predict the total number of pipeline breaks. Although this approach results in defined data points, it is theoretical and subject to high levels of variance. Qualitative evaluation techniques, such as review of record drawings and cross-referencing geotechnical observations, were used to evaluate other components such as the wellfield and 30-inch HDPE transmission main.

1.1 Structural Evaluation of Pipeline Bridge

As part of the Water System Seismic Resilience Study for the City of Newberg, HDR evaluated the pipeline bridge over the Willamette River based on the documents provided by the City, including past seismic evaluation reports and other public domain information available about this historic bridge.

The bridge is a three-span, cantilever deck truss, with a pony truss-type bridge making up the center span. The bridge was constructed in approximately 1917 by the Oregon State Highway Department (now known as the Oregon Department of Transportation [ODOT]). The central pony truss bears on the ends of the cantilever spans, which is a unique configuration. At some point, the structure was abandoned by ODOT and is now used by the City to carry its main water transmission line.

The structural evaluation was limited to a desktop study based on available information and noting general deficiencies and possible retrofits. As-built drawings are not currently available, therefore no numerical analysis was performed. If the City wishes to fully characterize the seismic hazards and investigate firm retrofit options, as-built drawings would be required.

1.1.1 Superstructure

The bridge superstructure (Figure 1) is constructed of a riveted truss with apparent pin bearing assemblies to the substructure. Because the photos do not show the abutments, their condition is unknown. Photos show the middle span bears on the cantilever arms, but the level of restraint is unclear. When the bridge was converted for waterline use, the deck was removed and waterlines and a catwalk installed on the existing floor beams. This helps the seismic performance of the bridge, as it reduces the seismic mass of the structure from its original configuration.

In general, older truss bridges were not designed for ductility and do not perform well in a seismic event. Retrofitting them to ensure ductile behavior is prohibitively expensive in most cases. A common retrofit procedure used with older truss bridges is replacing the bearings with isolation bearings. This method, also known as “base isolation," allows the superstructure to move independently of the substructure, and minimizes the earthquake forces being transmitted to the bridge. On this bridge, the waterline would need to be isolated, which could likely be accomplished by replacing the fixed bearing waterline assemblies with rollers. The truss would need to be checked for seismic forces, as some seismic loads may affect the superstructure. However, any required modifications would likely be less costly than those required if no base isolation was performed.

Figure 1. Pipeline Bridge Superstructure

1.1.2 Substructure

Based on photos and descriptions in the seismic evaluation performed by Montgomery-Watson in 2011, the in-water piers appear steel jacketed concrete. In a seismic event, these may perform well; however, the embedment depth is unknown. If the piers are not embedded deep enough into the soil, they will lack sufficient overturning resistance and could fail during a seismic event from inertial loading. The depth of the existing piers, and additional capacity required to meet seismic loading, will drive the required mitigation method. The most likely retrofit strategy is installation of additional piles or localized ground improvements below the existing pier to provide additional lateral stability.

The details of the end abutments are unknown, however drawings from the 1927 repair suggest that the end abutments, Piers 1 and 4, are of similar construction to the main in-water piers. The 2011 seismic evaluation suggests an additional abutment was constructed at the north end when the trestles were removed. Without specific details, no additional recommendations can be provided regarding seismic upgrades to the end abutments.

1.1.3 Geotechnical Hazards

As part of the Geotechnical Engineering Study, Shannon and Wilson performed two borings and two CPT (Cone Penetration Test) runs at the western approach of the pipe bridge. A slope stability study also was performed at the west edge of the bridge. Bore log results show the site is underlain by silts and clays.

Shannon and Wilson's preliminary analysis indicates the slope is not stable for seismic or post-seismic conditions and the site may experience on the order of 2 feet of lateral spread due to liquefaction. Additional as-constructed details on the foundation system are required to accurately determine what vulnerabilities exist at this particular site. In general, these foundations do not perform well in soils that are subject to liquefaction and lateral spread, as they do not have adequate capacity to remain standing under large lateral pressures induced by liquefaction. Typical mitigation strategies include installation of additional piles and/or drilled shafts to improve the lateral capacity of the foundation, or ground improvements to protect the foundation from additional lateral loads.

1.1.4 24-inch Transmission Main

The 24-inch ductile iron water transmission is approximately 2,085 linear feet, installed in 1980 (Figure 2). This transmission main parallels and serves the same function as the 30-inch HDPE transmission main, by conveying raw water from the wellfield to the City's WTP. The pipeline shares the bridge deck with other power and communication pipelines/conduits. Because the pipeline is solely supported by the bridge, the pipeline will be subject to any failure modes experienced by the bridge in a seismic event. Isolation valves are located on each side of the bridge, which can provide isolation of the damage. Depending on how the bridge fails, damage to the interconnecting system, water loss, and potential cross-contamination may also occur.

Figure 2. 24-inch Water Transmission Main

1.1.5 Summary

Based on review of the available data, the pipeline bridge is unlikely to withstand a CSZ magnitude 9.0 earthquake and will require significant retrofits. This could cost in the tens-of-millions. Before further investigation and analysis can be performed, review of as-built construction documents and a comprehensive physical inspection would be necessary. A dive inspection also is recommended to assess the condition of the exposed foundation elements underwater.

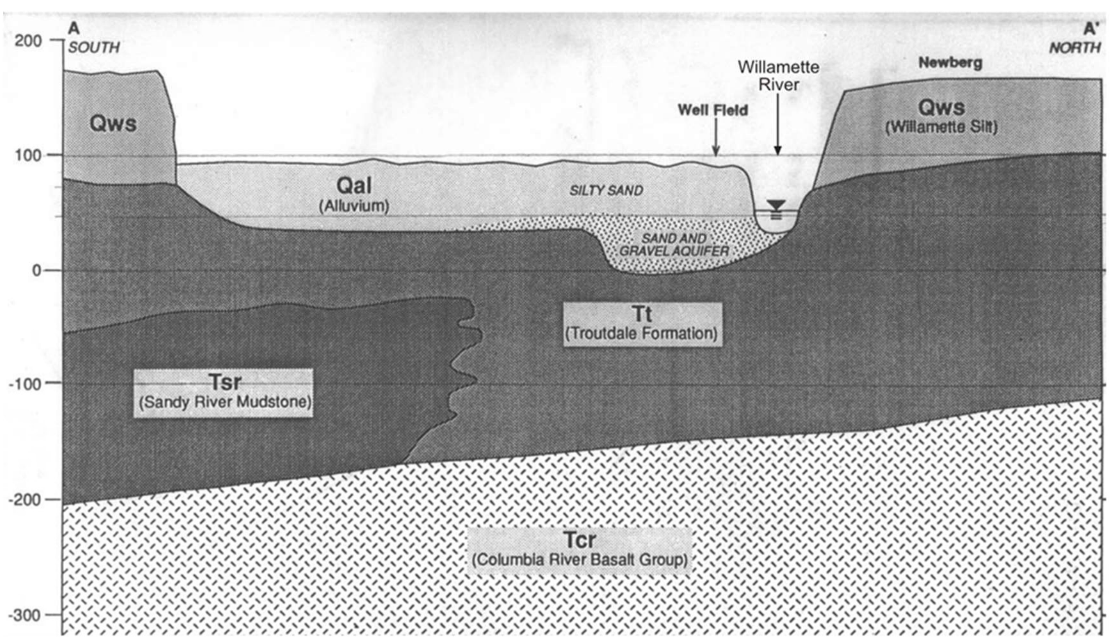
With regard to the 24-inch transmission main, it shares the same structural risks as the bridge. It is unlikely to survive a CSZ magnitude 9.0 seismic event. Because of its low resilience level, the water system is vulnerable to damage to the interconnecting system, water loss, and potential contamination. Isolation valves on either end of the bridge can be closed to minimize water loss if pipeline damage occurs, but they lack automation for quick closure and could be damaged during a CSZ event.

1.2 30-inch HDPE Transmission Main

In 2006, the 30-inch HDPE water transmission main was constructed using horizontal directional drilling under the Willamette River (Figure 3). It is approximately 2,600 linear feet, and extends several hundred feet beyond the river, ranging in depth from 50 feet directly under the river, to 175 feet below the west bank. As with the 24-inch transmission main, it conveys raw water from the City's wellfield to the WTP. Because of its unique construction and depth, Shannon and Wilson provided resilience observations specific to this transmission main crossing:

- According to geotechnical documents from the project, most of the undercrossing is within the Troutdale Formation. The Troutdale Formation is predominantly fine-grained (i.e., silts and clays), with medium to high plasticity. In general, material that is characterized as medium to high plasticity is not susceptible to liquefaction. The risk of liquefaction is likely low for most of the undercrossing.
- On the southern side of the river, the pipeline transitions into the surficial alluvial soils (i.e., wellfield area). This area may be susceptible to liquefaction induced settlement, which could induce differential settlement, especially where the pipeline transitions into the wellfield piping.
- Where the pipeline is at its shallowest on the northern side of the river, the pipeline is within approximately 400 feet of the bank of the Willamette River, and susceptible to lateral spreading. The magnitude of lateral spread at this distance is approximately 5 to 10 inches. Additional study, including explorations and laboratory testing would need to be performed to provide a more reliable estimate of the lateral spreading hazard at this location.

Figure 3. Soils at HDPE Crossing



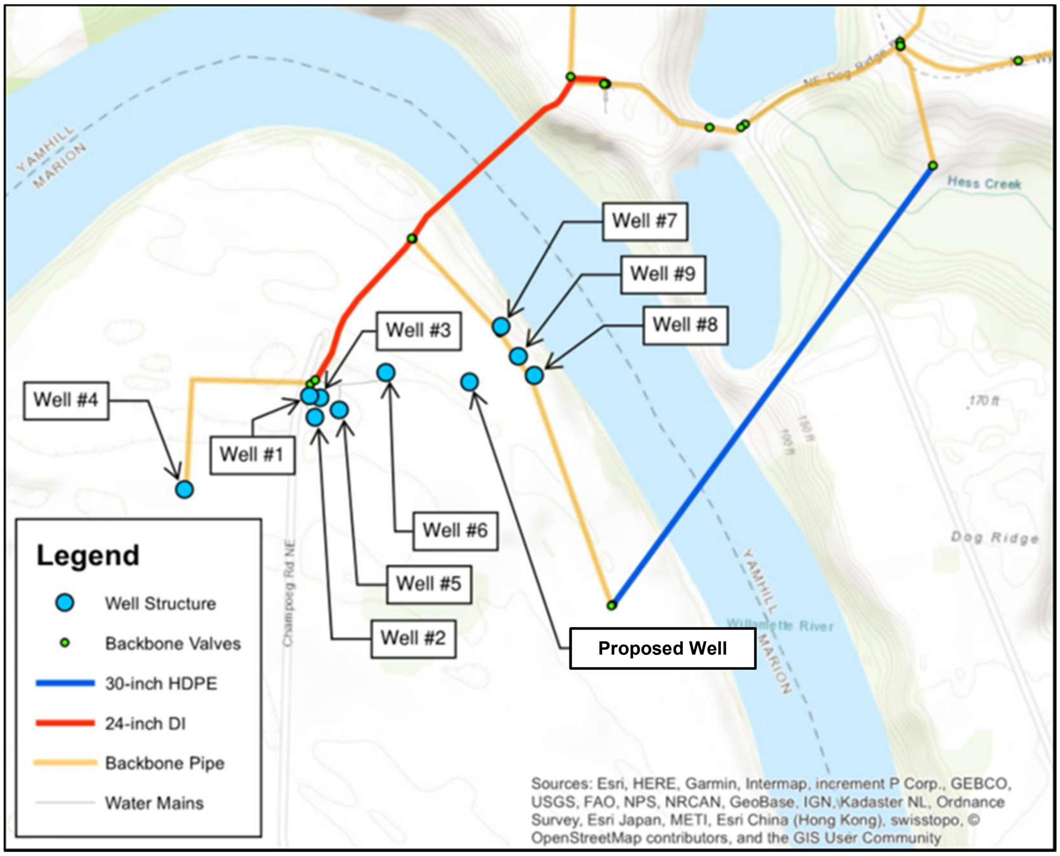
In summary, the majority of the crossing has a low risk of damage during a CSZ event. Vulnerabilities posed by the 30-inch HDPE transmission main are focused on the zone south of the river crossing in the wellfield area, and on the north side within 400 feet from the riverbank. In the wellfield area, differential settlement may occur between the HDPE line and wellfield lines, causing separation or damage. On the northern side, lateral spreading could cause pipe separation or damage.

1.3 Wellfield

The wellfield area is composed of nine wells on the southern side of the river (Figure 4). Currently, five of the nine wells are in operation. Construction of the wells occurred from as early as 1948 up to the present. Because the wellfield is composed of different types of infrastructure at different depths, and could experience impacts to groundwater during a seismic event, Shannon and Wilson provided a focused assessment of this area with the following key observations:

- According to the surficial geology mapped within the region and the available subsurface exploration logs, the surface soils near the well field will be predominantly alluvial soils. The alluvial soils encountered in nearby explorations are characterized as loose sands and gravels and non-plastic to low plasticity silts and were encountered to a depth of 70 feet below the ground surface (approximate elevation 15 feet). Groundwater is indicated at a depth of 24 feet. In general, loose sands and non-plastic to low plasticity silts below the water table will be susceptible to liquefaction.
- Based on the well descriptions in the water system plan, wells 1 through 3 have been removed from operation. Descriptions of wells 4 through 9 indicate that the wells were installed to total depths ranging from 88.5 to 96 feet below the ground surface with the screens placed within a sand and gravel aquifer that appears to overlie the Troutdale Formation and is part of the surficial alluvial soils. Therefore, the wells are likely at risk for liquefaction and lateral spread.
- Some of the consequences of seismic activity within the wellfield include:
    - Based on the proximity to the Willamette River, lateral spreading is likely the primary risk especially for wells near the bank of the Willamette River. Lateral spreading could cause significant lateral displacement of the well casing near the ground surface and above the river bottom. Lateral spreading magnitudes could range from 12 to 24 inches in this area with higher magnitudes closer to the river and then tapering down as you get farther from the river. The well descriptions indicate that wells 4 through 9 were installed with cement surface seals that ranged from 20 to 46 feet in thickness. The existing cement surface seals could help provide some lateral capacity for the well casings.
    - Liquefaction induced settlement is likely a secondary risk that could cause differential settlement between the well casing and pipe connection.
    - Seismic shaking could cause sand and other coarse particles to flow toward the well and plugging of the well screen reducing the capacity of the well.
    - Seismic shaking could cause groundwater levels to fluctuate.

Figure 4. Wellfield



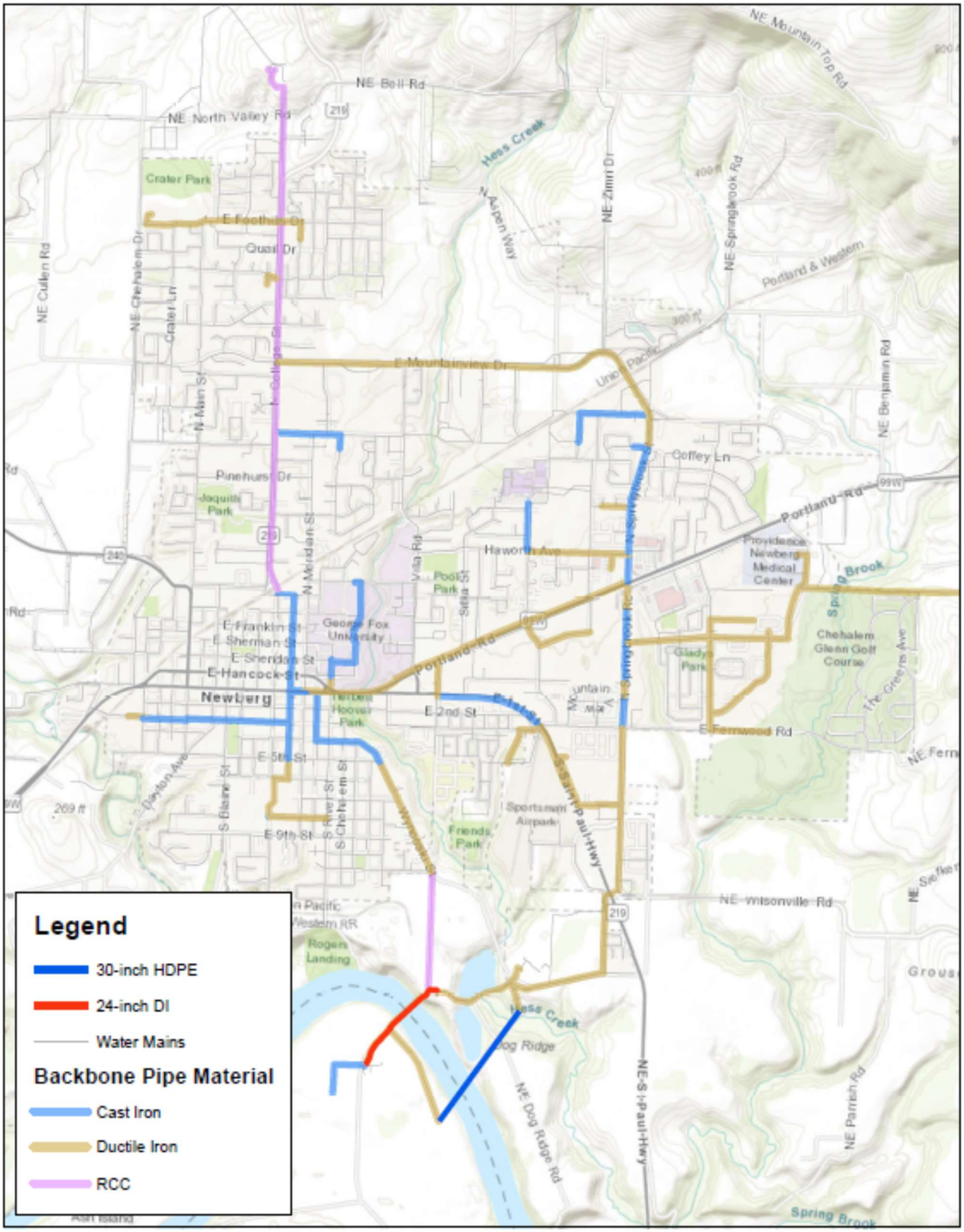
In summary, geotechnical vulnerabilities in the wellfield zone include significant lateral displacement for wells closest to the riverbank, differential settlement between wells and transmission pipelines, change in groundwater levels, and siltation of well screens. The following are additional vulnerabilities identified through discussion with operations personnel and review of record drawings:

- There is only one backup generator located at well 9. Considering that power may be disrupted for a long period of time, additional generators may be needed to provide adequate supply after a CSZ event.
- Because the wellfield is located on the other side of the Willamette River, City crews may not be able to access the wellfield quickly due to bridge failure or other access issues. This may make it difficult to access critical isolation valves (i.e., isolate 24-inch transmission main) or to provide fuel to the standby generator.

1.4 Water System Backbone

The water system backbone was identified in an early phase of this study in which level of service goals were established. Pipelines identified as part of the backbone are generally responsible for connecting all of the critical infrastructure such as the wells, WTP, primary transmission and distribution, and water storage tanks. The City's backbone water system consists of approximately 59 percent ductile iron, 24 percent cast iron, 13 percent concrete, 3 percent HDPE, and 2 percent other (Figure 5)

Figure 5. Water System Backbone by Pipe Material



A vulnerability assessment of the backbone was completed using the ALA procedure to evaluate the probability of earthquake damage. The ALA Pipeline Fragility Formulations consider the following factors that lead to damage of buried pipe in earthquakes:

- Ground shaking
- Landslides
- Liquefaction
- Settlement
- Fault crossings
- Continuous pipeline
- Segmented pipelines
- Appurtenances and branches
- Age and corrosion

The ALA outlines vulnerability functions focused on two specific mechanisms that cause pipe damage: *seismic wave passage* and *earthquake induced ground failure*. Wave passage is directly related to peak ground particle velocity (PGV) associated with ground shaking. Ground failure refers to permanent ground displacement (PGD) associated with landslides and liquefaction. The Geotechnical Engineering Report completed by Shannon & Wilson identifies the following related to PGV and PGD:

- Peak ground velocity (PGV)
- Liquefaction-induced lateral spread (PGD)
- Liquefaction-induced settlement (PGD)
- Landslide-induced PGD in both wet and dry conditions

This analysis applies the equations defined in the ALA with information provided in the geotechnical report. Non-geotechnical components, such as age and corrosion, are accounted for by applying a fragility curve modification factor. Key limitations of this analysis include quality of construction and consideration for pipeline restraint. Table 1 calculates the amount of damage for each significant pipe material:

Table 1. ALA Pipeline Results

Pipe Material	PGV	Liquefaction-induced lateral spread PGD	Liquefaction-induced settlement PGD	Landslide-induced PGD (dry)	Landslide-induced PGD (wet)
Cast Iron					
Hazard Score*	11.02 in/sec	2 in	1.5 in	24 in	180 in
Modification Factor	1.00	1.00	1.00	1.00	1.00
RR Score**	**0.02**	**2.12**	**1.59**	**25.44**	**190.80**
Est. Percentage of Pipe Impacted	100%	100%	100%	5%	5%
Est. Length of Pipe Impacted (ft.)	**23860**	**23860**	**23860**	**1193**	**1193**
Est. Total Breaks in Pipeline	**0.49**	**50.58**	**37.94**	**30.35**	**227.62**

Pipe Material	PGV	Liquefaction-induced lateral spread PGD	Liquefaction-induced settlement PGD	Landslide-induced PGD (dry)	Landslide-induced PGD (wet)
Ductile Iron					
Hazard Score*	11.02 in/sec	2 in	1.5 in	24 in	180 in
Modification Factor	0.50	0.50	0.50	0.50	0.50
RR Score**	**0.01**	**1.06**	**0.80**	**12.72**	**95.40**
Est. Percentage of Pipe Impacted	100%	100%	100%	5%	5%
Est. Length of Pipe Impacted (ft.)	**58433**	**58433**	**58433**	**2922**	**2922**
Est. Total Breaks in Pipeline	**0.60**	**61.94**	**46.45**	**37.16**	**278.72**
RCC					
Hazard Score*	11.02 in/sec	2 in	1.5 in	24 in	180 in
Modification Factor	1.00	1.00	1.00	1.00	1.00
RR Score**	**0.02**	**2.12**	**1.59**	**25.44**	**190.80**
Est. Percentage of Pipe Impacted	100%	100%	100%	5%	5%
Est. Length of Pipe Impacted (ft.)	**12592**	**12592**	**12592**	**630**	**630**
Est. Total Breaks in Pipeline	**0.26**	**26.69**	**20.02**	**16.02**	**120.13**

*Hazard Score estimated from Geotechnical Engineering Report (Shannon and Wilson)
** RR Score is calculated in breaks per 1,000 feet

The table shows that the amount of pipe damage is largely dependent on the pipe material and whether it is subject to liquefaction or landslide. Damage caused by PGV (shaking) is relatively minimal. Damage caused by liquefaction induced lateral spread or landslide induced deformation (dry) is comparable. If in wet soil conditions, the landslide induced deformation is magnitudes greater.

Table 2 and Table 3 further summarize the damage, separating non-landslide and landslide prone areas, respectively. The tables also include pipe length and material, with the majority of pipe located outside of landslide prone areas. For the non-landslide areas (Table 2), the total estimated number of pipeline breaks is 245, at a frequency of 3 per 1,000 feet (or an average of 387 feet between each break). As an example, if two repair crews could repair four locations per day, it would require a total of 60 days to repair the non-landslide backbone area. For the landslide prone areas, there is a dramatic difference between dry and wet conditions. Under the same scenario, repairs would take an additional 21 to 156 days to repair. In reality, those pipelines would require full replacement, whether it was wet or dry, because of the breakage frequency.

Table 2. ALA Summary Non-Landslide Areas

Pipe Material	Total Material Length Within Geo-Hazard (ft)	Percentage of Backbone Total	Est. Total No. of Breaks	Est. No. of Breaks per 1,000 ft.	Est. Space Between Breaks (ft)
Cast Iron	23,860	25%	89	4	268
Ductile Iron	58,433	62%	109	2	536
RCC	12,592	13%	47	4	268
Grand Total	**94,884**	**100%**	**245**	**3**	**387**

Table note: Estimated Number of Breaks Due to PGV and PGD (non-landslide) by Pipe Material

Table 3. ALA Summary for Landslide Areas

Pipe Material	Total Material Length Within Geo-Hazard(ft.)	Percentage of Backbone Total	Est. Total No. of Breaks	Est. No. of Breaks per 1,000 ft.	Est. Space Between Breaks (ft.)
Cast Iron	1,193	1%	30-228	25-191	5-39
Ductile Iron	2,922	3%	37-279	13-95	10-79
RCC	630	1%	16-120	25-191	5-39
Grand Total	**4,744**	**5%**	**84-626**	**64-477**	**5-79**

Table note: Estimated Number of Breaks Due to PGD (landslide) by Pipe Material

1.5 Water Distribution Pipelines (non-backbone)

The water system distribution network represents the highest quantity of water pipelines, but is also considered a lower priority for seismic resilience. In terms of composition, the network includes approximately 63 percent ductile iron, 23 percent cast iron, 9 percent PVC, and 5 percent other.

For simplicity of presentation, only the summary tables for non-landslide and landslide areas are provided (Table 4 and Table 5, respectively). For most of the distribution system (non-landslide), results show 1,159 water main breaks at a frequency of 2 per 1,000 feet (403 feet between each break; Table 4). Under the previously assumed scenario of repairing four locations per day (two crews at two repairs per day), repairs would require 290 days. For the landslide prone areas, a range of 336 to 2,518 breaks would occur and require a range of 84 to 630 days to repair. As in the case with the backbone system, those pipelines in the landslide prone areas would likely require full replacement instead of repair.

Table 4. ALA Summary Non-Landslide Areas

Pipe Material	Total Material Length Within Geo-Hazard (ft)	Percentage of Distribution Total	Est. Total No. of Breaks	Est. No. of Breaks per 1,000 ft.	Est. Space Between Breaks (ft)
C-900	11,713	3%	35	3	336
CI	106,470	23%	397	4	268
DI	296,271	63%	553	2	536
PVC	28,707	6%	85	3	336
Other	23,905	5%	89	4	268
Grand Total	**467,065**	**100%**	**1,159**	**2**	**403**

Table note: Estimated Number of Breaks Due to PGV and PGD (non-landslide) by Pipe Material

Table 5. ALA Summary of Landslide Areas

Pipe Material	Total Material Length Within Geo-Hazard(ft.)	Percentage of Distribution Total	Est. Total No. of Breaks	Est. No. of Breaks per 1,000 ft.	Est. Space Between Breaks (ft.)
C-900	586	3%	12-89	20-153	7-49
CI	5,324	23%	135-1,016	25-191	5-39
DI	14,814	63%	188-1,413	13-95	10-79
PVC	1,435	6%	29-219	20-153	7-49
Other	1,195	5%	30-228	25-191	5-39
Grand Total	**23,353**	**100%**	**336-2,518**	**59-439**	**5-79**

Table note: Estimated Number of Breaks Due to PGD (landslide) by Pipe Material

1.6 Yard Pipeline Vulnerabilities

An important component of water system resilience is to evaluate how the critical structures are connected to the transmission/distribution system. This includes not only pipeline construction, but also placement of seismic couplings, isolation valves, pressure-regulating valves, and remote monitoring or control capability. For this evaluation, vulnerabilities were identified through site visit observations, interview of operations personnel, and review of record drawings. Evaluated locations included yard pipelines (exterior to the building) for the WTP and water storage tank sites.

1.6.1 Water Treatment Plant

WTP vulnerabilities and observations include the following:

- There is a remotely operable isolation valve at the inlet to the WTP, but not a remotely operable isolation valve on the discharge to the WTP. If a seismic event occurred, the WTP may not be immediately isolated from the water system, creating more potential for water loss or cross-contamination.
- There are no known control valves (hydraulic pressure sustaining valves) on the inlet or outlet sides of the WTP that would engage automatically to isolate the WTP, thereby preserving water storage in the WTP and preventing cross-contamination.
- There is no bypass line around the WTP that would connect raw water transmission from the wellfield to the distribution system. This means that supplying water after a seismic event would depend on repair and recovery of the WTP. A bypass would allow temporary raw water for firefighting and domestic use (boiling would be needed for drinking).
- Based on record drawings, there are couplings located at pipeline building penetrations that may allow minimal movement; however, they are not seismically resistant. Differential settlement could occur between the structure and outside pipelines. Lateral spreading may also cause pipe separation.

1.6.2 Water Storage Tanks

There are two water storage tank sites; the Corral Creek Road Reservoir east of the City and the North Valley water storage tanks north of the City. Vulnerabilities and observations include the following:

Corral Creek Site

- Pipeline connections along the exterior of the water tank are fitted with flexible couplings. Given the relatively low amount of liquefaction and lateral spreading predicted, these may be adequate for movement that may occur. These couplings, however, do not provide the amount of protection that a seismic coupling provides.
- A landslide may result in up to 6 inches of lateral spread approximately 100 feet from the reservoir. There are no seismic couplings in the pipeline that could accommodate this movement, which could lead to pipe separation.
- There is a remotely operable isolation valve on the inlet/outlet line to the water tank, allowing for quick isolation and protection of the water storage in the tank during and after an event. There is not, however, a hydraulic control valve, that could operate and close independently of the SCADA system (if down) to protect the water storage.

North Valley Water Storage Tanks

- This site location (Figure 6) is subject to higher magnitudes of permanent ground deformation. Differential settlement of approximately 0.5 to 1.5 inches could occur between structures and connecting pipelines. It is unknown if exterior couplings could absorb this movement.
- The inlet/outlet line to the site will be subject to landslide movement up to 2 feet. This is a significant range of movement that would require one or more seismic couplings to absorb. In its current state, pipeline separation likely would occur.
- There is a remotely operable isolation valve on the inlet/outlet line to the water tank, allowing for quick isolation and protection of the water storage in the tank during and after an event. There is not, however, a hydraulic control valve, that could operate and close independently of the SCADA system (if down) to protect the water storage.

Figure 6. North Valley Site

1.7 Water System Operations

From an operational perspective, the following vulnerabilities and observations were gathered from a number of sources including review of the most current water system plan, site visit, review of record drawings, and interviews with operations personnel.

- The City operates at relatively high average system pressures. There are no fire-flow or pressure deficiencies identified that could affect system recovery after a CSV event.
- There are no current deficiencies in water system storage capacity.
- The SCADA system could be improved or expanded to include greater centralized monitoring and control of the system. Identify locations without backup battery power. Engage power and communications utilities to gauge utility resilience and backup measures.
- Not having a redundant water supply in an alternate geographic location creates a significant vulnerability for the water system. It is understood the City is actively pursuing redundant water supply options.
- Ensure geographic information system (GIS) mapping is adequately detailed to locate critical isolation valves and facilities in an emergency.

1.8 Summary

This study identified several water system vulnerabilities associated with the pipeline bridge, 30-inch HDPE transmission main, wellfield, water system backbone, water distribution network, and system operations. The probability and magnitude of the damage that could occur depends on both qualitative and quantitative assessments; meaning that there are a wide range of possible outcomes. With careful consideration of these assessments, a picture of the potential damage can be drawn, and can then lead to development of priorities and improvements.

Table 6 summarizes the vulnerabilities for each water system component and includes an estimated recovery period for repair or replacement.

Table 6. Summary of Vulnerabilities

Component	Vulnerabilities	Estimated Recovery Period (days)
Pipeline Bridge	• Superstructure not designed for ductility • Substructure compromised by liquefaction and lateral spread • Pipeline will fail with the bridge and risk damage to connecting system, water loss, and contamination	Unlikely repairable and not cost effective to re-build
30-inch HDPE Line	• On northern side of river, pipe separation likely due to lateral spread • On southern side of river, liquefaction induced differential settlement with wellfield transmission lines	If the damage is isolated, repair could be in the range of two weeks. Access issues may prevent repair
Wellfield	• Insufficient backup power generation • Lateral spread and liquefaction could cause irreparable damage to deep wells • Potential siltation and changes to groundwater levels	Damage could be severe and require several months for new well construction
Water System Backbone	• Pipeline breaks due to lateral spread, settlement, and landslide	Approximately 60 days for non-landslide, and 21 to 156 days for landslide areas
Water Distribution	• Pipeline breaks due to lateral spread, settlement, and landslide	Approximately 290 days for non-landslide, and 84 to 630 days for landslide area
Yard Piping	• Loss of water storage due to absence of automated hydraulic control valves • Loss of storage due to absence of seismic couplings at structures or landslide zones • No bypass around WTP	Repair could be within a month, but water loss could be costly to the community during recovery

Appendix D:
Mitigation Recommendations

Memo

Date:	Friday, April 24, 2020
Project:	Seismic Resilience Assessment
To:	Brett Musick, PE, City of Newberg
From:	Andy McCaskill, P.E.; Chad Gipson, P.E.; Katie Walker, P.E.
Subject:	WTP Seismic Resiliency Cost Estimates

Introduction

Due to a potential Cascadia Subduction Zone event, the City of Newberg, OR is evaluating its water system to identify gaps in seismic resiliency. The existing water treatment plant (WTP) consists of vintage concrete structures not designed or detailed for current seismic codes. To mitigate this risk, significant work is required to perform a detailed seismic analysis of the existing structures and develop a structural retrofit and reinforcement scheme for the facility. The existing WTP site is also susceptible to lateral spreading during an earthquake, which would cause extensive damage to the plant without significant ground improvements. The purpose of this memorandum is provide information on the estimated cost to retrofit the existing WTP structures and perform ground improvements to mitigate lateral spreading at the existing plant, as well as the cost of building a new WTP.

Current Water Treatment Plant – Seismic Mitigation

The following cost estimate was developed primarily based on the seismic deficiency findings developed by SEFT (September 2019), using the ASCE41 Tier 1 seismic deficiency checklist method. Based on those findings, HDR developed rough order of magnitude cost estimates to perform seismic retrofits to address these deficiencies in order to meet the Basic Performance Objective for Existing Buildings (BPOE) criteria for a Risk Category IV essential facility in accordance with ASCE41 recommendations and guidelines.

The cost estimate is based solely on addressing seismic deficiencies identified in the Tier 1 assessment. It should be noted that some structures are approaching the end of their useful design life and there are potentially other deficiencies not addressed by the seismic retrofits.

It should be noted that the geotechnical investigation performed by Shannon and Wilson (July 2019) indicated that the existing plant is susceptible to liquefaction, ground deformation and lateral spreading. It is assumed that given the estimated level of settlement during a seismic event (approximately 1 inch), that most of the structures within the plant can tolerate this settlement with minimal impact to operations or life safety during a Cascadia Subduction Zone (CSZ) earthquake. As such, it is assumed that piles or deep foundation elements are not required at the existing plant to mitigate for liquefaction induced settlement.

However, the estimated seismic induced lateral spread movement is expected to be several feet. This is generally mitigated through the installation of ground improvements between the site and the shoreline to help buttress the site and prevent lateral movement. While detailed design of ground improvements is determined by the geotechnical engineer, HDR used unit costs based on past project experience with similar seismic hazards in order to estimate the magnitude of ground improvement costs for this site.

Table 1 presents the summary of the cost estimate for seismic mitigation improvements to the existing WTP based on the findings from the SEFT report.

Table 1: Existing WTP Seismic Mitigation Cost Estimate

Description	Cost
Original Control Building	$ 320,000
1961 Control Building Addition	$ 325,000
1970 Control Building Addition	$ 350,000
Sedimentation Basin #1	$ 205,000
Sedimentation Basin #2 (not in SEFT study)	$ 205,000
Filter Gallery and Clearwell	$ 245,000
Pump Room	$ 170,000
Filters	$ 150,000
Sodium Hypochlorite Building	$ 50,000
Subtotal Seismic Retrofits	**$ 2,020,000**
Nonstructural Seismic Mitigation (25%)	$ 505,000
Ground Improvements	$ 2,000,000
Subtotal	**$ 4,525,000**
Engineering and permitting (15%)	$ 680,000
Contingency (25%)	$ 1,300,000
Total	**$ 6,505,000**

Conceptual level cost estimates for an AACE Class 5 estimate can range from -50% on the low end and up to 100% on the high end. Using the cost estimate presented in Table 1, the range of the WTP construction cost estimate could be from approximately $3.3M to $13M.

New Water Treatment Plant

The cost estimate for a new water treatment plant is based on the design criteria outlined in Section 7 of the 2002 Water Treatment Facility Plan. The treatment process are identified as follows:

- Oxidation Contact Basins – use chlorine to oxidize iron
- Dissolved Air Flotation – removes iron solids
- Granular Media Filters – filtration
- Clearwell – storage and additional disinfection contact time
- Sludge Pump Station – sends solids from DAF to the sludge thickener
- Backwash Equalization Basin – stores backwash waste from the filter before sending to sanitary sewer

- Sludge Thickener – thickens solids before discharge to sanitary sewer

Table 2 presents the design criteria used in the cost estimate.

Table 2: New WTP Cost Estimate Design Criteria

Parameter	Design Value or Specification
Initial Maximum Design Flow	12 million gallons per day (MGD)
Oxidation Contact Basins	Number of units: 3, initially Design contact time: 15 minutes
Dissolved Air Flotation	Number of units: 3, initially Surface loading rate: 6 gallons per square foot (gpm/sf)
Granular Media Filters	Number of units: 4, initially Filter loading rate: 6 gpm/sf Area of each filter: 384 sf Depth of media: 5 feet (1 foot sand, 4 feet anthracite)
Clearwell	Storage: 1 million gallons
Sludge Pump Station	Pumps: 1 duty + 1 standby Horsepower: assumed 2 hp
Backwash Equalization Basin	Backwash flow rate: 20 gpm/sf Backwash duration: 10 minutes Filter to waste flow rate: 6 gpm/sf Filter to waste duration: 5 minutes Number of stored backwashes: 4
Backwash Supply Pump Station	Pumps: 1 duty + 1 standby Horsepower: assumed 125 hp
High Service Pump Station	Pumps: 5 duty + 1 standby Horsepower: assumed 100 hp
Chemical Systems	Coagulant: tank plus metering pumps (1 duty + 1 standby) Sodium Hydroxide (caustic): tank plus metering pumps (1 duty + 1 standby) Filter Aid Polymer: 1 tote with mixer, 1 blending skid Sludge Thickener Polymer: 2 tote with mixer, ` blending skid Chlorine: none (assumed City would transfer existing chlorine generation system to the new plant)
Administrative Building	Size: 3,750 feet

Table 3 presents the summary of the cost estimate for a new WTP. This estimate does not include any requirements for offsite work, such as installation new electrical lines, raw or finished water pipelines.

Table 3: New WTP Conceptual Cost Estimate

Description	Cost
Administration Building	$ 1,218,750
Chemical Systems	$ 421,000
Site Civil	$ 927,000
Seismic Mitigation	$ 927,000
Generators	$ 500,000
Oxidation Contact Basins	$ 329,500

Description	Cost
Dissolved Air Flotation	$ 1,841,000
Filtration	$ 1,143,000
Solids Handling	$ 899,750
Clearwell	$ 2,570,750
Piping	$ 842,000
Electrical/I&C	$ 2,156,000
Start-up Costs	$ 275,600
Subtotal	**$ 14,051,350**
Engineering and permitting (15%)	$ 2,108,000
Contractor OH/Profit/Mob/Insurance/GC	$ 3,513,000
Subtotal	**$ 19,672,350**
Contingency (25%)	$ 4,918,000
Total	**$ 24,590,350**

Conceptual level cost estimates can range from -50% on the low end and up to 100% on the high end. Using the cost estimate presented in Table , the range of the WTP construction cost estimate could be from approximately $12.3M to $49.2M.

Memo

Date:	Monday, June 22, 2020
Project:	City of Newberg Seismic Resilience Assessment
To:	Brett Musick, PE, City of Newberg
From:	Andy McCaskill, PE; Katie Walker, PE
Subject:	Seismic Resilience Assessment – Mitigation Recommendations

Introduction

The City of Newberg (City) is conducting a seismic resilience assessment (SRA) to assess vulnerabilities in their system and identify mitigation strategies to meet their level-of-service (LOS) goals during and after a Cascadia Subduction Zone (CSZ) event. Previous mitigation strategies identified as part of the SRA include the rehabilitation of the existing water treatment plant and construction of a greenfield water treatment plant. The purpose of this memorandum is to present the following three additional recommendations to mitigate seismic challenges:

1. Emergency Connection and Control at the Water Treatment Plant (WTP)
2. Seismic Improvements at Corral Creek and North Valley Water Storage Tanks (WSTs)
3. Cast Iron and Concrete Pipe Replacement

The following sections describe these recommendations in more detail and include a conceptual design and construction cost estimate.

Mitigation Recommendation 1 – Emergency Connection and Control at WTP

As documented in other studies, the WTP is susceptible to several seismic risks including slope instability, liquefaction, and lateral induced settlement. Since all water to the City's distribution system currently runs through the WTP and repairs at the plant will likely be needed following a CSV event, the installation of a WTP emergency connection point is recommended. This emergency connection would provide a point where the raw water line could be connected to the finished water line (see Appendix A), allowing raw water to be used in the community for firefighting and domestic use (must be boiled for potable consumption). To facilitate the connection, tees are to be added to the raw and finished water pipeline with isolation valves installed in a connection vault (see Figure 1). A spool piece would be added during an emergency to provide a cross-connection point. The conceptual cost for this item is approximately $200K. One future item for consideration includes modeling the City's system hydraulics and pressures to evaluate how to operate the emergency connection and if additional appurtenances are required.

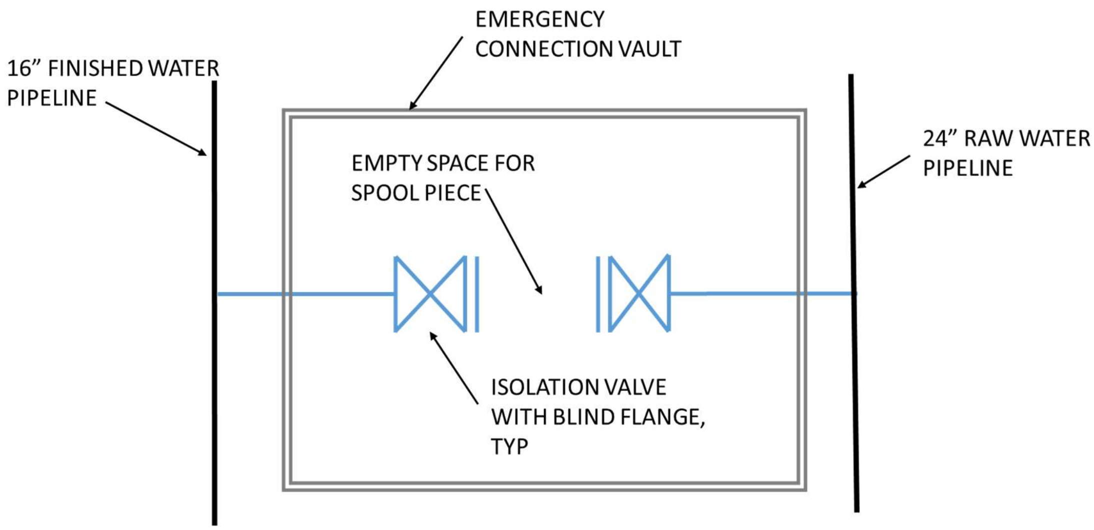


Figure 1. Raw Water Emergency Connection Vault

In addition, it is recommended that a hydraulically actuated pressure sustaining valve be installed on the raw water line that would close in the case of a pressure drop upstream, potentially due to a pipeline bridge failure or transmission main break. This valve would automatically close to prevent the water system from bleeding back into the river or wellfield area if there is a transmission main break. The conceptual cost for this item is approximately $300K. One future item for consideration includes modeling the City’s system hydraulics and pressures to refine the pressure sustaining valve operation.

Mitigation Recommendation 2 – Seismic Improvements at Corral Creek and North Valley WSTs

Conceptual layouts for these improvements are presented in Appendix B.

Corral Creek WST Improvements

Pipeline separation, and subsequent water loss, was identified as a main vulnerability at the Corral Creek WST. It is recommended that a hydraulically actuated pressure sustaining valve be installed on the inlet/outlet to the tank to preserve water storage if a pipeline break occurs. The conceptual cost for this item is approximately $300K. Future items for consideration include modeling the City’s system hydraulics and pressures to refine the pressure sustaining valve operation, and evaluating an option to retrofit the existing altitude vault.

North Valley WSTs Improvements

The North Valley WSTs have a similar vulnerability for water loss as the Corral Creek WST; a hydraulically actuated pressure sustaining valve is also recommended for installation on the inlet/outlet. The conceptual cost for this item is approximately $300K. One future item for consideration includes modeling the City’s system hydraulics and pressures to refine the pressure sustaining valve operation.

In addition to the valve, it is recommended that the portion of the concrete pipeline from the tank to NE North Valley Road be replaced due to the potential for landslide in the area and the lack of seismic resiliency within the pipeline. Approximately 800 linear feet of 24" pipeline is recommended to be replaced with restrained joint ductile iron pipe at a conceptual cost estimate of $450K.

Mitigation Recommendation 3 – Cast Iron and Concrete Pipe Replacement

The survey of the City's backbone identified that it contains approximately 24% cast iron pipe and 13% concrete pipe (see Appendix C). The vulnerability assessment identified that a majority of the breaks in the system's backbone will occur in these pipe materials and will likely not be repairable following a CSZ event. Table 1 presents the breakdown of pipe sizes by pipe material.

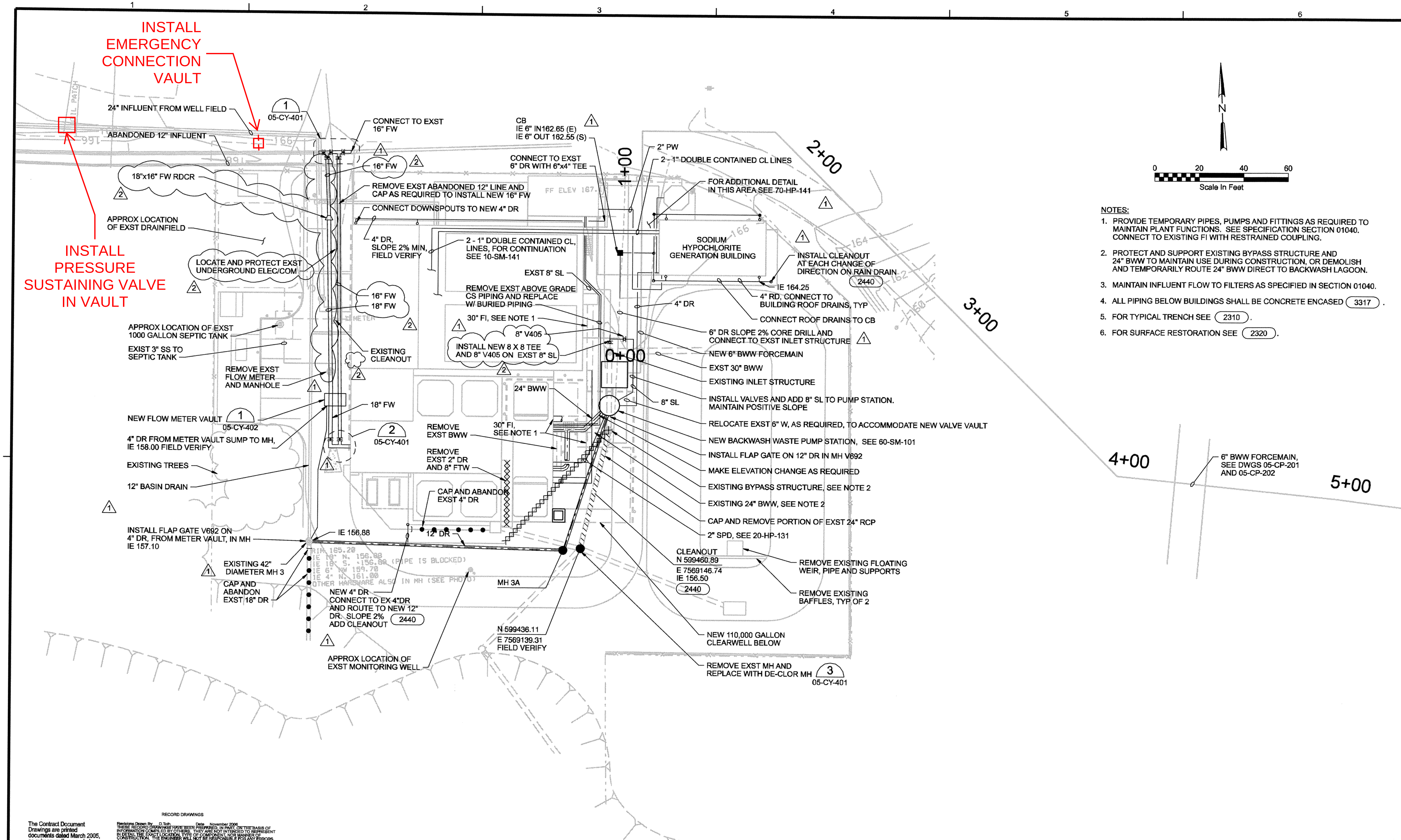
Table 1. Backbone Pipe Replacement by Pipe Size and Material

Pipe Diameter	Linear Feet of Pipe		Total Linear Feet of Pipe
	Cast Iron	Concrete	
6"	1,500	0	1,500
8"	7,979	0	7,979
10"	3,520	0	3,520
12"	6,850	17	6,867
14"	60	0	60
16"	0	2,600	2,600
18"	4,920	9,030	13,950
24"	0	950	950
Total			37,426

It is recommended that these pipes be replaced with restrained joint ductile iron pipe to reduce the recovery time for the water system backbone. A portion of the concrete pipe identified in this table is also recommended to be replaced under Mitigation Recommendation 2 – North Valley WSTs. The conceptual cost for this item is approximately $12.5M and assumes an additional 10% pipe replacement.

Appendix A:

Mitigation Recommendation 1 – Conceptual WTP Improvements



NOTES:

1. PROVIDE TEMPORARY PIPES, PUMPS AND FITTINGS AS REQUIRED TO MAINTAIN PLANT FUNCTIONS. SEE SPECIFICATION SECTION 01040. CONNECT TO EXISTING FI WITH RESTRAINED COUPLING.
2. PROTECT AND SUPPORT EXISTING BYPASS STRUCTURE AND 24" BWW TO MAINTAIN USE DURING CONSTRUCTION, OR DEMOLISH AND TEMPORARILY ROUTE 24" BWW DIRECT TO BACKWASH LAGOON.
3. MAINTAIN INFLUENT FLOW TO FILTERS AS SPECIFIED IN SECTION 01040.
4. ALL PIPING BELOW BUILDINGS SHALL BE CONCRETE ENCASED (3317).
5. FOR TYPICAL TRENCH SEE (2310).
6. FOR SURFACE RESTORATION SEE (2320).

The Contract Document Drawings are printed documents dated March 2005, as subsequently amended, which define the scope, extent, and character of the work. The original document drawing was sealed & signed by: Todd Bryan Perimon State of Oregon P.E. No. 18708

RECORD DRAWINGS

Revisions Drawn By: D.Toth Date: November 2006
THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT, NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

DSGN TB PERIMON	3	2007	RECORD DRAWING	RFG	BJP	VERIFY SCALE
DR JL PFEIFER	2	4/05	ADDENDUM NO. 2	TBP	RCF	BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
CHK WB WAGNER	1	4/05	ADDENDUM NO. 1	TBP	RCF	IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
APVD RC FRANKENFIELD	NO.	DATE	REVISION	BY	APVD	

CH2MHILL

CITY OF NEWBERG
NEWBERG, OREGON
WATER TREATMENT PLANT EXPANSION
TO 9.5 MGD

SITE DEVELOPMENT

YARD PIPING PLAN AND DEMOLITION

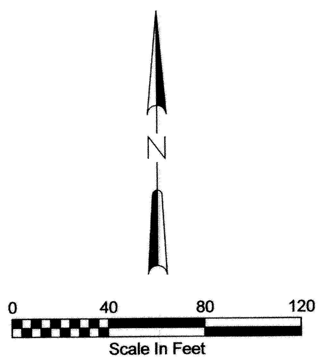
SHEET	17
DWG	05-CY-101
DATE	MARCH 2005
PROJ	320153

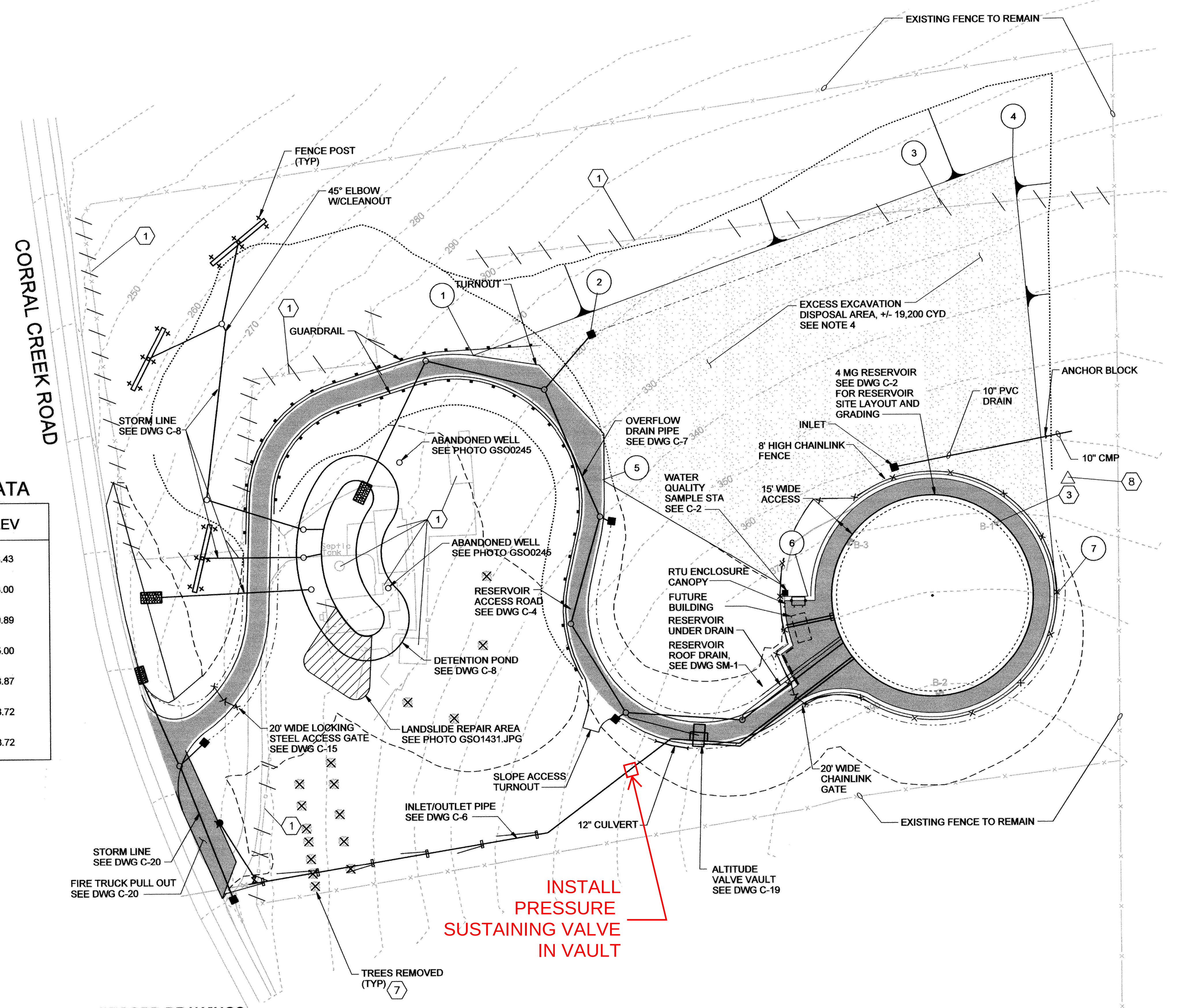
FILENAME: 05ncy101d_320153.dgn PLOT DATE: 5/29/2007 PLOT TIME: 11:46:54 AM

A2007005T

Appendix B:

Mitigation Recommendation 2 – Conceptual WSTs Improvements





LEGEND:

- B-1 — BORING LOCATIONS (CH2M HILL, JUNE 2000)
- ASPHALT PAVEMENT
- TOE OF FILL
- CUT SLOPE LIMIT
- BOTTOM OF DITCH
- FENCE DEMOLITION
- 370 — EXISTING CONTOURS

NOTES:

1. MAN-MADE FEATURES TO BE DEMOLISHED INCLUDE, BUT ARE NOT LIMITED TO:
   A. HOUSE FOUNDATION *
   B. GARAGE BARN FOUNDATION *
   C. SEPTIC SYSTEM
   D. FENCE
   E. GRAVEL ACCESS ROAD
   F. CONCRETE VAULT STRUCTURE
   G. STONE SHED
   H. BRICKPATIO

   * WOOD STRUCTURES WERE BURNED 04/07/2002
2. CONTRACTOR STAGING AREA MAY BE ANYWHERE ON SITE, WITHIN CLEARING LIMIT FENCE SHOWN ON DWG C-9
3. ABANDON PIEZOMETER
4. ADJUST FINISHED ELEVATION OF DISPOSAL AREA TO WASTE ACTUAL QUANTITY OF EXCESS EXCAVATION MATERIAL. PROVIDE UNIFORM SURFACE THAT DRAINS TO DITCH INLET 2.
5. SEE ELECTRICAL PLAN FOR POWER POLE LOCATIONS.
6. BOUNDARY SURVEY WAS COMPLETED BY MATT DUNCKEL & ASSOC. IN APRIL 2002. SUCCESSFUL BIDDER MAY OBTAIN COPY OF SURVEY FROM THE CITY OF NEWBERG.
7. ☒ TREE REMOVED FOR CONSTRUCTION
8. CONSTRUCTION TBM-2 RR SPIKE IN 10" FIR TREE ± 50' N TANK ELEVATION 371.26 NGVD 1929

DISPOSAL AREA LOCATION DATA

PT NO	COORDINATES		ELEV
1	N 607081.25	E 7579315.66	324.43
2	N 607096.02	E 7579399.95	323.00
3	N 607187.30	E 7579653.44	329.89
4	N 607221.41	E 7579704.92	335.00
5	N 606990.61	E 7579407.80	338.87
6	N 606905.65	E 7579555.30	378.72
7	N 606905.65	E 7579734.30	378.72

RECORD DRAWINGS

Revisions Drawn By Prisciliano Peralta Date Feb 2004

The Contract Document Drawings are printed documents dated April 2002, as subsequently amended, which define the scope, extent, and character of the work. The original document drawing was sealed and signed by Tim G. Yamada, State of Oregon, P.E. No. 62607PE, dated November 9, 1999.

DSGN	T. YAMADA
DR	H. GIFFORD
CHK	B. WAGNBR
APVD	BJ PHELPS

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS.

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

CITY OF NEWBERG
NEWBERG, OREGON

CORRAL CREEK ROAD

4.0 MG RESERVOIR

CORRAL CREEK ROAD RESERVOIR
SITE WORK
SITE PLAN

A2004001D

SHEET	4
DWG	C-1
DATE	APRIL 2002
PROJ	167877

FILENAME: 05cc101d_167877.dgn PLOT DATE: 25-AUG-2004 PLOT TIME: 10:15:19

NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR MAKING IMPROVEMENTS TO EXISTING ACCESS ROAD THAT ARE NECESSARY FOR CONSTRUCTION ACTIVITIES DURING RESERVOIR IMPROVEMENTS.
2. MAINTAIN ACCESS ROAD FOR USE OF PRIVATE RESIDENTS AT ALL TIMES.
3. ROAD TO THE SOUTH SHALL NOT BE USED TO ACCESS THE SITE.
4. INSTALL SAMPLE STATION ON COMMON FILL LINE IN EXISTING VALVE VAULT. FINAL LOCATION OF SAMPLE STATION SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER. SEE DETAIL 4 ON SHEET M-7.
5. CONTRACTOR SHALL SWEEP HWY 219 AT THE INTERSECTION OF THE ACCESS ROAD DAILY. DO NOT TRACK MUD, DIRT OR DEBRIS ONTO HIGHWAY.

SURVEY CONTROL:

TOPOGRAPHIC SURVEY DATUM FOR VERTICAL CONTROL IS NAVD 88. HORIZONTAL CONTROL IS BASED ON NAD 83, OREGON STATE PLANE NORTH.

CP#1: PK NAIL
N 617155.10
E 7565937.40
EL 386.17

CP#2: PK NAIL
N 617176.16
E 7566157.68
EL 396.88

CP#3: 5/8" IRON ROD
N 617106.16
E 7567007.16
EL 378.65

0 50 100
1"=50'

RECORD DRAWINGS

STEPHANIE GOTSCH 2/7/2017 1:58 PM

\\Por2\cad\cad\10\1091031.20-Newberg_NorthValley\1091031c01_REC.dwg

USE OF DOCUMENTS

NO.	REVISION	DATE	BY
	RECORD DRAWINGS	JAN 2017	SCS

SCALES
0 1"
0 25mm
IF THIS BAR IS NOT DIMENSION SHOWN, ADJUST SCALES ACCORDINGLY.

THESE RECORD DRAWINGS HAVE BEEN PREPARED BASED ON INFORMATION PROVIDED BY THE CONTRACTOR AND OTHERS. KENNEDY/JENKS CONSULTANTS HAS NOT VERIFIED THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED TO THEM AND DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THESE RECORD DRAWINGS. USERS OF THESE RECORD DRAWINGS ASSUME ALL RISK OF LOSS RESULTING FROM THEIR USE.

DESIGNED SCS
DRAWN SLG
CHECKED MDL

CITY OF NEWBERG
NEWBERG, OREGON

NORTH VALLEY AND CORRAL CREEK RESERVOIRS SEISMIC UPGRADE AND INLET/OUTLET MODIFICATIONS

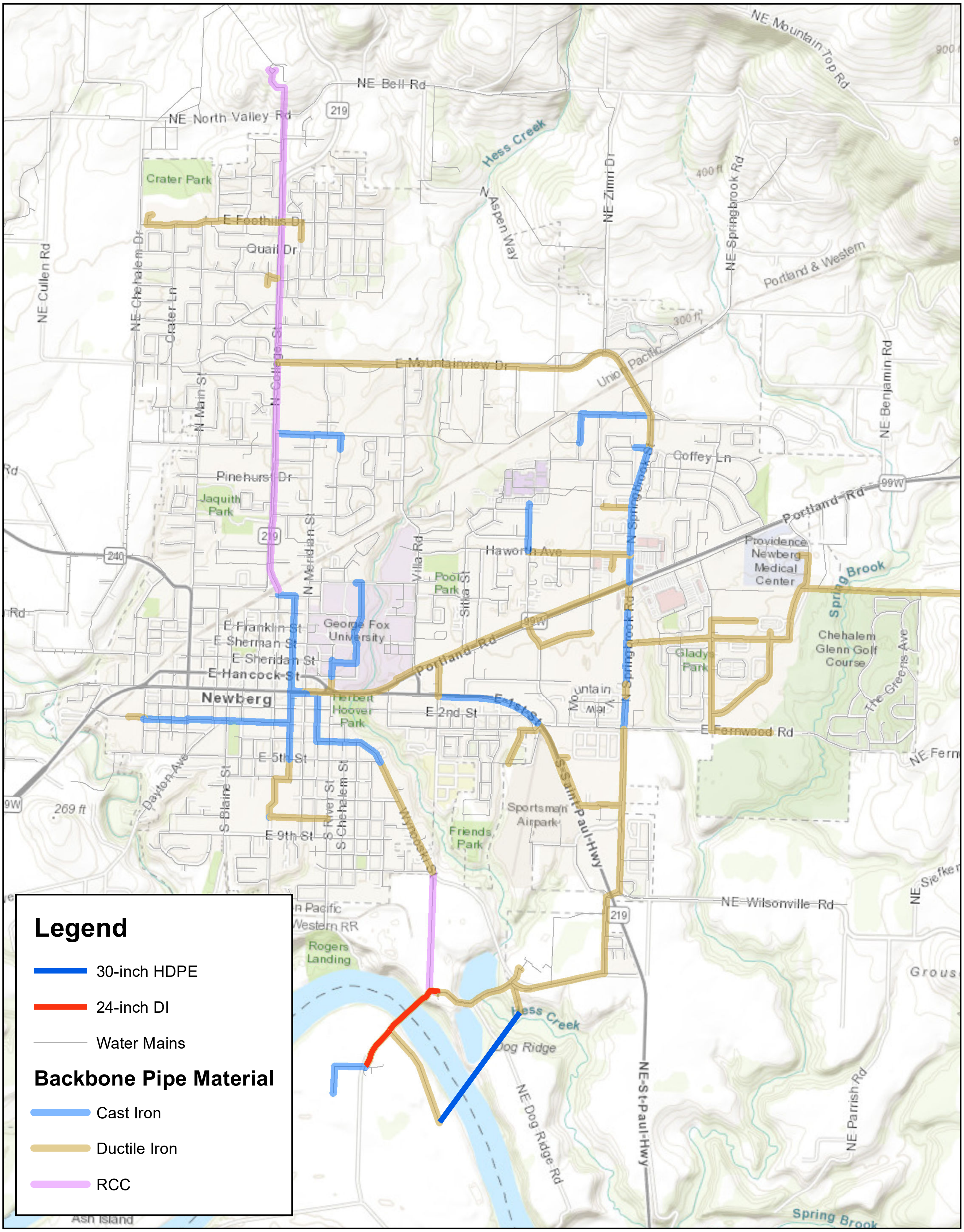
Kennedy/Jenks Consultants©
200 SW MARKET STREET, SUITE 500, PORTLAND, OREGON 97201

NORTH VALLEY RESERVOIRS NO1 & NO2 - SITE & EROSION CONTROL PLAN

FILE NAME 1091031C01_REC.DWG
JOB NO. 1091031.20
DATE SEPTEMBER 2015
SHEET C-1 OF -

Appendix C:

Mitigation Recommendation 3 – Backbone Pipeline Replacements


Legend
30-inch HDPE
24-inch DI
Water Mains
Backbone Pipe Material
Cast Iron
Ductile Iron
RCC
Newberg
NE Bell Rd
NE North Valley Rd
Crater Park
E Foothills Dr
Quail Dr
E Mountainview Dr
Pinehurst Dr
Jaquith Park
Haworth Ave
Coffey Ln
Portland Rd
Providence Newberg Medical Center
Chehalem Glenn Golf Course
George Fox University
E Franklin St
E Sherman St
E Sheridan St
E Hancock St
Herbert Hoover Park
E 2nd St
E 1st St
E 5th St
E 9th St
E Fernwood Rd
Sportsman Airpark
Friends Park
Gladys Park
NE Wilsonville Rd
Rogers Landing
Hess Creek
Spring Brook
NE Dog Ridge Rd
NE St Paul Hwy
S Saint Paul Hwy
Portland & Western
Union Pacific
NE Mountain Top Rd
NE Springbrook Rd
N Springbrook Rd
NE Zimri Dr
N Aspen Way
NE Cullen Rd
NE Chehalem Dr
Crater Ln
N Main St
N College St
N Meridian St
Villa Rd
Sitka St
S Blaine St
S River St
S Chehalem St
Waterfront St
Dayton Ave
NE Benjamin Rd
NE Parrish Rd
The Greens Ave
Ash Island
Pacific
Western RR
Dog Ridge
Mountain View
Pool Park
219
240
99W
269 ft
300 ft
400 ft

Appendix E:

Recommendations for Future Studies

Memo

Date:	Monday, June 22, 2020
Project:	City of Newberg Seismic Resilience Assessment
To:	Brett Musick, PE, City of Newberg
From:	Andy McCaskill, P.E. and Katie Walker, P.E.
Subject:	Seismic Resilience Assessment – Recommendations for Future Studies

Introduction

The City of Newberg (Newberg) operates a water system consisting of a wellfield, raw water transmission pipelines, a water treatment plant, three water storage reservoirs, one pump station, and distribution system pipelines. In support of the 2017 Water Master Plan and Oregon Health Authority (OHA) guidelines, Newberg conducted a water system seismic resilience assessment (SRA). The purpose of this memorandum is to identify the additional recommended studies to further clarify and confirm the City's seismic mitigation needs.

Future Studies

Seismic Recovery Goals

During workshops, alternative demand strategies were discussed, such as a potential influx of residents from coastal areas. Additional studies could be conducted to identify additional demands that impact the water storage available within the system.

Geotechnical

Additional geotechnical studies are recommended to better classify the seismic hazards that the water system components may experience. Targeted field investigations will allow Newberg to focus on the most hazardous areas. These include:

- Investigate vulnerabilities of the horizontal directional drill transmission main under the river. The soil conditions in the south side of the alignment indicate liquefaction induced settlement, especially at the transition to the well field piping.
- Impacts of seismic activity to the well field, well infrastructure, and groundwater. It is likely, based on the soil information available, that significant liquefaction and lateral spreading will occur during a CSZ earthquake. This could cause separation between the well casing and the pipe connection, plug the screens and reduce the capacity of the well, and fluctuation in the groundwater levels.
- Review the effects of bank erosion due to the Willamette River on slope stability in the proximity of the WTP.

Structural

The SRA included high level assessments of structural components within the City's water system. Depending on the desire to retrofit or rehabilitate the pipeline bridge, additional studies should be conducted to identify the mitigation measures needed to maintain the structure and the pipeline during a CSZ event. Likewise, additional investigations should be conducted at the WTP to identify specific mitigation measures for individual structural components.

Mitigation Strategies

As part of the SRA, only five mitigation strategies were identified. Additional improvements need to be identified and implemented to achieve the LOS goals. Additional mitigation strategies to investigate include:

- Wellfield infrastructure improvements based on the recommended additional geotechnical investigations.
- Improvements to the seismic resiliency of the transmission system main to address the potential for pipe separation.
- Improvements to slope stability at the WTP to prevent landslides.
- Installation of pipeline bridge isolation valves to minimize water loss if the bridge or pipeline fails.
- Construct a seismic resilient well with backup generator away from the river to replace well 4.
- Install seismic raw waterline from new seismic well to existing 30" HDPE line.
- Install a raw water booster pump station with a connection to potable water system.
- Investigate locations where seismic joints can be added to protect the water system.

Other Studies

- Develop new engineering standards to address seismic resiliency needs including those for the backbone system and updates to water service connections
- Review SCADA and GIS mapping system to see where improvements can be made with helpful alarms and feedback.
- Review fiber optic and power supply to identify vulnerabilities, and how the outage of those items would impact the water system.

APPENDIX F

Addendum Water Supply Planning (Adopted 4/3/23)

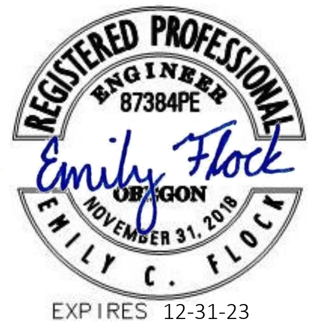
Technical Memorandum

Date: January 17, 2023

Project: 22-3506

To: Kaaren Hofmann, PE
City of Newberg

From: Emily Flock, PE
Brian Ginter, PE
Consor



Re: Water Master Plan Addendum – Water Supply Planning

Introduction and Purpose

Since the completion of the 2017 Water Master Plan (WMP) (Riverfront Master Plan Addendum updated in 2021), there have been several developments related to the City of Newberg's (City's) water supply planning. The developments have evolved both simultaneously and sequentially. The purpose of this Water Supply Planning Addendum (Addendum) is to document and reflect these developments in the City's WMP and Capital Improvement Program (CIP). The Addendum updates two sections of the 2021 Updated WMP.

- 4.0 Water Supply Analysis
- 7.0 Recommendations and Capital Improvement Program (CIP)

The Addendum focuses on two activities.

1. **Redundant Water Supply** – Creating a system to draw water from the Willamette River on the north side will provide the City with a safe and reliable water future.
2. **Groundwater Treatment Plant** – Building a modern, seismically resilient groundwater treatment plant will cost similar to required upgrades of the existing treatment plant.

This Addendum is not intended to meet all State requirements for a WMP update; it is primarily to document updates to the CIP. The goal of the Addendum is to assist the City in planning for adequate water infrastructure to comply with Oregon Health Authority (OHA) treatment regulations, incorporate seismic resilience considerations, and build a redundant water supply to meet the City's long-term needs to provide a resilient water future for the community.

Water Master Plan Background

The 2017 WMP identified a redundant water supply as a key element in planning for a resilient water future for the City. The 2017 WMP highlighted that both the well field and at least one transmission main to the Water Treatment Plant (WTP) may be vulnerable to flooding, ground movement, seismic activity, or other natural disasters. Given these potential vulnerabilities it was recommended that the City assess redundant supply options on the north side of the Willamette River. Two locations on the north side of the Willamette River were reviewed for potential feasibility and capacity to provide a redundant groundwater source. Additional evaluation and investigations on a redundant water supply since the 2017 WMP are summarized in the following section.

The Riverfront Master Plan Addendum to the WMP was completed in 2021 to incorporate additional information and analyses on the following three areas.

- Riverfront Master Plan (adopted 2019)
- Seismic Resiliency Assessment (SRA) (HDR, 2020)
- Infrastructure Based Time Extension Request (IBTER) under Oregon House Bill 2001 Middle Housing implementation rules

Each of the three analyses resulted in recommended changes to the City's WMP CIP. The Riverfront Master Plan and IBTER evaluations provided support in planning adequate water infrastructure to serve new development areas that were not included in the 2017 WMP. The SRA provided recommendations for the City's long-term water system resiliency and planning. Since this Addendum focuses on City's water supply, the Riverfront Master Plan and IBTER infrastructure recommendations are not discussed further in the Addendum. The seismic resiliency recommendations and impacts on supply and treatment will be discussed in subsequent sections.

Redundant Water Supply Project Background

While the Riverfront Master Plan Addendum was being completed, further study and evaluation of a redundant water source was proceeding concurrently. As identified in the 2017 WMP, evaluation of a redundant water source is a key need due to concerns over seismic integrity of the existing water supply and vulnerability of the City's single source of supply with no emergency interties. The Redundant Water Supply Project was developed with three phases to define overall redundant water supply goals and identify potential alternatives (Phase 1), complete an alternatives analysis and select a preferred alternative (Phase 2), and provide preliminary plans and cost estimate to complete the preferred alternative (Phase 3). The phased approach has allowed the City to use the information and recommendations from one phase to develop and adapt the scope of work for the next phase. Conclusions and recommendations from each phase are summarized below. Additional information and evaluation will be presented in the Redundant Water Supply Report, which will be completed in the first half of 2023.

Phase 1 assessed the needs and objectives for a redundant source of supply within the context of the City's overall water system service goals. The three options listed below were identified and explored in the context of providing a secondary source, as well as consideration of a broader range of alternatives including consideration of additional supply partnerships with Washington County or Marion County water providers and local raw water impoundments.

1. Storage using aquifer storage and recovery
2. Additional groundwater supply capacity
3. Surface water supply from the Willamette River

City staff and a City Council subcommittee provided input and review throughout Phase 1 to help craft goals, criteria, and a public engagement strategy for Phase 2. The City Council approved three motions at the conclusion of Phase 1 (summarized below).

1. Use current winter average day demand (ADD) of 2 million gallons per day (MGD) and the 50-year projected winter ADD of 8 MGD as preliminary "level-of-service" goal ranges to evaluate potential redundant water supply options.

2. Have City staff reach out to potential local and regional water rights owners to investigate the feasibility of using and/or acquiring their water rights to meet the City's long-term redundant water supply strategy.

3. Have City staff initiate a public engagement process.

Based on the interactions with City Council, the ideal source would initially meet the City's 2 MGD winter ADD, could be expanded to a future demand of 8 MGD, and provide a redundant source for increased system resiliency. Feasible storage of water in aquifers and additional groundwater supply would not be able to meet the criteria outlined. This leaves surface water supply from the Willamette River as the ideal redundant water source that could also meet supply needs.

Phase 2 of the Redundant Water Supply Project further explored options for the Willamette River as a water source, including water rights acquisition, and possible partnership opportunities with nearby cities. The alternatives were narrowed to: (1) Local Willamette Alternative, and (2) Regional Willamette Alternative. Local Willamette water rights would involve the City acquiring water rights with a point of diversion (POD) located near the City. Regional Willamette water rights would utilize water rights held by the Yamhill Regional Water Authority (YRWA) and McMinnville Water and Light (MW&L). Current members of the YRWA are MW&L and the Cities of Carlton and Lafayette. The YRWA was formed to seek, acquire, and manage water use permit(s) for appropriation of water from the Willamette River, and to construct, operate, and maintain a Willamette River potable water supply system. There are multiple water use authorizations on the Willamette between YRWA and MW&L with PODs south of the City of Dayton.

The two alternatives have several similarities because they are both surface water supplies from the Willamette River. The preliminary list of evaluation criteria was refined and consolidated for this phase of the study to highlight the differences and the advantages/disadvantages between the two alternatives. The criteria were also selected based on feedback obtained from key stakeholder interviews and a community survey on water supply topics. The six evaluation criteria defined for analyzing the alternatives are listed below.

1. Ownership
2. Resilience
3. Implementation Schedule
4. Source Water Quality
5. Operational Complexity
6. Life Cycle Costs

Public engagement in Phase 2 included stakeholder interviews and a public survey. The public engagement process highlighted education, ongoing communication, and transparency as vital for the decision-making process. The public will be concerned about rate impacts and cost. There may also be negative public perception of the Willamette River water quality, particularly with concerns about contamination from the old mill site. The four highest ranked community values for a redundant water supply were:

- Provides safe, high-quality water
- Provides enough water for future needs
- Prepares the community for an earthquake or other natural disasters
- Provides the most benefit for the lowest cost

The Local Willamette Alternative is the first option for a redundant water source from the Willamette River via an intake and new treatment plant located near the City of Newberg. Ideally, this intake would be located on the north bank of the Willamette River to avoid a river crossing. The existing WTP is designed and operated to treat groundwater, which has different treatment requirements than surface water. A surface water supply will require additional water treatment facilities.

The Regional Willamette Alternative is the second option and provides the City with an opportunity to join with the YRWA, which is headed by MW&L and also includes the cities of Lafayette and Carlton, in their efforts to develop a secondary water source. The YRWA Willamette Supply Project evaluated options for a new intake, treatment facility, and required piping located off the Willamette River just south of the City of Dayton in 2016. The City has the option to procure a long-term supply contract from YRWA and/or MW&L or participate in an ownership contract with YRWA. As a partner, the City would be responsible for partial costs of the design, construction, and maintenance.

The City of Dundee, located just southwest of the City along Highway 99 is also exploring options for a secondary water supply to meet future demand needs from anticipated growth in the Riverside Master Plan Area on the east side of Hwy 99. With the Regional Willamette Alternative, the City of Dundee is located along a possible pipe route which would offer an easy option to upsize the pipe and share design and construction costs. With the Local Willamette Alternative, a partnership could result in shared costs of the intake and/or the treatment plant.

The Local Willamette Alternative and the Regional Willamette Alternative were evaluated using the six criteria listed above. The purpose of the evaluation was to identify the advantages and disadvantages of each alternative relative to these criteria, such that the City could assess how to move forward with the two alternatives in Phase 3 of the Redundant Water Supply Project. At this stage, the evaluation was completed in a qualitative basis in conjunction with City staff as part of a workshop in June 2020. The preliminary evaluation was presented to City Council for further input on July 20, 2020 and refined as documented here. Based on the evaluation criteria, the local Willamette Alternative appears to provide a better value from a City control and cost basis. **Table 1** summarizes the evaluation for each criterion. Overall, based on understanding of the Local and Regional Willamette alternatives to-date, both alternatives provide the City with added reliability, but at a significant cost. Ownership and direct control of operations were the most significant factors in how City staff considered the two alternatives. The City council approved proceeding with preliminary engineering for the Local Willamette Alternative in December 2020.

Table 1 | Summary of Alternatives Evaluation Advantages

Criteria	Local Willamette		Regional Willamette	
Ownership	+1	✓	0	
Resilience	0		+1	✓
Implementation Schedule	0		+1	✓
Source Water Quality	0		0	
Operational Complexity	+1	✓	0	
Life-Cycle Costs	+1	✓	0	

Phase 3 is currently underway. This phase will evaluate the preliminary design and implementation plan for the Local Willamette Alternative, including the following main components.

- Intake facility
- Treatment plant
- Transmission

The City is in the process of finalizing purchase of approximately 8.0 cubic feet per second (cfs) (5.17 MGD) of water rights from WestRock Northwest on the Willamette River from two PODs located in the area of Rogers Landing County Park. The City Council has begun the water right transfer application and process. The City has been able to acquire additional properties proximate to the existing groundwater treatment plant. These areas are viable for the required infrastructure for the future redundant water supply.

As part of the Phase 3 work, the analysis of redundant supply included the consideration of the seismic resilience of the existing WTP and the new regulatory requirements for upgrade of the treatment facilities, discussed in further detail in the next section.

It is anticipated that the Redundant Water Supply – Phase 3 (Preliminary Engineering) will be completed in early 2023 and will be documented in the Redundant Water Supply Report (2023).

Groundwater Treatment Plant Background

The City's existing WTP was constructed in 1953 and is located on the north bank of the Willamette River south of downtown Newberg within the fence of the former WestRock Northwest mill. The WTP was expanded and upgraded in 1961, 1970, 1980, 1997 and 2006. The current WTP is a conventional filtration facility used to treat high levels of dissolved iron in the well source water. The plant includes one settling basin, two chlorine contact basins, and six rapid sand filters, all of which are uncovered and located outdoors. Treatment processes also include the addition of caustic soda to adjust pH for corrosion control and sodium hypochlorite for disinfectant residual maintenance. The plant has a nominal capacity of 9 MGD. According to City staff, operational capacity at the WTP is limited to approximately 8 MGD due to undersized piping between the raw water transmission mains and the settling basins.

The 2017 WMP identified only minor deficiencies with the existing WTP and thus improvement recommendations were relatively minor. The 2021 Technical Update Addendum included a summary and recommendations from the 2020 SRA. The SRA included a review of the existing geologic and geotechnical conditions in the City's water service area to develop seismic ground motion, seismic hazard, and permanent ground deformation hazard maps. Water system components were compared against these seismic hazard maps showing peak ground velocity, probability of liquefaction, and landslide induced permanent ground deformation.

Based on the SRA, vulnerabilities were identified in the raw water pipeline bridge, the 30-inch raw water transmission main, the wellfield, and the WTP due to lateral spreading and soil liquefaction. In general, the SRA review of the WTP structures indicated that none meet either the structural or non-structural performance objectives outlined as part of the seismic recovery goals. The SRA noted that while the buildings will not withstand a Cascadia Subduction Zone (CSZ) event, the WTP site itself is not susceptible to a landslide into the adjacent Willamette River. The SRA states significant work is required at the WTP to meet recovery goals, and further evaluation is recommended to compare the cost of upgrading the WTP with building a new WTP. The SRA estimated seismic improvements at the WTP would cost $7 million (in 2020 dollars). As noted in the previous section, Phase 3 of the Redundant Water Supply Project included preliminary geotechnical investigation as part of the new intake citing process. This investigation provided additional information on the seismic hazards to the existing WTP. A number of geological and seismic hazards were identified near the WTP site, including riverbank instability, seismic liquefaction and lateral spreading. There is an approximately 40-50 foot deep layer of highly liquifiable soils in the vicinity of the WTP and is assumed to extend underneath the WTP property. There are additional risks of slope instability and lateral spreading even if the soil does not liquify during a seismic event. The additional geotechnical information provided by this investigation and subsequent recommendations would be in addition to those identified in the 2020 SRA. Significant seismic improvements are required for long-term resiliency of the existing WTP.

In 2019, the Oregon Health Authority, Public Health Division, Office of Environmental Public Health, Drinking Water Services (DWS) determined that the uncovered, outdoor drinking water facilities at the WTP (sand filters and contact basins) pose a risk of pathogen contamination from birds and mammals. The State presented the City with two options: either cover the open basins or begin treating the water as surface water.

In October 2019, Consor (previously Murraysmith) was authorized by the City to conduct an analysis of alternatives for addressing the risk of pathogen contamination from birds and mammals posed by the uncovered, outdoor basins. The findings of the analysis were considered in the context of the City's long-term investment in redundant water supply. While the potential to convert the plant to operation as a surface water treatment plant (for both the groundwater supply and future redundant water supply from the Willamette River) was considered, treating the existing groundwater supply as surface water was not cost effective and this approach was dismissed due to the significant increase in operations and water quality reporting that would be required. Alternatives for covering the basins were then investigated. A pre-engineered steel building was assessed to be the option that did not change or complicate existing operation and maintenance (O&M) practices, while still being cost-effective and seismically resilient. Preliminary cost estimates for covering the basins were $1.5 million. These cost estimates for a pre-engineered steel building were evaluated around the same time additional seismic improvements for the overall WTP were evaluated. The combined cost of foundation improvements needed for the pre-engineered steel building plus seismic upgrades to existing structures resulted in a capital cost approaching the cost of replacement of the WTP without addressing the age of the existing facility.

In addition to seismic vulnerabilities and required covers for filters and basins, many parts of the WTP are aging and near the end of life. An alternatives analysis for the following two alternatives was completed for the WTP based on capital/life-cycle cost, resiliency, operational complexity, and implementation risk/schedule.

1. Upgrade the existing WTP
2. Build a new, resilient WTP

The estimated cost for required upgrades (seismic and facilities covers) to the existing WTP is $10.1 million (in 2022 dollars; Engineering News-Record construction cost index (ENR CCI) used to adjust from 2020 dollars), before considering improvements to mitigate for liquifiable soil conditions. Site ground improvements to mitigate seismic hazards were estimated as $1-2 million, resulting in overall anticipated WTP improvements costs (seismic, covers, and ground improvements) of approximately $12.1 million. However, upgrades would not extend the useful life or capacity of the aging plant. The estimated cost for a new, seismically resilient WTP is $21.6 million (2022 dollars). The new, proposed plant would be designed with a 40-50 year useful life.

The findings of the alternatives analysis guided the City's decision to move forward with building a new, resilient WTP. The new, modern WTP will provide the community with:

- The best value for investment
- Safe, high-quality water
- Capacity for future needs
- Community preparation for earthquakes or other natural disasters

Plan for a Safe & Reliable Water Future

The City plans to advance incrementally towards reaching a safe and resilient water future for the community. The three main phases of the plan are:

1. Build a new groundwater WTP on recently purchased property
2. Demolish the current WTP to use for Willamette River surface water intake facilities
3. Build a new surface water WTP on the new groundwater WTP site

A preliminary project schedule estimates the new groundwater WTP would come online in five years. The OHA has provided a deadline for a new groundwater WTP to be online by September 1, 2027.

Capital Improvement Program (CIP) Update

The 2021 WMP Addendum CIP table [WMP Table 7-5, page 7-15] was updated by:

- Removing projects that have been completed or are to be completed by the end of the 2022/2023 fiscal year

- Updating Year 1 as Fiscal Year 2023/2024

- Revising costs for projects with more refined City budgeted costs

- Updating proposed CIP projects for Supply as presented in the previous sections

The proposed CIP for this Water Supply Planning Addendum is presented in Table 2. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The Association for the Advancement of Cost Engineering International (AACE) classifies cost estimates depending on project definition, end usage, and other factors. The cost estimates presented here are considered Class 4 with an end use being a study or feasibility evaluation and an expected accuracy range of -30 percent to +50 percent. As the project is better defined, the accuracy level of the estimates can be narrowed.

Table 2 | Updated Capital Improvement Plan

Improvement Category	Project No.	Project Title	CIP Cost Summary[1,2] 5-year 2023 to 2027	5 to 10-year 2028 to 2032	10 to 20-year 2033 to 2043	20-year TOTAL	Beyond 20-year	Purpose	% Allocated to Growth	Total Cost Allocated to Growth
Supply	S-1	Seismic resilience - add emergency connection and controls at existing WTP	$ 600,000			$ 600,000		Resilience	50%	$ 298,000
	S-2	New Groundwater Treatment Plant	$ 21,600,000			$ 21,600,000		Resilience, replacement of existing	50%	$ 10,694,000
	S-3	Water Right Acquisition (8 cfs = 5.2 MGD)	$3,500,000					Redundant Source	50%	$ -
	S-4	New Intake for Willamette River			$ 15,050,000	$ 15,050,000		Redundant Source	50%	$ 7,451,000
	S-5	New 4 MGD Surface Water Treatment Plant			$ 31,500,000	$ 31,500,000	$ 5,000,000	Redundant Source	50%	$ 15,595,000
		Supply Subtotal	**$ 25,700,000**	**$ -**	**$ 46,550,000**	**$ 68,750,000**	**$ 5,000,000**			**$ 34,040,000**
Storage Reservoirs	R-2	Seismic resilience - North Valley Reservoirs hydraulic control valves and site piping improvements	$ 730,000			$ 730,000		Resilience, replacement of existing, not SDC eligible	0%	$ -
	R-3	Seismic resilience - Corral Creek Reservoir		$ 320,000		$ 320,000		Resilience, replacement of existing, not SDC eligible	0%	$ -
		Storage Subtotal	**$ 730,000**	**$ 320,000**	**$ -**	**$ 1,050,000**				**$ -**
Pump Stations	P-1	Bell East Pump Station - Zone 3 constant pressure			$ 2,605,000	$ 2,605,000		Growth, Reliability	97%	$ 2,535,000
		Pump Stations Subtotal	**$ -**	**$ -**	**$ 2,605,000**	**$ 2,605,000**				**$ 2,535,000**
Distribution Mains	M-1 thru 5, M-7, 8,	Upsize existing mains and construct new distribution loops to improve fire flow capacity	$ 889,000	$ 1,196,000	$ 901,000	$ 2,986,000		Improve level of service - Zone 1	41%	$ 1,234,000
	M-9	NE Zimri Drive Zone 3 distribution backbone within UGB			$ 413,000	$ 413,000		Growth, reliability - Zone 2 and 3	97%	$ 402,000
	M-19	Chehalem Drive water system extension north to Columbia Drive		$ 721,000		$ 721,000		Service area extension	100%	$ 721,000
	I	*IBTER Fire Flow improvements for increased housing density*				*$ 6,835,000*				*$ 4,525,000*
	I-1	Upsize existing 6-inch mains to 8-inch mains on S Main, S Lincoln, W 4th, W 5th Streets	$ 610,000			$ 610,000		Growth, upsize existing	45%	$ 272,000
	I-2	Upsize existing 4- and 6-inch mains to 12-inch mains on S Blaine Street	$ 1,190,000			$ 1,190,000		Growth, upsize existing	74%	$ 882,000
	I-3a	Upsize existing 6-inch main to 8-inch main in S College Street north of E 9th Street		$ 11,000		$ 11,000		Growth, upsize existing	45%	$ 5,000
	I-3b	Upsize existing 6-inch mains to 12-inch mains in E 9th Street, Charles Street, and S College Street		$ 1,320,000		$ 1,320,000		Growth, upsize existing	75%	$ 991,000
	I-4a/b	Upsize existing 6-inch main to 8-inch main in S Meridian Street north of E 5th Street; upsize existing 6-inch main to 12-inch main to south	$ 640,000			$ 640,000		Growth, upsize existing	73%	$ 470,000
	I-5	Upsize existing 4- and 6-inch mains to 12-inch mains in E 7th Street, S Pacific Street, E 9th Street, and Paradise Drive	$ 1,662,000			$ 1,662,000		Growth, upsize existing	77%	$ 1,282,000
	I-8	Upsize existing 6-inch main to 8-inch main from E 11th Street to the Boston Square Apartments	$ 1,400,000			$ 1,400,000		Growth, upsize existing	45%	$ 624,000
	RMP	*Riverfront area improvements*				*$ 1,890,000*				*$ 1,575,000*
	RMP-1 & 2	New water mains to serve future development in Riverfront area[3]		$ 218,500	$ 218,500	$ 437,000		Growth, partial developer minimum	100%	$ 437,000
	RMP-3 & 4	New water mains to serve future development in Riverfront area[3]		$ -	$ -	$ -		Growth, developer minimum	Developer costs	$ -
	RMP-5	Upsize existing 6-inch S College St main to 8-inch main to serve future Riverfront development		$ 301,000		$ 301,000		Growth, upsize existing	45%	$ 134,000
	RMP-6, 7	Upsize existing 6-inch River and 11th St mains to 12-inch mains to serve future Riverfront development (south of the by-pass)		$ 601,000		$ 601,000		Growth, upsize existing	75%	$ 452,000
	RMP-8 & 9	New water mains to serve future development in Riverfront area		$ 275,000	$ 275,000	$ 550,000		Growth, Zone 1 not currently served	100%	$ 550,000
	M-21	Seismic resilience - cast iron and concrete pipe replacement	$ 760,000	$ 240,000	$ 500,000	$ 1,500,000	$ 11,760,000	Resilience	12%	$ 173,000
	M-22	Routine Main Replacement Program	$ 250,000	$ 1,626,000	$ 2,000,000	$ 3,876,000	$ 121,810,000	Asset renewal, reliability	0%	$ -
		Distribution Mains Subtotal	**$ 7,400,000**	**$ 6,510,000**	**$ 4,310,000**	**$ 18,220,000**	**$ 133,570,000**			**$ 8,630,000**
Future High Elevation Water Infrastructure	R-1	1.7 MG Bell Road Reservoir - Zone 3			$ 2,886,000	$ 2,886,000		Growth, reliability	97%	$ 2,808,000
	M-16	Zimri Drive East transmission main to Bell Road Reservoir			$ 3,078,000	$ 3,078,000		Growth, reliability	97%	$ 2,995,000
	M-17	Bell Road west transmission main - N College Street to Zimri Drive			$ 2,678,000	$ 2,678,000		Growth, reliability	97%	$ 2,606,000
		Zone 2, 3, 4 Infrastructure Subtotal	**$ -**	**$ -**	**$ 8,640,000**	**$ 8,640,000**				**$ 8,410,000**
Planning	PL-1	Water Management & Conservation Plan update		$ 150,000		$ 150,000		Requirement	50%	$ 75,000
	PL-2	Water Master Plan update		$ 300,000		$ 300,000		Requirement	50%	$ 149,000
	PL-3	AWIA Risk & Resilience Assessment	$ 280,000			$ 280,000		Requirement	50%	$ 139,000
		Seismic resilience planning								
	SR-1	Develop new engineering standards		$ 50,000		$ 50,000		Resilience	50%	$ 25,000
	SR-2	Additional geotechnical investigations to define geohazards		$ 75,000		$ 75,000		Resilience	50%	$ 38,000
	SR-4	Evaluate mitigation strategies for raw water pipeline bridge		$ 75,000		$ 75,000		Resilience	50%	$ 38,000
		Planning Subtotal	**$ 280,000**	**$ 650,000**	**$ -**	**$ 930,000**	**$ -**			**$ 465,000**
Other	O-2	North non-potable water line and Otis Springs pumping improvements	$ 480,000	$ 1,625,000		$ 2,105,000		Non-potable system growth	100%	$ 2,105,000
	O-3	Public Works Maintenance Facility Master Plan	$ 250,000	$ 50,000		$ 300,000			20%	$ 60,000
		Other Subtotal	**$ 730,000**	**$ 1,675,000**	**$ -**	**$ 2,405,000**	**$ -**			**$ 2,165,000**
		CIP Total	$ 34,840,000	$ 9,155,000	$ 62,105,000	$ 102,600,000	$ 138,570,000			$ 56,245,000

Notes:

1. All estimated costs are presented in 2020 dollars, except 5-year estimates for projects S-1, S-2, S-3, S-4, S-5, R-2, M-1 thru 5, M-7, M-8, I-1, I-2, 1-4a/b, I-5, I-8, M-21, M-22, PL-3, and O-2, which have been updated to match 2022 City CIP budget estimates.
2. The Engineering News-Record (ENR) Construction Cost Index (CCI) is a commonly used index to adjust estimates in the future. For purposes of future cost estimate updating, the ENR CCI for Seattle, Washington for these estimates is 12,771.70 (September 2020). Estimates updated in 2022 as noted above, the ENR CCI for Seattle, Washington for these estimates is 15115.33 (December 2022).
3. CIP costs do not include developer required minimum 8-inch pipeline costs.

Exhibit "B" to Planning Commission Resolution No. 2023-384
Findings – File CPTA22-0001

APPROVAL CRITERIA

A. Statewide Planning Goals (the "Goals")

GOAL 1: CITIZEN INVOLVEMENT
To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process.

Finding: The City meets this requirement by having various citizen committees and/or commissions with opportunities for the public to testify on general or specific matters. For the Water Master Plan - Addendum Water Supply Planning 2023 an online community open house was utilized to gain public feedback. The proposal went before the Newberg Planning Commission on March 9, 2023, and Newberg City Council on April 3, 2023, which provided the opportunity for public comment. Finally, notice was published in the Newberg Graphic newspaper and posted in four public places.

The amendment is subject to the Type IV Legislative process, which requires public notification and public hearings before the Planning Commission and the City Council. This process has been established by the City and determined to be consistent with Goal I of the Oregon Statewide Planning Goals. The public hearing notice of the action and decision, and the hearings on this case before the Planning Commission and the City Council are all recognized as opportunities for citizen participation.

The Goal is met.

GOAL 2: LAND USE PLANNING
To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

Finding: This Goal requires that actions related to land use be consistent with acknowledged comprehensive plans of cities and counties. The City of Newberg last updated its Water Master Plan in 2017 and an Addendum Riverfront Master Plan 2021 to implement the 2019 Riverfront Master Plan. The Addendum Water Supply Planning 2023 and will be incorporated by reference into the Newberg Comprehensive Plan as noted in Exhibit "C".

Development of the 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A" and Exhibit "C" was based on an adequate factual base as documented in 2017 Water Master Plan – Addendum Water Supply Planning 2023.

The Goal is met.

GOAL 3: AGRICULTURAL LANDS
To preserve and maintain agricultural lands.

Finding: Not applicable because the proposal does not propose any land use regulation changes to agricultural lands outside of the Newberg Urban Growth Boundary.

GOAL 4: FOREST LANDS
To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with sound management of soil, air, water, and fish and wildlife resources and to provide for recreational opportunities and agriculture.

Finding: Not applicable because the proposal does not propose any land use regulation changes to the Stream Corridor that protects wooded areas within the Newberg Urban Growth Boundary.

GOAL 5: NATURAL RESOURCES, SCENIC AND HISTORIC AREAS, AND OPEN SPACES
To protect natural resources and conserve scenic and historic areas and open spaces.

Finding: The proposed amendments will not negatively impact inventoried Goal 5 resources because the amendments do not change protections that already exist in the Newberg Municipal Code to protect these resources. Newberg has an acknowledged Stream Corridor designation, inventoried historic resources, and identified open spaces in compliance with Goal 5.

This Goal is met.

GOAL 6: AIR, WATER AND LAND RESOURCES QUALITY
To maintain and improve the quality of the air, water and land resources of the state.

Finding: Goal 6 addresses the quality of air, water, and land resources. In the context of a comprehensive plan amendment, a local government complies with Goal 6 by explaining why it is reasonable to expect that the proposed uses authorized by the plan amendment will be able to satisfy applicable federal and state environmental standards, including air and water quality standards. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 addresses the land use pattern and density consistent with the acknowledged Newberg Comprehensive Plan to ensure that air, water and land resource quality through efficient use of the land supply through the provision of water facilities.

Newberg has an acknowledged Comprehensive Plan that complies with this goal. Protections are already in place for air, water, and land resource quality. This proposal does not modify the existing goals and policies.

This Goal is met.

GOAL 7: AREAS SUBJECT TO NATURAL HAZARDS
To protect people and property from natural hazards.

Finding: Newberg has an acknowledged Comprehensive Plan that complies with this goal. This proposal does not modify the City's natural hazards requirements such as flood plain or landslide areas. This proposal does not modify the existing goals and policies.

This Goal is met.

GOAL 8: RECREATIONAL NEEDS
To satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

Finding: Newberg has an acknowledged Comprehensive Plan that complies with this goal. This proposal does not modify the City's recreational goals and policies.

This Goal is met.

GOAL 9: ECONOMIC DEVELOPMENT
To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 provides for an adequate water system for all residential, commercial, and industrial uses that are anticipated in the acknowledged Newberg Comprehensive Plan through the identification of necessary water system supply and improvements based on projected population growth which will ensure a diverse and stable economic base of the community over the 20-year planning horizon. The update includes a Water Supply Analysis and Recommendations and Capital Improvement Program (CIP) to ensure the system could provide potable water for residential, commercial, and industrial uses.

This Goal is met.

GOAL 10: HOUSING
To provide for the housing needs of citizens of the state.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 address the supply of water and the Capital Improvement Program (CIP). The amendment will ensure a water supply and a new Groundwater Treatment Plant for development currently within the Urban Growth Boundary (UGB) and for new development that will occur within the UGB. The proposal will ensure that the City of Newberg has both water supply and treatment for new housing that will occur in the future. The proposal does not specifically provide for housing, only a water system to support development of housing.

The Goal is met.

GOAL 11: PUBLIC FACILITIES AND SERVICES
To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 outlines the provision of the City of Newberg's water system for treatment, and capital improvement program as identified in Exhibit "A". The plan lays out the necessary improvements for the system to service all lands within the Newberg Urban Growth Boundary in a timely, orderly and efficient arrangement for urban development.

This Goal is met.

GOAL 12: TRANSPORTATION
To provide and encourage a safe, convenient and economic transportation system.

Finding: Not applicable because the proposal does not address a transportation system.

GOAL 13: ENERGY CONSERVATION
To conserve energy.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 has taken into consideration the acknowledged Newberg Comprehensive Plan and the Population Forecasts for Newberg prepared by Portland State University in June 2017 to provide an energy efficient treatment and distribution system of the water system within the Newberg Urban Growth Boundary and Riverfront Master Plan area.

This Goal is met.

GOAL 14: URBANIZATION
To provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.

Finding: The proposed amendments do not include an expansion of the Urban Growth Boundary. The proposed amendment address water supply and Capital Improvement Program (CIP) for the new Groundwater Treatment Plant.

This Goal is met.

GOAL 15: WILLAMETTE RIVER GREENWAY

> To protect, conserve, enhance and maintain the natural, scenic, historical, agricultural, economic and recreational qualities of lands along the Willamette River as the Willamette River Greenway.

Finding: Not applicable because the proposal does not propose any land use regulation changes to the Willamette River Greenway.

This Goal is met.

B. Newberg Comprehensive Plan

II. GOALS AND POLICIES

A. CITIZEN INVOLVEMENT
GOAL: To maintain a Citizen Involvement Program that offers citizens the opportunity for involvement in all phases of the planning process.

Finding: The City meets this requirement by having various citizen committees and/or commissions with opportunities for the public to testify on general or specific matters. For the Water Master Plan - Addendum Water Supply Planning 2023 an online community open house was utilized to gain public feedback. The proposal went before the Newberg Planning Commission on March 9, 2023, and Newberg City Council on April 3, 2023, which provided the opportunity for public comment. Finally, notice was published in the Newberg Graphic newspaper and posted in four public places.

The amendment is subject to the Type IV Legislative process, which requires public notification and public hearings before the Planning Commission and the City Council. This process has been established by the City and determined to be consistent with Goal I of the Oregon Statewide Planning Goals. The public hearing notice of the action and decision, and the hearings on this case before the Planning Commission and the City Council are all recognized as opportunities for citizen participation.

The Goal is met.

B. LAND USE PLANNING
GOAL: To maintain an on-going land use planning program to implement statewide and local goals. The program shall be consistent with natural and cultural resources and needs.

POLICY: 2. The Comprehensive Plan and implementing ordinances shall be reviewed continually and revised as needed. Major reviews shall be conducted during the State periodic review process.

Finding: This Goal requires that actions related to land use be consistent with acknowledged comprehensive plans of cities and counties. The City of Newberg last updated its Water Master Plan in 2017 and an Addendum Riverfront Master Plan 2021 to implement the 2019 Riverfront Master Plan. The Addendum Water Supply Planning 2023 and will be incorporated by reference into the Newberg Comprehensive Plan as noted in Exhibit “C”.

Development of the 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A” and Exhibit “C” was based on an adequate factual base as documented in 2017 Water Master Plan – Addendum Water Supply Planning 2023.

The Goal is met.

C. AGRICULTURAL LANDS
GOAL: To provide for the orderly and efficient transition from rural to urban land uses.

Finding: Not applicable because the proposal does not propose any land use regulation changes to agricultural lands outside of the Newberg Urban Growth Boundary.

D. WOODED AREAS
GOAL: To retain and protect wooded areas.

Finding: Not applicable because the proposal does not propose any land use regulation changes to the Stream Corridor that protects wooded areas within the Newberg Urban Growth Boundary.

E. AIR, WATER, AND LAND RESOURCE QUALITY
GOAL: To maintain and, where feasible, enhance the air, water and land resource qualities within the community.

POLICY: 1. Development shall not exceed the carrying capacity of the air, water or land resource base.

Finding: Goal E addresses the quality of air, water, and land resources. In the context of a comprehensive plan amendment, a local government complies with Goal 6 by explaining why it is reasonable to expect that the proposed uses authorized by the plan amendment will be able to satisfy applicable federal and state environmental standards, including air and water quality standards. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 addresses the land use pattern and density consistent with the acknowledged Newberg Comprehensive Plan to ensure that air, water and land resource quality through efficient use of the land supply through the provision of water facilities.

Newberg has an acknowledged Comprehensive Plan that complies with this goal. Protections are already in place for air, water, and land resource quality. This proposal does not modify the existing goals and policies.

This Goal is met.

F. AREAS SUBJECT TO NATURAL HAZARDS
GOAL: To protect life and property from flooding and other natural hazards.

Finding: Newberg has an acknowledged Comprehensive Plan that complies with this goal. This proposal does not modify the City's natural hazards requirements such as flood plain or landslide areas. This proposal does not modify the existing goals and policies.

This Goal is met.

G. OPEN SPACE, SCENIC, NATURAL, HISTORIC AND RECREATIONAL RESOURCES

GOALS:

1. To ensure that adequate land shall be retained in permanent open space use and that natural, scenic and historic resources are protected.
2. To provide adequate recreational resources and opportunities for the citizens of the community and visitors.
3. To protect, conserve, enhance and maintain the Willamette River Greenway.

Finding: Newberg has an acknowledged Comprehensive Plan that complies with this goal. This proposal does not modify the City's recreational needs goals and policies. The population forecast information will be used to assist in evaluating future land use planning efforts related to open space, scenic historic and recreational resources.

These Goals are met.

H. THE ECONOMY

GOAL: To develop a diverse and stable economic base.

POLICY: 1. General Policies. b. The City shall encourage economic expansion consistent with local needs.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 provides for an adequate water system for all residential, commercial, and industrial uses that are anticipated in the acknowledged Newberg Comprehensive Plan through the identification of necessary water system supply and improvements based on projected population growth which will ensure a diverse and stable economic base of the community over the 20-year planning horizon. The update includes a Water Supply Analysis and Recommendations and Capital Improvement Program (CIP) to ensure the system could provide potable water for residential, commercial, and industrial uses.

This Goal is met.

I. HOUSING

GOAL: To provide for diversity in the type, density and location of housing within the City to ensure there is an adequate supply of affordable housing units to meet the needs of City residents of various income levels.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 address the supply of water and the Capital Improvement Program (CIP). The amendment will ensure a water supply and a new Groundwater Treatment Plant for development currently within the Urban Growth Boundary (UGB) and for new development that will occur within the UGB. The proposal will ensure that the City of Newberg has both water supply and treatment for new housing that will occur in the future. The proposal does not specifically provide for housing, only a water system to support development of housing.

This Goal is met.

J. URBAN DESIGN

GOAL 1: To maintain and improve the natural beauty and visual character of the City.
GOAL 2: To develop and maintain the physical context needed to support the livability and unique character of Newberg.

Finding: Not applicable because the proposal does not propose any land use regulation changes to urban design policies or regulations.

K. TRANSPORTATION

GOAL 1: Establish cooperative agreements to address transportation based planning, development, operation and maintenance.
GOAL 2: Establish consistent policies which require concurrent consideration of transportation/land use system impacts.
GOAL 3: Promote reliance on multiple modes of transportation and reduce reliance on the automobile.
GOAL 4: Minimize the impact of regional traffic on the local transportation system.
GOAL 5: Maximize pedestrian, bicycle and other non-motorized travel throughout the City.
GOAL 6: Provide effective levels of non-auto oriented support facilities (e.g. bus shelters, bicycle racks, etc.).
GOAL 7: Minimize the capital improvement and community costs to implement the transportation plan.
GOAL 8: Maintain and enhance the City's image, character and quality of life.
GOAL 9: Create effective circulation and access for the local transportation system.
GOAL 10: Maintain the viability of existing rail, water and air transportation systems.
GOAL 11: Establish fair and equitable distribution of transportation improvement costs.
GOAL 12: Minimize the negative impact of a Highway 99 bypass on the Newberg community.
GOAL 13: Utilize the Yamhill County Transit Authority (YCTA) Transit Development Plan (TDP) as a Guidance Document.
GOAL 14: Coordinate with Yamhill County Transit Area.
GOAL 15: Implement Transit-Supportive Improvements.

Finding: No applicable because the proposal does not address a transportation system.

L. PUBLIC FACILITIES AND SERVICES

GOAL: To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban development.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 outlines the provision of the City of Newberg's water system for treatment, and capital improvement program as identified in Exhibit "A". The plan lays out the necessary improvements for the system to service all lands within the Newberg Urban Growth Boundary in a timely, orderly and efficient arrangement for urban development.

This Goal is met.

M. ENERGY
GOAL: To conserve energy through efficient land use patterns and energy- related policies and ordinances.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 has taken into consideration the acknowledged Newberg Comprehensive Plan and the Population Forecasts for Newberg prepared by Portland State University in June 2017 to provide an energy efficient treatment and distribution system of the water system within the Newberg Urban Growth Boundary and Riverfront Master Plan area.

This Goal is met.

N. URBANIZATION
GOALS:
1. To provide for the orderly and efficient transition from rural to urban land uses.
2. To maintain Newberg's identity as a community which is separate from the Portland Metropolitan area.
3. To create a quality living environment through a balanced growth of urban and cultural activities.

Finding: The proposed amendments do not include an expansion of the Urban Growth Boundary. The proposed amendment address water supply and Capital Improvement Program (CIP) for the new Groundwater Treatment Plant.

This Goal is met.

C. Oregon Revised Statutes and Oregon Administrative Rules

Applicable Oregon Revised Statute

197.712 Commission duties; comprehensive plan provisions; public facility plans; state agency coordination plans; compliance deadline; rules.
(2) By the adoption of new goals or rules, or the application, interpretation or amendment of existing goals or rules, the Land Conservation and Development Commission shall implement all of the following:
(e) A city or county shall develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The public facility plan shall include rough cost estimates for public projects needed to provide sewer, water and transportation for the land uses contemplated in the comprehensive plan and land use regulations. Project timing and financing provisions of public facility plans shall not be considered land use decisions.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 is an element of the City of Newberg public facility plan covering the Urban Growth Boundary of the City and updates the 2017 Water Master Plan. The City of Newberg population is 25,767 which is larger than the baseline population requirement to have a public facilities plan. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 includes cost estimates for infrastructure improvements based on the land uses contemplated in the comprehensive plan and land use regulations and meets the requirement.

Applicable Oregon Administrative Rules (OARs)

OAR Chapter 660, Division 11 Public Facilities Planning

OAR 660-011-0000

Purpose

The purpose of this division is to aid in achieving the requirements of Goal 11, Public Facilities and Services, OAR 660-015-0000(11), interpret Goal 11 requirements regarding public facilities and services on rural lands, and implement ORS 197.712(2)(e), which requires that a city or county shall develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons. The purpose of the plan is to help assure that urban development in such urban growth boundaries is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban areas to be serviced, and that those facilities and services are provided in a timely, orderly and efficient arrangement, as required by Goal 11. The division contains definitions relating to a public facility plan, procedures and standards for developing, adopting, and amending such a plan, the date for submittal of the plan to the Commission and standards for Department review of the plan.

Finding: The City of Newberg is a community of 25,767 individuals with an acknowledged Comprehensive Plan and Urban Growth Boundary. Because the population is greater than 2,500 Newberg is required to have an adopted public facility plan (Water Master Plan). The City of Newberg currently has a 2017 Water Master Plan which is proposed to be updated by the 2017 Water Master Plan – Addendum Water Supply Planning 2023 to assure that urban development in the Urban Growth Boundary is guided and supported by types and levels of urban facilities and services appropriate for the needs and requirements of the urban area to be serviced, and that water facilities are provided in a timely, orderly and efficient arrangement. The proposed 2017 Water Master Plan – Addendum Water Supply Planning 2023 is consistent with the Purpose of OAR 660-011-0000.

OAR 660-011-0005

Definitions

(1) "Public Facilities Plan": A public facility plan is a support document or documents to a comprehensive plan. The facility plan describes the water, sewer and transportation facilities which are to support the land uses designated in the appropriate acknowledged comprehensive plans within an urban growth boundary containing a population greater than 2,500. Certain elements of the public facility plan also shall be adopted as part of the comprehensive plan, as specified in OAR 660-11-045.

Finding: The City of Newberg population forecast as of July 2017, as determined by Portland State University Population Research Center, was 23,480. The 2020 Portland State University Population Research Center estimate was 24,120. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 is being adopted as a support document and as part of the Newberg Comprehensive Plan. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 supports the land use designations in the acknowledged Newberg Comprehensive Plan which covers the Newberg Urban Growth Boundary. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 as part of the overall Public Facilities Plan meets the definition of OAR 660-011-0005(1).

(2) "Rough Cost Estimates": Rough cost estimates are approximate costs expressed in current-year (year closest to the period of public facility plan development) dollars. It is not intended that project cost estimates be as exact as is required for budgeting purposes.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains cost estimates as noted under OAR 660-011-0010 and meets the definition.

(3) "Short Term": The short term is the period from year one through year five of the facility plan.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains a short-term horizon of Priority 1 projects covering the first 5 years consistent with the definition of OAR 660-011-0005(3).

(4) "Long Term": The long term is the period from year six through the remainder of the planning period.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains a long-term horizon of six years to the end of the planning horizon of 20-years consistent with the definition of OAR 660-011-0005(3).

(5) "Public Facility": A public facility includes water, sewer, and transportation facilities, but does not include buildings, structures or equipment incidental to the direct operation of those facilities.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", is a public facility per the definition of OAR 660-011-0005(5).

(6) "Public Facility Project": A public facility project is the construction or reconstruction of a water, sewer, or transportation facility within a public facility system that is funded or utilized by members of the general public.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains identified projects per the definition of OAR 660-011-0005(6).

(7) "Public Facility Systems": Public facility systems are those facilities of a particular type that combine to provide water, sewer or transportation services.

For purposes of this division, public facility systems are limited to the following:

(a)Water:

(A) Sources of water;

(B) Treatment system;

(C) Storage system;

(D) Pumping system;

(E) Primary distribution system.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", is a part of the Public Facility System and includes the required elements of OAR 660-011-0005(7)(b) *(b) Sanitary sewer:*

(A) Treatment facilities system;

(B) Primary collection system.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 is not a Sanitary Sewer Plan and does not apply.

(c) Storm sewer

(A) Major drainageways (major trunk lines, streams, ditches, pump stations and retention basins);

(B) Outfall locations.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 is not a Storm Sewer Plan and does not apply.

(d) Transportation:

(A) Freeway system, if planned for in the acknowledged comprehensive plan;

(B) Arterial system;

(C) Significant collector system;

(D) Bridge system (those on the Federal Bridge Inventory);

(E) Mass transit facilities if planned for in the acknowledged comprehensive plan, including purchase of new buses if total fleet is less than 200 buses, rail lines or transit stations associated with providing transit service to major transportation corridors and park and ride station;

(F) Airport facilities as identified in the current airport master plans;

(G) Bicycle paths if planned for in the acknowledged comprehensive plan.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 is not a Transportation Plan and does not apply.

(8) "Land Use Decisions": In accordance with ORS 197.712(2)(e), project timing and financing provisions of public facility plans shall not be considered land use decisions as specified under ORS 197.015(10).

Finding: The City of Newberg has a rolling Five Year Capital Improvement Program that addresses project timing and financing and is not considered a land use decision per OAR 660-011-0005(8). The Five Year Capital Improvement Program for water is included as Exhibit “B”, Attachment 2.

(9) "Urban Growth Management Agreement": In accordance with OAR 660-003-0010(2)(c), and urban growth management agreement is a written statement, agreement or set of agreements setting forth the means by which a plan for management of the unincorporated area within the urban growth boundary will be completed and by which the urban growth boundary may be modified (unless the same information is incorporated in other acknowledged documents).

Finding: The City of Newberg has a Newberg Urban Area Growth Management Agreement with Yamhill County that was initially adopted in 1979 (as amended) that is an agreement on the management of the unincorporated area within the Newberg Urban Growth Boundary and contains requirements on how the Urban Growth Boundary may be modified consistent with the definition in OAR 660-011-0005(9). This Agreement is included as Exhibit “B”, Attachment 1.

OAR 660-011-0010

The Public Facility Plan

(1) The public facility plan shall contain the following items:

(a) An inventory and general assessment of the condition of all the significant public facility systems which support the land uses designated in the acknowledged comprehensive plan;

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, includes an assessment of the condition of the overall water system that supports the designated uses in the acknowledged Newberg Comprehensive Plan and meets the requirement.

(b) A list of the significant public facility projects which are to support the land uses designated in the acknowledged comprehensive plan. Public facility project descriptions or specifications of these projects as necessary;

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies the priority projects with descriptions to support the estimated population and land uses identified in the acknowledged Newberg Comprehensive Plan and meets the requirement.

(c) Rough cost estimates of each public facility project;

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, provides costs estimates for projects and meets the requirement.

(d) A map or written description of each public facility project's general location or service

area;

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, contains descriptions and maps of the public facility projects and meets the requirement.

(e) Policy statement(s) or urban growth management agreement identifying the provider of each public facility system. If there is more than one provider with the authority to provide the system within the area covered by the public facility plan, then the provider of each project shall be designated;

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies that the City of Newberg is the water service provider within the city limits and as annexations occur to lands within the Urban Growth Boundary. This is consistent with the Newberg Urban Area Growth Management Agreement included as Exhibit “B”, Attachment 1 and meets the requirement.

(f) An estimate of when each facility project will be needed; and

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, includes an estimate of the time horizons of when water system capital improvements are estimated to occur. This is broken out in the horizons of Priority 1 projects (1-5 years) and long-term projects (Priority 6-20 years) which meets the requirement.

(g) A discussion of the provider's existing funding mechanisms and the ability of these and possible new mechanisms to fund the development of each public facility project or system.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies the proposed capital improvement projects, costs and funding mechanisms and meets the requirement.

(2) Those public facilities to be addressed in the plan shall include, but need not be limited to those specified in OAR 660-011-0005(5). Facilities included in the public facility plan other than those included in OAR 660-011-0005(5) will not be reviewed for compliance with this rule.

Finding: OAR 660-011-0005(5)(c) identifies water and its subsets of sources of water, treatment system, storage system, pumping system, and primary distribution system. The 2017 Water Master Plan – Addendum Water Supply Planning 2023 addresses these components as noted in Exhibit “A” and meets the requirement.

(3) It is not the purpose of this division to cause duplication of or to supplant existing applicable facility plans and programs. Where all or part of an acknowledged comprehensive plan, facility master plan either of the local jurisdiction or appropriate special district, capital improvement program, regional functional plan, similar plan or any combination of such plans meets all or some of the requirements of this division, those plans, or programs may be incorporated by

reference into the public facility plan required by this division. Only those referenced portions of such documents shall be considered to be a part of the public facility plan and shall be subject to the administrative procedures of this division and ORS Chapter 197.

Finding: The City of Newberg is proposing to update the existing water system master plans and adopt the 2017 Water Master Plan – Addendum Water Supply Planning 2023. Other than the proposed Water Capital Improvement Plan included as Exhibit “A” no other special district or regional functional plan is being referenced or is applicable.

OAR 660-011-0015

Responsibility for Public Facility Plan Preparation

(1) Responsibility for the preparation, adoption and amendment of the public facility plan shall be specified within the urban growth management agreement. If the urban growth management agreement does not make provision for this responsibility, the agreement shall be amended to do so prior to the preparation of the public facility plan. In the case where an unincorporated area exists within the Portland Metropolitan Urban Growth Boundary which is not contained within the boundary of an approved urban planning area agreement with the County, the County shall be the responsible agency for preparation of the facility plan for that unincorporated area. The urban growth management agreement shall be submitted with the public facility plan as specified in OAR 660-011-0040.

Finding: The Newberg Urban Area Growth Management Agreement, Exhibit “B”, Attachment 1, Section V. Urban Services identifies the City of Newberg as the ultimate provider of urban services within the Urban Growth Boundary and specifically notes that service expansion plans are the responsibility of the City of Newberg, which meets the requirement of OAR 660-011-0015.

(2) The jurisdiction responsible for the preparation of the public facility plan shall provide for the coordination of such preparation with the city, county, special districts and, as necessary, state and federal agencies and private providers of public facilities. The Metropolitan Service District is responsible for public facility plans coordination within the District consistent with ORS 197.190 and 268.390.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, has been coordinated with Yamhill County. No other service providers are responsible for water service provisions within the Newberg Urban Growth Boundary, which meets the requirement of OAR 660-011-0015(2). As part of the Post Acknowledgement Plan Amendment process through the Oregon Department of Land Conservation and Development and other State agencies that have an interest in Newberg’s Water Master Plan will be notified to be in compliance with OAR Chapter 333, Division 61.

(3) Special districts, including port districts, shall assist in the development of the public facility

plan for those facilities they provide. Special districts may object to that portion of the facilities plan adopted as part of the comprehensive plan during review by the Commission only if they have completed a special district agreement as specified under ORS 197.185 and 197.254(3) and (4) and participated in the development of such portion of the public facility plan.

Finding: Chehalem Park and Recreation District provides park and trail system development within the Riverfront Master Plan area. The Chehalem Park and Recreation District participated in the preparation of the 2017 Water Master Plan – Addendum Water Supply Planning 2023. There is no special district agreement between the City and Chehalem Park and Recreation District.

(4) Those state agencies providing funding for or making expenditures on public facility systems shall participate in the development of the public facility plan in accordance with their state agency coordination agreement under ORS 197.180 and 197.712(2)(f).

Finding: No State agency funding sources have been identified at this time for capital expenditures to implement the 2017 Water Master Plan – Addendum Water Supply Planning 2023. Future opportunities may be identified.

OAR 660-011-0020

Public Facility Inventory and Determination of Future Facility Projects

(1) The public facility plan shall include an inventory of significant public facility systems. Where the acknowledged comprehensive plan, background document or one or more of the plans or programs listed in OAR 660-011-0010(3) contains such an inventory, that inventory may be incorporated by reference. The inventory shall include:

(a) Mapped location of the facility or service area;

(b) Facility capacity or size; and

(c) General assessment of condition of the facility (e.g., very good, good, fair, poor, very poor).

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains an inventory of all significant water facility systems and includes a mapped location, facility capacity and size, and an assessment of the condition of the water system in compliance with OAR 660-011-0020(1)(a-c) and meets the requirement.

(2) The public facility plan shall identify significant public facility projects which are to support the land uses designated in the acknowledged comprehensive plan. The public facility plan shall list the title of the project and describe each public facility project in terms of the type of facility, service area, and facility capacity.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies water system facility projects that support the projected population and land uses designated in the acknowledged Newberg Comprehensive Plan, and lists by project title and description each project within the plan in compliance with OAR 660-011-0020(2) and meets the requirement.

(3) Project descriptions within the facility plan may require modifications based on subsequent environmental impact studies, design studies, facility master plans, capital improvement programs, or site availability. The public facility plan should anticipate these changes as specified in OAR 660-011-0045.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies capital improvement projects over the next 20 years. As these projects are further developed through the City’s 5-Year Water Capital Improvement Program (Exhibit “B”, Attachment 2) and as project designs start, the environmental impacts, facility master plans and capital improvement program adjustments may be necessary and will be addressed at that time and any necessary project description modifications in the 2017 Water Master Plan – Addendum Water Supply Planning 2023 will be addressed, which meets the requirement.

OAR 660-011-0025

Timing of Required Public Facilities

(1) The public facilities plan shall include a general estimate of the timing for the planned public facility projects. This timing component of the public facilities plan can be met in several ways depending on whether the project is anticipated in the short term or long term. The timing of projects may be related directly to population growth, e.g., the expansion or new construction of water treatment facilities. Other facility projects can be related to a measure of the facility's service level being met or exceeded, e.g., a major arterial or intersection reaching a maximum vehicle-per-day standard. Development of other projects may be more long term and tied neither to specific population levels nor measures of service levels, e.g., sewer projects to correct infiltration and inflow problems. These projects can take place over a long period of time and may be tied to the availability of long-term funding. The timing of projects may also be tied to specific years.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, includes a general estimate of the timing of the planned public improvements based on population and urban development activities within the Newberg Urban Growth Boundary. The timing is broken down into time horizons of Priority 1 projects (1-5 years) and long-term projects 6-20 year horizon which meets the requirement of OAR 660-011-0025(1).

(2) Given the different methods used to estimate the timing of public facilities, the public facility plan shall identify projects as occurring in either the short term or long term, based on those factors which are related to project development. For those projects designated for development

in the short term, the public facility plan shall identify an approximate year for development. For those projects designated for development over the long term, the public facility plan shall provide a general estimate as to when the need for project development would exist, e.g., population level, service level standards, etc. Timing provisions for public facility projects shall be consistent with the acknowledged comprehensive plan's projected growth estimates. The public facility plan shall consider the relationships between facilities in providing for development.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies short-term and longer-term projects identified as horizons of Priority 1 projects in the 1-5 years with the balance identified in the 6-20 year horizon. The Plan Figure 7-1 and Appendix E identify the estimated year within the 1-5 year horizon, but also notes the individual schedule for each project will be refined during pre-design phase for each proposed improvement. The City is utilizing its 5-Year Capital Improvement Program to identify the timing of the short-term projects. A copy of the most recent 5-Year Capital Improvement Program is included as Exhibit “B”, Attachment 2. Long-term projects are correlated to population growth estimates provided by Portland State University, 2017, which must be used for planning purposes. The requirement to comply with OAR 660-011-0025(2) has been met.

(3) Anticipated timing provisions for public facilities are not considered land use decisions as specified in ORS 197.712(2)(e), and, therefore, cannot be the basis of appeal under ORS 197.610(1) and (2) or 197.835(4).

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, identifies Priority 1 – 4 projects with Priority 1 in the first five-year horizon.

OAR 660-011-0030

Location of Public Facility Projects

(1) The public facility plan shall identify the general location of the public facility project in specificity appropriate for the facility. Locations of projects anticipated to be carried out in the short term can be specified more precisely than the locations of projects anticipated for development in the long term.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, Section 7 and Appendix E identifies the general location of short-term and long-term projects in compliance with OAR 660-011-0030(1) and meets the requirement.

(2) Anticipated locations for public facilities may require modifications based on subsequent environmental impact studies, design studies, facility master plans, capital improvement programs, or land availability. The public facility plan should anticipate those changes as specified in OAR 660-011-0045.

Finding: The 207 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", identifies capital improvement projects over the next 20 years. As these projects are further developed through the City's 5-Year Capital Improvement Plan and project designs start then environmental impacts, facility master plans and capital improvement program adjustments may be necessary and will be addressed at that time and any necessary project description modifications in the 2017 Water Master Plan will be addressed, which meets the requirement.

OAR 660-011-0035

Determination of Rough Cost Estimates for Public Facility Projects and Local Review of Funding Mechanisms for Public Facility Systems

(1) The public facility plan shall include rough cost estimates for those sewer, water, and transportation public facility projects identified in the facility plan. The intent of these rough cost estimates is to:

(a) Provide an estimate of the fiscal requirements to support the land use designations in the acknowledged comprehensive plan; and

(b) For use by the facility provider in reviewing the provider's existing funding mechanisms (e.g., general funds, general obligation and revenue bonds, local improvement district, system development charges, etc.) and possible alternative funding mechanisms. In addition to including rough cost estimates for each project, the facility plan shall include a discussion of the provider's existing funding mechanisms and the ability of these and possible new mechanisms to fund the development of each public facility project or system. These funding mechanisms may also be described in terms of general guidelines or local policies.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", contains cost estimates for the water system. The Newberg City Council accepted the 2022-2027 Water Capital Improvement Program and the funding sources for the wastewater improvements. This overall process meets the requirement of OAR 660-011-0035(1)(a). The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit "A", identifies the funding methodology for water system improvements in compliance with OAR 660-011-0035(1)(b). The City also evaluated an urban renewal program for possible water system funding. An Urban Renewal Feasibility Study was accepted on July 20, 2020, by Resolution 2020-3685 and an urban renewal agency was established on August 17, 2020, by Ordinance No. 2020-2865. The urban renewal plan and report was adopted by Ordinance 2022-2896. This overall process meets the requirement of OAR 660-011-0035(1)(a). The 2017 Water Master Plan – Addendum Riverfront Master Plan 2021, Exhibit "A", identifies the funding methodology for water system improvements in compliance with OAR 660-011-0035(1)(b).

(2) Anticipated financing provisions are not considered land use decisions as specified in ORS 197.712(2)(e) and, therefore, cannot be the basis of appeal under ORS 197.610(1) and (2) or 197.835(4).

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, has financing provisions included in Appendix D for System Development Charges and City funded responsibilities to implement the Water Master Plan and meets the requirement.

OAR 660-011-0040

Date of Submittal of Public Facility Plans

The public facility plan shall be completed, adopted, and submitted by the time of the responsible jurisdiction's periodic review. The public facility plan shall be reviewed under OAR Chapter 660, Division 25, "Periodic Review" with the jurisdiction's comprehensive plan and land use regulations. Portions of public facility plans adopted as part of comprehensive plans prior to the responsible jurisdiction's periodic review will be reviewed pursuant to OAR Chapter 660, Division 18, "Post Acknowledgment Procedures".

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023 will be reviewed under OAR Chapter 660, Division 18, "Post Acknowledgment Procedures" as the City of Newberg is not currently in a Periodic Review process under OAR Chapter 660, Division 25 and meets the requirement.

OAR 660-011-0045

Adoption and Amendment Procedures for Public Facility Plans

(1) The governing body of the city or county responsible for development of the public facility plan shall adopt the plan as a supporting document to the jurisdiction's comprehensive plan and shall also adopt as part of the comprehensive plan:

(a) The list of public facility project titles, excluding (if the jurisdiction so chooses) the descriptions or specifications of those projects;

(b) A map or written description of the public facility projects' locations or service areas as specified in sections (2) and (3) of this rule; and

(c) The policy(ies) or urban growth management agreement designating the provider of each public facility system. If there is more than one provider with the authority to provide the system within the area covered by the public facility plan, then the provider of each project shall be designated.

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, is being adopted as a supporting document to the acknowledged Newberg Comprehensive Plan and is being adopted as part of the Newberg Comprehensive Plan as noted in Exhibit “C” and complies with OAR 660-011-0045(1). The 2017 Water Master Plan – Addendum Water Supply Planning 2023 includes a listing of projects as identified in Exhibit “A” and meets the requirement of OAR 660-011-0045(1)(a). A map of the location of wastewater system improvements is included in Exhibit “A” and meets the requirement of OAR 660-011-0045(1)(b). The Newberg Urban Area Growth Management Agreement (Exhibit “B”, Attachment 1) identifies that the City of Newberg is the service provider of the water system within the Urban Growth Boundary and the Newberg city limits and meets the requirement of OAR 660-011-0045(1)(c).

(2) Certain public facility project descriptions, location or service area designations will necessarily change as a result of subsequent design studies, capital improvement programs, environmental impact studies, and changes in potential sources of funding. It is not the intent of this division to:

(a) Either prohibit projects not included in the public facility plans for which unanticipated funding has been obtained;

(b) Preclude project specification and location decisions made according to the National Environmental Policy Act; or

(c) Subject administrative and technical changes to the facility plan to ORS 197.610(1) and (2) or 197.835(4).

Finding: The 2017 Water Master Plan – Addendum Water Supply Planning 2023, Exhibit “A”, has a list of capital projects to be implemented over the 20-year period. As new funding options may be identified in the future or environmental reviews requiring modifications to a proposed project, the plan may have to be revisited on an as needed basis in conformance with OAR 660-011-0045(2)(a-c).

(3) The public facility plan may allow for the following modifications to projects without amendment to the public facility plan:

(a) Administrative changes are those modifications to a public facility project which are minor in nature and do not significantly impact the project's general description, location, sizing, capacity, or other general characteristic of the project;

(b) Technical and environmental changes are those modifications to a public facility project which are made pursuant to "final engineering" on a project or those that result from the findings of an Environmental Assessment or Environmental Impact Statement conducted under regulations implementing the procedural provisions of the National Environmental Policy Act of 1969 (40 CFR Parts 1500-1508) or any federal or State of Oregon agency project development regulations consistent with that Act and its regulations.

(c) Public facility project changes made pursuant to subsection (3)(b) of this rule are subject to the administrative procedures and review and appeal provisions of the regulations controlling the study (40 CFR Parts 1500-1508 or similar regulations) and are not subject to the

administrative procedures or review or appeal provisions of ORS Chapter 197, or OAR Chapter 660 Division 18.

Finding: No administrative or technical changes are anticipated at this time for the 2017 Water Master Plan. If these situations arise the City of Newberg will comply with the provisions of OAR 660-011-0045(3)(a-b).

(4) Land use amendments are those modifications or amendments to the list, location or provider of, public facility projects, which significantly impact a public facility project identified in the comprehensive plan and which do not qualify under subsection (3)(a) or (b) of this rule. Amendments made pursuant to this subsection are subject to the administrative procedures and review and appeal provisions accorded "land use decisions" in ORS Chapter 197 and those set forth in OAR Chapter 660 Division 18.

Finding: No land use amendments are anticipated at this time that would trigger OAR 660-011-0045(4). If such amendments occur in the future the City of Newberg will comply with OAR 660-011-0045(4).

D. Newberg Municipal Code

Chapter 15.100 LAND USE PROCESSES AND PROCEDURES

15.100.060 Type IV procedure – Legislative.
A. Type IV Actions Are Legislative. The planning commission shall hold a public hearing and make a recommendation to the city council. The city council shall hold another public hearing and make a final decision.
B. Legislative actions include, but are not limited to:
1. Amendments to the Newberg comprehensive plan text;
2. Amendments to the Newberg development code;
3. The creation of any land use regulation.
C. The public hearing before the planning commission shall be held in accordance with the requirements of this code. Notice of a hearing on a legislative decision need not include a mailing to property owners or posting of property (refer to NMC 15.100.200 et seq.).
D. Interested persons may present evidence and testimony relevant to the proposal. If criteria are involved, the planning commission shall make findings for each of the applicable criteria.
E. The city council shall conduct a new hearing pursuant to this code. At the public hearing, the staff shall present the report of the planning commission and may provide other pertinent information. Interested persons shall be given the opportunity to present new testimony and information relevant to the proposal that was not heard before the planning commission.
F. To the extent that a finding of fact is required, the city council shall make a finding for each of the applicable criteria and in doing so may sustain or reverse a finding of the planning commission. In granting an approval, the city council may delete, add, or modify any of the provisions in the proposal or attach certain conditions beyond those warranted for the compliance with standards if the city council determines that the conditions are necessary to fulfill the approval criteria.
G. The city council's decision shall become final upon the effective date of the ordinance or resolution.

Finding: Public hearings with the Planning Commission and the City Council will be required to finalize a decision regarding the application for the amendments to the Comprehensive Plan and Development Code.

This requirement can be met.

Conclusion: The proposed Comprehensive amendment meets the applicable requirements of the Statewide Planning Goals, and the Newberg Comprehensive Plan, and should be approved.

Exhibit "B"
Attachment 1

Newberg Urban Area
Growth Management Agreement

Adopted by Newberg City Council on July 2, 1979 and Yamhill County Board of Commissioners on June 20, 1979; As Amended by Newberg City Council on November 2, 1998 and Yamhill County Board of Commissioners on December 3, 1998; As Further Amended by Newberg City Council on June 5, 2000 and Yamhill County Board of Commissioners on December 14, 2000; As Further Amended By Newberg City Council on August 15, 2022 and Yamhill County Board of Commissioners on September 22, 2022.

Preface

Seen from above, the modern city edges imperceptibly out of its setting. There are no clear boundaries. Just now the white trace of the super highway passed through cultivated fields; now it is an asphalt image of streets and buildings. As one drives in from the airport or looks out from the train window, clumps of suburban houses, industrial complexes, and occasional green space flash by; it is hard to tell where city begins or county ends." (Oscar Handlin, "The Modern City as a Field of Historical Study" in The Historian and the City (Cambridge, Mass. 1963, p.1).

I. Introduction

The City of Newberg and Yamhill County recognize the need for coordination and cooperation in the management of growth in and around the Newberg Urban Area. This agreement is formulated in accordance with this principle.

This agreement establishes a process for maintaining ongoing planning efforts, designed to keep pace with growth and change. It is essential that intergovernmental coordination be maintained to assure the citizens of the City of Newberg and Yamhill County that growth occurs in an orderly and efficient manner.

To that end, this agreement sets forth the means by which a plan for management of the unincorporated areas within the Urban Growth Boundary, and Urban Reserve will be implemented, and by which the Urban Growth Boundary and Urban Reserve may be modified.

II. Definitions

<u>Area of Influence</u> - An area of land designated by the City of Newberg and Yamhill County that extends one mile outside Newberg's Urban Growth Boundary wherein the County will give the City an opportunity to participate in land use actions to be taken by the County.

<u>Urban Growth Boundary</u> - A line jointly adopted by the City of Newberg and Yamhill County that encircles the City and separates rural and urbanizable land. Newberg's Urban Growth Boundary is shown on the attached map.

<u>Urban Reserve Area</u> – Land outside the Urban Growth Boundary jointly designated and adopted by

the City of Newberg and Yamhill County to provide for future expansion over a long-term period and the cost-effective provision of public facilities and services within the area when the lands are included within the Urban Growth Boundary.

III. General

1. Plan Map Conflicts. The Comprehensive Plan Land Use Map adopted by the City of Newberg shall be the plan map for the area within the Urban Growth Boundary, and shall replace conflicting portions of the Yamhill County Comprehensive Plan Map pertinent to this area. Where said maps conflict, Yamhill County shall initiate the process necessary for consideration of a map amendment. The Comprehensive Plan Land Use Map adopted by Yamhill County shall be the plan map for the area within the Urban Reserve Area.

2. Urban Growth Boundary. In accordance with the Comprehensive Plan of the City of Newberg, the jointly adopted Urban Growth Boundary shall define the geographical limits of urbanization. The City of Newberg shall prepare for the orderly extension of public facilities and services within the boundary. Lands outside the Urban Growth Boundary shall be maintained in accordance with the Yamhill County Comprehensive Plan.

3. Urban Reserve Area. In accordance with the Comprehensive Plan of Yamhill County, the jointly adopted Urban Reserve Area shall provide for expansion and urbanization over a long-term period and the cost-effective provision of public facilities and services within the area. The Urban Reserve Area shall be maintained in accordance with the Yamhill County Comprehensive Plan.

4. Urbanization. The City of Newberg and Yamhill County shall encourage urbanization within the boundary to occur in an orderly and efficient manner, resulting in a compact, balanced urban center meeting long-term economic and social needs of the residents of the area regardless of political boundaries.

5. Implementation and Coordination. The very nature of planning requires continual refinement of various elements of the Comprehensive Plan. This includes the preparation of implementing ordinances, refinement plans and functional plans. As the Newberg Comprehensive Plan is implemented, the City and County will work together in a coordinated effort to achieve the goals of the Yamhill County and Newberg Comprehensive Plans.

6. Concurrence and Recommendation. The legitimate interests of the City and County overlap within the City's Urban Growth Boundary, Urban Reserve, and Area of Influence. This agreement attempts to resolve these overlapping interests by providing for concurrence of City and County governing bodies for certain decisions and by providing for recommendations of one governing body to the other for other decisions.

    a. Concurrence. Where concurrence is required, the City and County shall agree upon a decision. If agreement cannot be reached, the City and County agree to mediate the dispute using a jointly selected mediator.

    b. Recommendation. Where a recommendation is required, the City and County need not agree upon a decision. The procedures are these: The right to comment on or object to any item referred to a jurisdiction for a recommendation shall be deemed to have been waived unless the referring jurisdiction is notified otherwise within thirty days; the time limit for consideration of items referred for recommendation shall begin to run from the time the item is received by the jurisdiction whose recommendation is being solicited; each jurisdiction shall have standing to appeal the decision of the other governing body.

IV. Term of this Agreement; Amendment

The term of this agreement runs from July 2, 1979, to July 2, 1980, and may be extended thereafter by increments of one year. During the term of the agreement or extension, the agreement may be changed by mutual consent of the parties hereto. This agreement is automatically renewed at the end of such term or extension unless either party hereto requests revision of the agreement by so notifying the other party at least ninety days before the end of the current term or extension.

V. Urban Services

1. The City of Newberg is recognized as the ultimate provider of urban services within the Urban Growth Boundary. To this end:

   a. Special Districts. Before Yamhill County shall create any special district for the provision of utilities, transportation, or other public facilities or services, the matter shall be referred to the City of Newberg for a recommendation. The County shall not act contrary to such recommendation.

   b. Service Capacity. Development within the Urban Growth Boundary shall not exceed the capacity of existing services.

   c. Annexation. Annexation shall occur in accordance with the Newberg Comprehensive Plan. Before final action by the City Council on an annexation proposal, the proposal shall be referred to the County Planning Department for the County's recommendation. In order to provide the County with advance notice of reasoning for a proposed annexation, the findings adopted by the City Planning Commission shall be referred to the County Planning Department following the Commission action.

   d. Service Expansion Plans. As the ultimate provider of urban services, the City shall prepare and from time to time update utility expansion plans. These plans shall provide a basis for the extension of services within the Urban Growth Boundary and as such shall be referred to Yamhill County for information and comment.

   e. Roads. The County and City shall cooperatively develop an implementation policy regarding streets and roads within the Urban Growth Boundary which is consistent with the City Comprehensive Plan. Such policy shall include, but not be limited to, the following:

      (1) The circumstances under which the City will assume ownership of and maintenance responsibility for County roads within the corporate limits.

(2) The conditions under which new public streets and roads will be developed within the Urban Growth Boundary.

(3) The conditions under which existing roads designated as future arterial in the City Comprehensive Plan will be improved.

(4) The conditions under which County and other roads should meet City Standards within the Urban Growth Boundary. Roads should be compatible with City street alignments and extensions. Upon annexation of property, roads adjacent to (and which serve) such property should also be annexed, and the City assume ownership and maintenance responsibility.

f. The County and the City through its departments shall coordinate their planning efforts and actions that affect land use with those of special districts.

g. Transfer of Services within URA and UGB. As required by OAR 660-021-0050:

(1) Unless otherwise agreed to, designation of the local government responsible for building code administration and land use regulation in the URA shall be:

i.	Prior to inclusion within the UGB:	County
ii.	After inclusion within the UGB :	County
iii.	After annexation into the city:	City

(2) Service responsibility is designated as follows:

i. The local government or special district responsible for services (including wastewater, water, fire protection, parks, transportation, storm water) for areas within the URA are designated and shown on map(s) attached hereto and incorporated herein as Exhibit "1A" and “1B” as may be amended from time to time.

ii. The areas projected for future urban service responsibility after inclusion in the urban growth boundary are shown on map(s) attached hereto and incorporated herein as Addendum to Newberg Urban Area Growth Management Agreement Exhibit "1A" as may be amended from time to time.

(3) The terms and conditions under which service responsibility will be transferred or expanded, for areas where the provider of service is expected to change over time, is described in Addendum to Newberg Urban Area Growth Management Agreement Exhibit "1B," attached hereto and incorporated herein.

VI. Establishment of the Newberg Urban Area Management Commission

The City of Newberg and Yamhill County do hereby establish the Newberg Urban Area Management Commission (NUAMC) as a hearings officer in accordance with ORS 215.406. The NUAMC shall be composed of the following members:

Commissioner of the Yamhill County Board of Commissioners designated by the board.

Mayor or council person of the City of Newberg designated by the Council.

Member of Newberg Planning Commission designated by the City Council.

Member of the Yamhill County Planning Commission Designated by the Board of County Commissioners.

Member of the Yamhill County Planning Commission designated by the Board of County Commissioners.

Member who is a citizen of the City of Newberg designated by the City Council.

Member-at-large chosen by the above NUAMC members and ratified by the City Council and County Board.

Duties and Responsibilities. The NUAMC shall function in accordance with bylaws to be adopted by the Newberg City Council and the Yamhill County Board of Commissioners.

It shall be the responsibility of the Newberg Urban Area Management Commission to hold hearings, make findings, and present its decision to City and County governing bodies in this agreement and the bylaws.

VII. Establishment of Land Use Review Procedures

1. Urban Growth Boundary Amendment

Amendment of the Urban Growth Boundary may be initiated by the Yamhill County Board of Commissioners, the Newberg City Council, or by a property owner who request(s) inclusion in or exclusion from the Urban Growth Boundary.

Amendment of the Urban Growth Boundary shall be treated as a map amendment to both the City and County Comprehensive Plan maps.

Individual amendment applicants shall pay the fees established from time to time by each governing body.

Each application shall include a map and sufficient information to make a decision based upon the applicable requirements of Statewide Land Use Planning Goal 14, ORS Chapter 197 or 197A, and related Oregon Administrative Rules.

A property owner requesting inclusion or exclusion from the Urban Growth Boundary shall file applications simultaneously with the Newberg Community Development Department, Planning Division, and the Yamhill County Planning and Development Department. The City and County shall each collect fees from the applicant. The City and County shall coordinate with each other to process the application. The City of Newberg may initiate an amendment to the Urban Growth Boundary by filing its completed application and required fees with the Yamhill County Planning and Development Department for processing. Yamhill County may initiate an amendment to the Urban Growth Boundary by filing its completed application and required fees with the Newberg Community Development Department, Planning Division, for processing. Applications must be complete prior to consideration by the Newberg Urban Area Management Commission.

Applications shall be accumulated and referred quarterly to the Newberg Urban Area Management Commission for a Public Hearing for which at least ten days advance notice shall be given by publication in a newspaper of general circulation in the County (or published in the territory so concerned—ORS 215.060).

Following the Public Hearing, the NUAMC shall make and forward its findings and decision directly to the governing body of each jurisdiction. Each jurisdiction shall hold a public hearing (de novo) and make a determination based on the evidence and argument in the NUAMC record.

Nothing included in this process requires or prohibits the City or County from referring the application to its respective Planning Commissions for information.

Each jurisdiction shall make a final decision within sixty days of NUAMC forwarding its findings and decision. If the governing bodies do not concur in their final decision within sixty days, a joint meeting shall be held to resolve differences. If agreement cannot be reached, the parties agree to mediate the issue using a jointly selected mediator.

2. Urban Reserve Area Expansions

a. Procedures to establish Urban Reserve Area.

An application to amend the Urban Reserve Area may be initiated by the Yamhill County Board of Commissioners, the Newberg City Council, or by a property owner who requests inclusion in or exclusion from the Urban Reserve Area.

Amendment of the Urban Reserve Area shall be treated as a map amendment to both the City and County Comprehensive Plan maps.

Individual amendment applicants shall pay the fees established from time to time by each governing body.

Each application shall include a map and sufficient information to make a decision based upon the applicable requirements of Statewide Land Use Planning Goal 14, ORS Chapter 197 or 197A, and related Oregon Administrative Rules.

A property owner requesting inclusion or exclusion from the Urban Reserve Area shall file applications simultaneously with the Newberg Community Development Department, Planning Division, and the Yamhill County Planning and Development Department. The City and County shall each collect fees from the applicant. The City and County shall coordinate with each other to process the application. The City of Newberg may initiate an amendment to the Urban Growth Area by filing its completed application and required fees with the Yamhill County Planning and Development Department for processing. Yamhill County may initiate an amendment to the Urban Reserve Area by filing its completed application and required fees with the Newberg Community Development Department, Planning Division, for processing. Applications must be complete prior to consideration by the Newberg Urban Area Management Commission.

Applications shall be accumulated and referred quarterly to the Newberg Urban Area Management Commission for a Public Hearing for which at least ten days advance public notice shall be given by publication in a newspaper of general circulation in the County (or published in the territory so concerned ORS 215.060).

Following the Public Hearing, the NUAMC shall make and forward its findings and decision directly to the governing body of each jurisdiction. The City shall review NUAMC's finding and decision in a public hearing (de novo), and adopt its final decision by ordinance. The City shall forward its ordinance to the County, which shall make its final decision based on the NUAMC record, the City's ordinance, and public testimony. The County shall adopt its final decision by ordinance and issue a Board order.

Nothing included in this process requires or prohibits the City or County from referring the application to its respective Planning Commissions for information.

If the governing bodies do not concur in their final decision within sixty days of referral of the matter to them by the NUAMC, a joint meeting shall be held to resolve differences. If agreement cannot be reached, the parties agree to mediate the issue using a jointly selected mediator.

3. <u>Comprehensive Plan Amendment</u>

a. Inside the Urban Growth Boundary, but outside the city limits. The amendment shall be filed with Yamhill County, and shall otherwise be subject to the same procedures as an Urban Growth Boundary Amendment under this Agreement.

b. Inside the Urban Reserve Area, but outside the City limits. This amendment shall be filed with Yamhill County, and shall otherwise be treated subject to the same procedures as an amendment to the Urban Reserve Area, with referral to the City for its recommendation.

c. Outside the Urban Growth Boundary, but within the "Area of Influence". This amendment shall be processed by Yamhill County and shall be referred to the City of Newberg for a recommendation.

d. Inside city limits. The application shall be processed by the City of Newberg and shall be referred to Yamhill County for comments.

4. Zone Changes

The City of Newberg and Yamhill County recognize that each jurisdiction has authority to zone within its legal boundaries. However, the Urban Growth Boundary recognizes the eventual assumption of authority by the City of Newberg. Therefore, the following procedures are established:

a. County zone change outside city limits but within the Urban Growth Boundary. Prior to filing an application with Yamhill County, the applicant shall apply for and receive a recommendation from the City of Newberg concerning the requested land use actionRequests shall be processed following the procedures outlined in the Addendum to this agreement, Section 2, item 5 (b). No fee shall be charged for processing a recommendation from the City of Newberg. Applications submitted without this recommendation will be deemed incomplete. The application then be processed in accordance with Yamhill County ordinances, except that the application will be referred to the NUAMC for a hearing in lieu of the Yamhill County Planning Commission. Appeals of the NUAMC decision shall be heard by the Yamhill County Board of Commissioners.

b. County zone change outside the city limits but within the Urban Reserve Area. Prior to filing an application with Yamhill County, the applicant shall apply for and receive a recommendation from the City of Newberg concerning the requested land use action. Requests shall be processed following the procedures outlined in the Addendum to this agreement, Section 2, item 5 (b). No fee shall be charged for processing a recommendation from the City of Newberg. Applications submitted without this recommendation will be deemed incomplete. The application then shall be processed in accordance with Yamhill County ordinances, except that the application will be referred to the NUAMC for a hearing in lieu of the Yamhill County Planning Commission. Appeals of the NUAMC decision shall be heard by the Yamhill County Board of Commissioners.

c. Zone change inside city limits. The application shall be processed by the City of Newberg and shall be referred to Yamhill County for information and/or comment.

d. County zone change outside the Urban Growth Boundary but within the "Area of Influence". The application shall be processed by Yamhill County and shall be referred to the City of Newberg for information and/or comment.

5. Other Items Affecting Land Use Under Yamhill County's Jurisdiction

a. Items having a substantial impact upon land use under the jurisdiction of Yamhill County within Newberg's Area of Influence shall be referred to the City of Newberg for recommendation. Items not having a substantial impact may be referred for information and comment.

b. Items having a substantial impact upon land use under the jurisdiction of Yamhill County within Newberg’s Urban Reserve area shall be reviewed by the City of Newberg for recommendation. Prior to filing an application with Yamhill County, the applicant shall apply for and receive a recommendation from the City of Newberg concerning the requested land use action. Requests shall be processed following the procedures outlined in the Addendum to this agreement, Section 2, item 5 (b). No fee shall be charged for processing a recommendation from the City of Newberg. Applications submitted without this recommendation will be deemed incomplete.

c. Items having a substantial impact upon land use under the jurisdiction of Yamhill County within Newberg's UGB shall be reviewed by the City of Newberg for recommendation. Prior to filing an application with Yamhill County, the applicant shall apply for and receive a recommendation from the City of Newberg concerning the requested land use action. Requests shall be processed following the procedures outlined in the Addendum to this agreement, Section 2, item 5 (b). No fee shall be charged for processing a recommendation from the City of Newberg. Applications submitted without this recommendation will be deemed incomplete.

d. Items having a substantial impact upon land use shall include but are not limited to:

(1) Conditional Use Permits, (Excluding Temporary Hardship Dwellings)

(2) Planned Unit Developments

(3) Subdivisions and Partitions

(4) Public Improvement Projects

(5) Health Hazards

(6) Special Exceptions

(7) Capital Improvement Programs

(8) Major Transportation Improvements

e. Within the U.G.B., when Yamhill County ordinances require a Planning Commission public hearing on any of the above items, either as a recommendation or as a final action, the application shall be referred to NUAMC who shall hear the matter in lieu of the Yamhill County Planning Commission. Appeals of the NUAMC decision shall be heard by the Yamhill County Board of Commissioners.

6. Any of the above applications which may affect an agency identified in the City of Newberg or Yamhill County referral list shall be referred to said agency for information and/or comment.

ADDENDUM TO NEWBERG URBAN AREA GROWTH MANAGEMENT AGREEMENT

This Addendum to Newberg Urban Area Growth Management Agreement pursuant to Newberg City Ordinance #1967 dated July 2, 1979 (hereinafter "Addendum") is made by agreement between Yamhill County ("County") and the City of Newberg ("City").

RECITALS

A. The City and the County have previously entered into an intergovernmental agreement known as the Newberg Urban Area Growth Management Agreement ("NUAGMA") pursuant to Newberg City Ordinance #1967 dated July 2, 1979 and Yamhill County Ordinance 214 dated June 20, 1979, setting forth their respective rights and responsibilities with respect to the Urban Growth Boundary (UGB) and Area of Influence.

B. The County and the City have previously adopted an Urban Reserve Area for the City of Newberg as required by OAR Chapter 660, Division 21, as shown on their comprehensive plan and zoning maps, plan policies and land use regulations, to guide the management of these areas in accordance with the requirements of OAR Chapter 660 Division 21. Newberg City Ordinance 95-2397, Yamhill County Ordinance 596 (copies attached).

C. The Urban Reserve Area is intended over time to be incorporated into an urban growth boundary. Because full urban services are not yet available in the area, urban level development is not permitted. Very limited rural development of property can occur in the area, but only when such usage is consistent with and does not impede the future urbanization of property.

D. The purpose of this Addendum is to clarify planning and zoning intents and add provisions to the existing intergovernmental agreement for the purpose of satisfying the requirements of OAR Chapter 660, Division 21 relating to Urban Reserve Areas.

AGREEMENT

NOW, THEREFORE, the City and County agree as follows:

Section 1 <u>Definitions:</u>

(1) "<u>Urban Reserve Area</u>" has the same meaning as set forth in OAR 660-021-0010 (1), and means lands outside of an urban growth boundary identified as highest priority for inclusion in the urban growth boundary when additional urbanizable land is needed in accordance with the requirements of Goal 14.

Section 2. <u>Compliance with OAR Chapter 660, Division 21</u>. In accordance with the applicable requirements of Chapter 660, Division 21, City and County agree as follows:

(1) As required by OAR 660-021-0040(3):

(a) The County shall prohibit zone amendments allowing more intensive uses, including higher residential density, than permitted at the date of this agreement.

(2) As required by OAR 660-021-0050(1), unless otherwise agreed to, designation of the local government responsible for building code administration and land use regulation in the URA shall be:

(a) Prior to inclusion within the UGB: County

(b) After inclusion within the UGB : County

(c) After annexation into the city: City

(3) Designation of service responsibility, as required by OAR 660-021-0050(2):

(a) The local government or special district responsible for services (including sewer, water, fire protection, parks, transportation, storm water) for areas within the URA are designated and shown on map(s) attached hereto and incorporated herein as Exhibit "1A."

(b) The areas projected for future urban service responsibility after inclusion in the urban growth boundary are shown on map(s) attached hereto and incorporated herein as Exhibit "1A."

(4) As required by OAR 660-021-0050(3), the terms and conditions under which service responsibility will be transferred or expanded, for areas where the provider of service is expected to change over time, is described in Exhibit "1B," attached hereto and incorporated herein.

(5) As required by OAR 660-021-0050(4), procedures for notification and review of land use actions to ensure involvement by all affected local governments and special districts:

(a) Within the Urban Reserve Area, Comprehensive Plan Amendments, zone changes, and other applications affecting land use, including conditional use, PUDs, subdivisions and partitions, public improvement projects, health hazards, capital improvement programs and major transportation improvements, shall be processed by Yamhill County. Prior to filing an application with Yamhill County, the applicant shall apply for and receive a recommendation from the City of Newberg concerning the requested land use decision. Applications submitted without this recommendation will be deemed incomplete.

(b) Upon request or application for a recommendation on a requested land use decision in the URA, the City shall use the following procedures in developing a recommendation (see Exhibit 1C for criteria to be used by the City in the recommendation process):

(1) Applicant shall file with the City a substantially complete Yamhill County application and include a future development plan as provided in this agreement.

(2) The City staff or City Council may refer the application to the City Planning Commission for a recommendation to the City Council.

(3) The recommendation to Yamhill County shall be from the City Council.

(4) Notice of any hearings shall be to the general public and any hearings shall be legislative in nature. Additional notice may be provided as the City deems necessary. This shall not be a quasi-judicial hearing since the City of Newberg is making a recommendation.

(5) The City of Newberg shall furnish to the applicant its recommendation to Yamhill County within 60 days of the date that the request for recommendation is filed with the City of Newberg. City staff may request additional information from the applicant concerning the application prior to making a recommendation. Unless otherwise agreed between City and applicant, failure to furnish the recommendation within 60 days will waive the requirement to have a recommendation accompany the application.

(6) The City reserves the right to make additional recommendations and comments concerning the application to Yamhill County during the Yamhill County process.

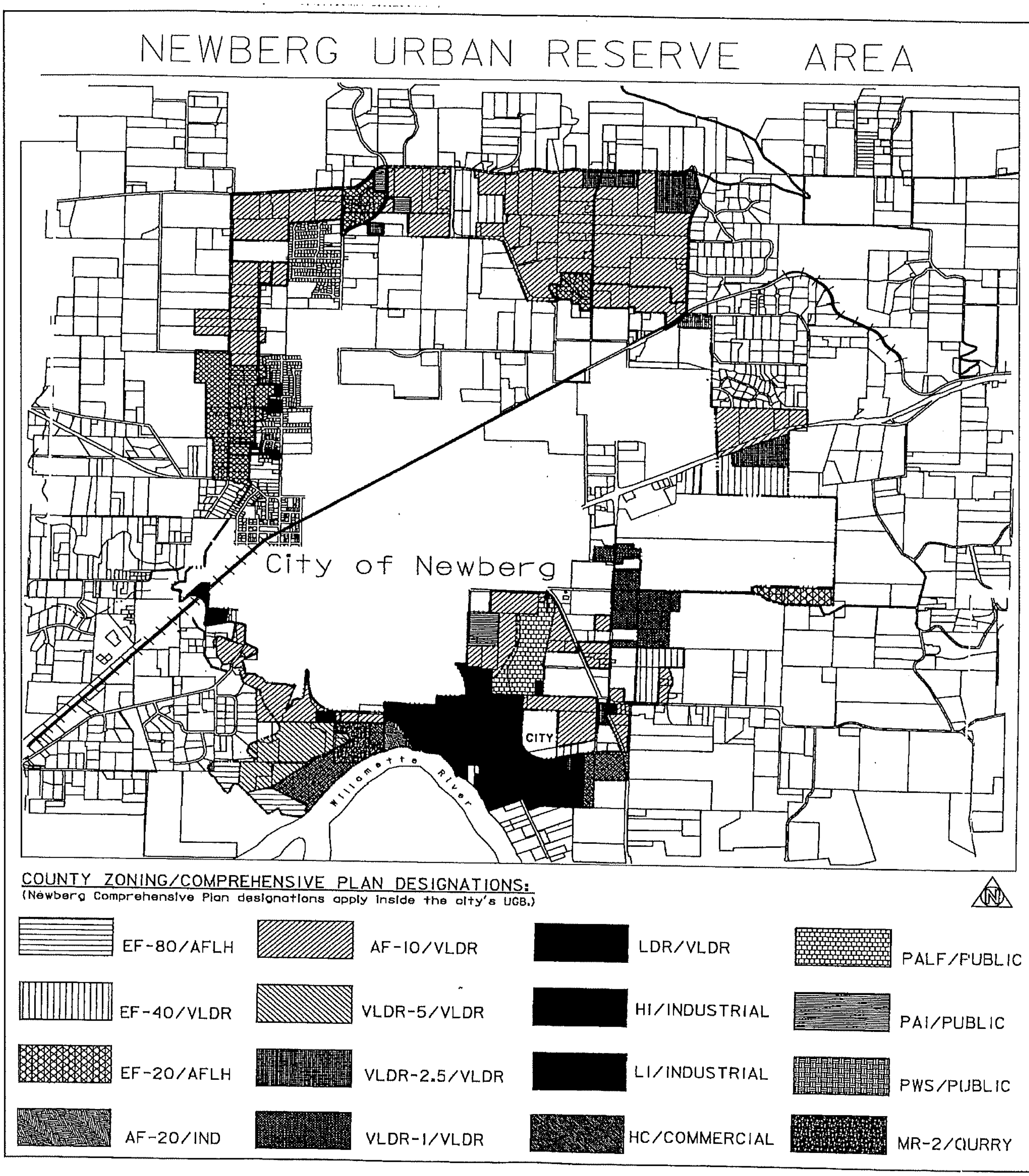
(7) Nothing in this agreement limits the rights of either party in participating in the land use process before either jurisdiction.

(8) Nothing in this agreement shall be construed as mandatory county approval criteria.

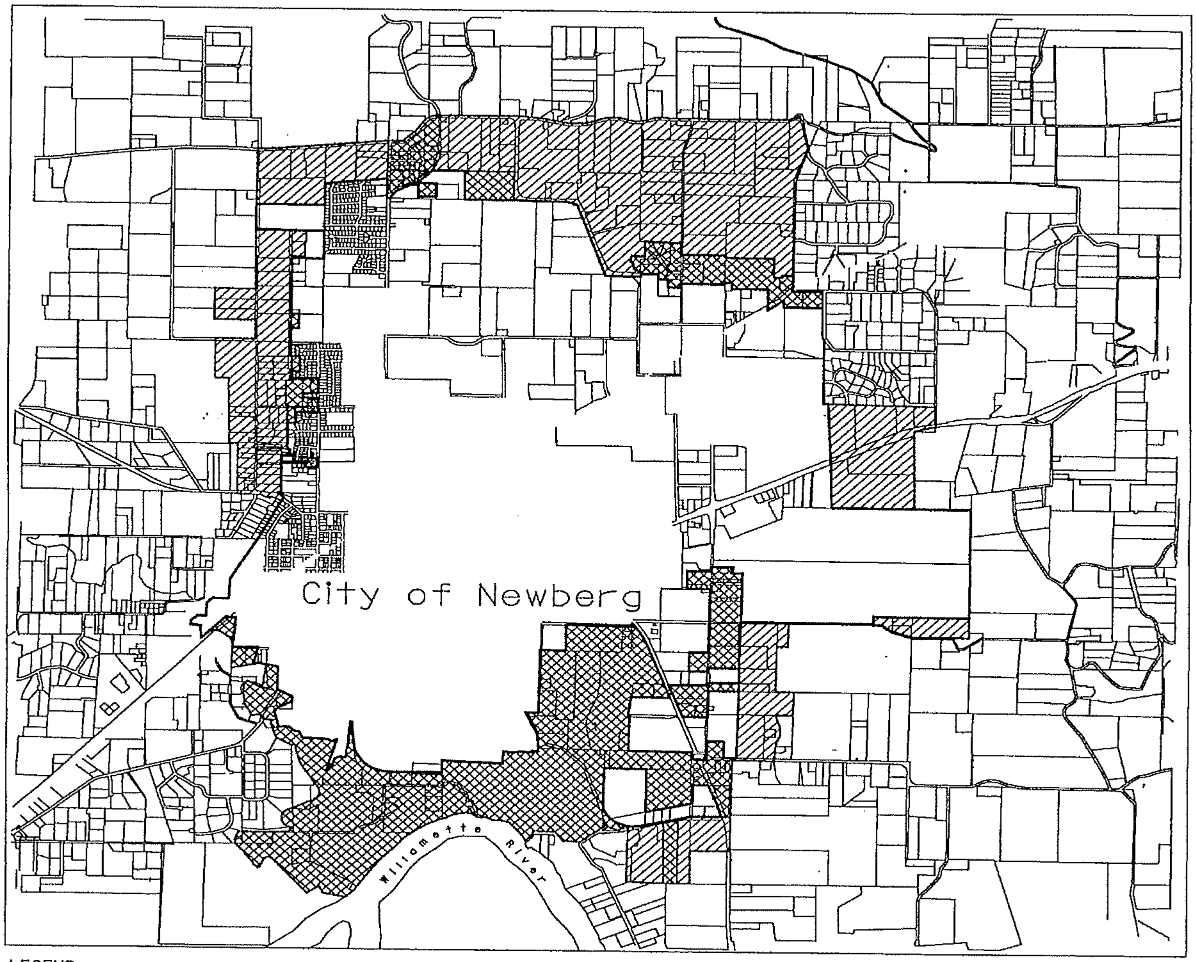
Section 3. In all other respects, the Newberg Urban Area Growth Management Agreement shall remain in full force and effect.

Section 4. <u>Effective Date</u>. This Addendum becomes effective on November 2, 1998.

EXHIBIT 1A
URBAN RESERVE AREA MAPS



NEWBERG URBAN RESERVE AREA



LEGEND:

Urban Reserve Area

Urban Growth Boundary

City Boundary Line

Urban Reserve Area

Urban Growth Boundary

Special Districts: Yamhill County Extension Service
Yamhill County Soil and Water Conservation Service
School District 29J, Newberg
Yamhill Educational Service District
Newberg Fire Protection District
Chehalem Park and Recreation District
Portland Community College

EXHIBIT lB
URBAN SERVICE TRANSITION POLICIES

Service Responsibility in General. The following "Existing Service Provider" shall be responsible for providing public services within the Urban Reserve Areas. The "Future Urban Service Provider" is the provider projected to have responsibility after inclusion in the UGB or in the City depending on the terms and conditions identified below. The timing for changing the responsible service provider will be flexible, depending on citizen needs and location of properties.

Service	Existing Service Provider	Future Urban Service Provider
Sanitary Disposal	No Public Provider	City of Newberg
Water	Service Districts	City of Newberg
Fire Protection	Tualatin Valley Fire & Rescue	Tualatin Valley Fire & Rescue
Parks & Recreation	Chehalem Park and Recreation District/Yamhill County	Chehalem Park and District District/Yamhill County
Transportation	Yamhill County/ODOT	City of Newberg/ODOT
Storm Water	Yamhill County	City of Newberg

Terms and Conditions under which Service Responsibility will be transferred or expanded.

A. Special Districts. The City shall agree to the formation of any special district within the Urban Reserve Area prior to the approval of the formation of the district by Yamhill County. This provision shall not apply to County-wide service districts formed under ORS Chapter 451.

B. Annexation. Annexation of property from the URA may be permitted if contiguous to City limits and shall occur in accordance with the Newberg Comprehensive Plan. Before final action by the City Council on an annexation proposal, the proposal shall be forwarded to the Board of County Commissioners for a recommendation. In order to provide the Board with advance notice of a proposed annexation, the findings adopted by the City Planning Commission shall be referred to the Board following the Planning Commission action.

C. Service Expansion Plans. Service expansion plans shall be consistent with the Newberg Urban Area Growth Management Agreement. As the future provider of wastewater disposal, storm water and water services, the City shall prepare and from time to time update utility expansion plans. These plans shall provide a basis for the extension of services within the Urban Growth Boundary, and as such shall be referred to Yamhill County for information and comment.

D. Transition Policies Relating to Service Responsibility

1. Wastewater Service. There will be no public provider of these services until City

servicesare available, except in the case of a state mandate due to a health hazard. At the time of annexation, the City will require hook-up to City wastewater sewer services. Nothing in this provision shall limit the ability of individuals to provide services on their own private property within the Urban Reserve Area.

2. <u>Potable Water Service</u> The City of Newberg shall be the sole and only public provider of water in this area, except for existing water districts, unless new districts are expanded or created through mutual agreement by the City and the County. Nothing in this provision shall limit the ability of individuals to provide services on their own private property within the Urban Reserve Area.

3. <u>Fire Protection</u> Tualatin Valley Fire & Rescue provides fire protection services to property within the Urban Reserve Area and the Urban Growth Boundary.

4. <u>Parks and Recreation</u> Chehalem Park and Recreation District and Yamhill County providepark and recreation services within the Urban Reserve Area and the Urban Growth Boundary. Chehalem Park and Recreation District and Yamhill County will remain providers of these services within the city limits unless agreed otherwise.

5. <u>Transportation and Street Improvements</u> Yamhill County provides Transportation services on county roads within the Urban Reserve Area. Yamhill County policies for transfer of jurisdiction are outlined in the Yamhill County Transportation System Plan Section 5.1, Policy 1.5, and Section 5.2.2, Goals and Policies 4, 5, 6 (See attachment Exhibit 1. B.). In summary, the policy is to transfer jurisdiction and maintenance responsibilities to the city upon annexation and improvement to City standards.

   Roads in the Urban Reserve Area ultimately are to be developed to City standards. Development in the Urban Reserve Area shall provide adequate transportation facilities to serve the development as provided in Yamhill County ordinances.

   The Oregon Department of Transportation provides transportation services on state highways within the Urban Reserve area. The department retains jurisdiction and maintenance responsibilities on all state highways after incorporation into the UGB and annexation exceptin special cases where jurisdiction is transferred to the City or County by a specific agreement.

6. <u>Storm Water Management</u> Yamhill County provides public storm water management services to property where required within the Urban Reserve Area. The City will provide storm water management services to property within the city limits. Transition of public storm water management services will follow transition of road maintenance responsibilities.

ATTACHMENT TO EXHIBIT lB

County Transportation Plan (Page 73): The Transportation System Plan (TSP) of Yamhill County provides in Section 5.1, Policy 1.5, Section 5.2.2, Goals and Policies 4, 5, and 6 as follows:

> ***Yamhill County TSP Policy*** *1.5. The lead agency for transportation project review shall be: a: Yamhill County for facilities outside the UGBs*
>
> *b. The affected city for facilities within the UGBs*
>
> *c. The State of Oregon. Yamhill County and affected cities on projects involving state-owned facilities.*

> ***Yamhill County TSP Policy*** *4. It is the policy of Yamhill County to coordinate the County Transportation System Plan with the transportation plans of the ten incorporated cities within Yamhill County. The County will emphasize continuity in the classification of roads and appropriate design standards for roadways which link urban areas with rural areas outside Urban Growth Boundaries. At the time of UGB amendment Yamhill County and the City involved shall agree on classification and design standards of all County Roads within the proposed UGB area prior to finalization of the amendment.*

> ***Yamhill County TSP Policy 5*** *County policy will encourage the expeditious transfer of jurisdiction of roadways to inc01porated cities in conjunction with annexation. It is the policy of Yamhill County that developers of property who propose annexation and who have frontage on a road that does not meet City road standards shall have the primary responsibility for upgrading the road to City standards. Roads shall be upgraded at the time of annexation, or the developer shall sign an agreement with the City to upgrade the road, at the time of development. Transfer of jurisdiction shall require the approval of both the County and the City, in accordance with provisions in Oregon Revised Statutes 373.270.*

> ***Yamhill County TSP Policy 6.*** *It is the policy of Yamhill County to require the transfer, or an agreement to transfer with specific time lines and milestones as part of the agreement, jurisdiction of County roadways within urban growth boundaries to their respective cities at the time of annexation.*

EXHIBIT 1C
CRITERIA AND SUBMITTALS FOR CITY RECOMMENDATION REGARDING DEVELOPMENT IN THE URA

A. Criteria: Generally, the following criteria will be used by the City of Newberg in developing City recommendations regarding land use development in the Urban Reserve Area. It is the City's intent to recommend that the County only allow development in the Urban Reserve Area that is limited in scope and that is consistent with the future urban development of the property.

1. Future Development Plan: The City Council shall recommend approval, recommend approval with conditions, or recommend against the future development plan in accordance with the following criteria:

(a) The current development shall not cause more than 10 percent of the property to be used for site improvements including buildings, parking areas, improved recreation areas, and storage areas, unless the City agrees the development intensity will not prohibit future urban development.

(b) The future development plan shall allow for the efficient future urban development of the remainder of the property. It shall allow for construction of future urban streets and utilities, and shall allow for required setbacks to current and future property lines.

(c) The plan is consistent with adopted plans and policies for the area, such as street or utility plans and policies in this agreement.

2. The City may recommend that the application be approved with conditions, which may include, but are not limited to: an agreement to annex, a deferred improvement agreement for future public facilities; construction of necessary street improvements, storm drains, or other public facilities; dedication of right-of-way, easements for utilities; special setbacks from planned right-of-ways.

B. Submittal Requirements

1. A future development plan shall be required for any development in the Urban Reserve Area requiring a Yamhill County Type B or Type C review, excluding any development that involves a change in use to existing buildings only. The future development plan shall be used solely to evaluate the current proposal's compatibility with potential future urban development. It does not bind or commit the applicants, property owners, review bodies, or governing bodies to approve or carry out the proposed future development.

2. The future development plan shall show how the property could be fully developed when incorporated into the city. The plan shall be drawn to scale and shall include the following:

(a) The location of potential future streets within and surrounding the site.

(b) The location of potential future sewer, water, and storm drainage facilities within and surrounding the site.

(c) The location and approximate dimensions of potential future lot lines.

(d) Setback lines for proposed structures from current and proposed property lines.

Exhibit "B"
Attachment 2

CAPITAL IMPROVEMENT PROGRAM

March 22, 2022

FISCAL YEARS 2022-2027

The Capital Improvement Program (CIP) is the implementation plan for identified software, City facilities, transportation, storm drainage, water, and wastewater projects. The CIP may change based on the community's needs, available budget, regulatory impacts, and other factors.

CAPITAL IMPROVEMENT PROGRAM

Table of Contents

INTRODUCTION

The City Council Goals of Customer Service; Diversity, Equity, and Inclusion; Affordable Workforce Housing; Urban Renewal; and Sustainability flow directly and work in conjunction with the Community Vision that was adopted in 2019.

A NEWberg Community Vision: IN 2040, NEWBERG IS A GEM OF THE WILLAMETTE VALLEY – MIRRORING THE SURROUNDING PASTORAL LANDSCAPES, ITS CULTIVATED RELATIONSHIPS, FLOURISHING CULTURE, THOUGHTFULLY ENHANCED SENSE OF PLACE, STRONG LOCAL ECONOMY, AND COLLABORATIVE LEADERSHIP NOURISH OUR THRIVING COMMUNITY.

- COMMUNITY ENGAGEMENT In Newberg, engagement is a part of who we are. We give our time, talents and treasures to strengthen the community. We blend service into our jobs and institutions, help each other, and pride ourselves in donating and shopping locally. Our authentic relationships serve as a strong foundation for a supportive community
- COMMUNITY LEADERSHIP Our leaders come from diverse groups, backgrounds, and sectors throughout the community and surrounding region. They foster creative, two-way communications and collaborate to ensure Newberg’s long-term success.
- CULTURAL ASSETS Newberg residents take pride in all that our community offers. As a cultural hub, there is a range of accessible artistic events and recreational activities as well as many local shops and restaurants you can wander into with friends.
- ECONOMIC DEVELOPMENT Newberg’s economy thrives by leveraging our geographic amenities and the capabilities of local businesses and organizations. We create family wage jobs through a strong business and workforce development program. We retain and attract businesses to Newberg and have a vibrant downtown.
- LIVABILITY & DEVELOPMENT Newberg is a well-planned community where the built environment blends seamlessly into surrounding, natural landscapes. Our small-town character, accessibility and affordability create a sense of belonging where individuals, families, and people of all ages love to live, work, and play.

The capital infrastructure needs within the five-year Capital Improvement Program (CIP) are identified through a variety of sources, including master plans, City Council goals, the Community Vision, operational needs, regulatory obligations and funding availability. The City has completed updates of the utility system master plans over the last several years to address the reduced growth and demand shown in previous master plans and to incorporate the Riverfront Master Plan area. These plans show a variety of projects in all locations.

The City Council is committed to providing well maintained streets to our citizens when the Transportation Utility Fee was adopted and implemented in 2017. The goal was to maintain the current condition of the roadway system which is one of the most valuable assets the City owns. In the intervening years the City has improved a significant number of road segments and has maintained the overall condition of the asset. One complicating factor is the need for adequate utilities under the pavement. This provides the challenge of coordinating the roadway needs with the underground utility needs. The need for sidewalks and ADA facilities within our public access areas continue. There will be a renewed commitment to address those locations that will provide the greatest benefit (i.e. Critical Routes noted in the 2007 ADA Pedestrian Bike Plan; and School Routes).

The City continues to focus its efforts toward establishing a high quality and adequate potable water supply, storage, and distribution system. The City’s utility systems are vulnerable to damage resulting from a Cascadia Subduction Zone earthquake. Because of this and other regulatory requirements, rather than trying to retrofit the existing 70-year-old water treatment plant the City will embark on a process to replace our groundwater treatment plant with a new groundwater treatment plant. Phases 1 & 2 of the Safe, Reliable Water project were completed in 2020, and Phase 3 of the project is moving forward based on the City Council's direction to provide additional resiliency to the City's potable water system.

As in the past, the focus of the wastewater program is to aggressively repair and/or replace inadequate portions of the wastewater system. Several projects to eliminate and/or reduce the stormwater that infiltrate the wastewater pipes were completed in the last several years and there has been a noticeable reduction (37%) in Inflow and Infiltration in those basins. These projects will continue. The City will continue upgrades to the Wastewater Treatment Plant with roofing repairs, studies addressing the capacity of the plant and will start on larger growth-related projects and addressing our larger trunk lines.

Capital projects within the City are funding by a variety of mechanisms. They include:

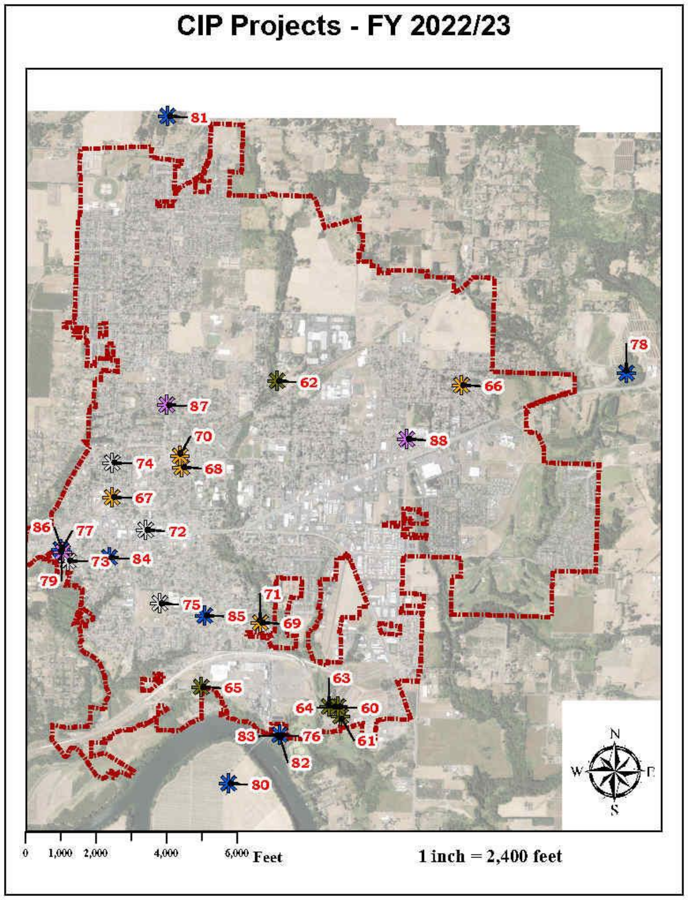
- Enterprise Funds: these funds are revenues from monthly rates (water, wastewater and stormwater) paid by customers. These funds can only be spent on projects in those systems.
- Gas Taxes: these are revenues from both Federal and State gas taxes. These funds can only be spent on roadway projects. At least 1% of the state gas taxes must be spent on bicycle and pedestrian facilities.
- Transportation Utility Funds: these are revenues paid monthly by customers. These funds must be used on existing pavement and ADA requirements.
- System Development Charges: these funds are paid by developers and can only be used on capacity increasing projects.
- Grants: these are funds received from a variety of locations.

The Public Works Engineering Division works closely with Public Works Operations and Maintenance Divisions to complete the identified projects on an annual basis. The fiscal year 2022-2023 Capital Improvement Program implements the planning, design, and construction of the capital infrastructure needs of the City by prioritizing projects based on an analysis of the master plans and other studies in combination with the availability of funding. The scheduled projects in the years beyond FY 2022-2023 are not intended to be a spending commitment, but are included to show a proposed plan for the projects that are considered to be a priority at this particular snapshot in time.

	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27
Total Wastewater Projects	$4,128,247	$2,835,357	$2,495,744	$4,683,830	$4,436,009	$3,811,510
Total Stormwater Projects	$312,500	$826,352	$315,374	$380,895	$892,538	$661,189
Total Transportation Projects	$2,277,141	$1,914,978	$1,801,133	$1,890,859	$2,289,927	$1,779,763
Total Water Projects	$ 2,549,663	$7,843179	$3,127,034	$6,477,074	$8,299,712	$2,067,104
Total Multi-Funded Projects	$7,353,328	$3,621,061	$482,052	$1,410,206	$459,008	$534,458
Total Capital Project Program	**$15,911,220**	**$17,900,927**	**$8,221,338**	**$ 14,842,863**	**$16,377,195**	**$8,854,025**

A map of the Capital Improvement Projects for FY 2022-2023 is shown on the following page.

CAPITAL IMPROVEMENT PROGRAM



Label #	FY	DEPT	PN_COST	Notes	PR_Desc_
60	22/23	WASTEWATER	$452,389.00		I&I PROJECTS
61	22/23	WASTEWATER	$79,168.00		ROOFING REPLACEMENT
62	22/23	WASTEWATER	$517,800.00		HESS CREEK LINING
63	22/23	WASTEWATER	$106,311.00		LIFT STATION SHORT TERM IMPROVEMENTS
64	22/23	WASTEWATER	$549,016.00		WWTP HYDRAULIC
65	22/23	WASTEWATER	$1,130,972.00		RIVERFRONT PUMP STATION
66	22/23	STORMWATER	$217,350.00		LIBRA ST IMPROVEMENTS
67	22/23	STORMWATER	$113,097.00		OR240/RR Tracks/Franklin St
68	22/23	STORMWATER	$82,362.00		VERMILLION ST - EAST OF 219
69	22/23	STORMWATER	$166,260.00		800 BLOCK WYNOOSKI EXTENSION
70	22/23	STORMWATER	$46,575.00		Railroad Ditch - N College to N Meridian
71	22/23	STORMWATER	$82,363.00		WYNOOSKI ST FROM 7TH TO 800 BLOCK LINING
72	22/23	TRANSPORTATION	$274,275.00		ADA/PEDESTRIAN IMPROVEMENTS
73	22/23	TRANSPORTATION	$1,397,250.00		PAVEMENT MAINTENANCE PROGRAM
74	22/23	TRANSPORTATION	$222,753.00		MAIN ST / ILLINOIS INTERSECTION STUDY
75	22/23	TRANSPORTATION	$20,700.00		SAFE ROUTES TO SCHOOL
76	22/23	WATER	$3,198,018.00		REDUNDANT WATER SUPPLY
77	22/23	WATER	$258,750.00		FIRE FLOW CAPACITY IMPROVEMENTS
78	22/23	WATER	$103,500.00		North non-potable water line and Otis Springs pumping Improvements
79	22/23	WATER	$207,000.00		FIXED BASE RADIO READ
80	22/23	WATER			WELL #1 DECOMMISSION
81	22/23	WATER	$239,970.00		NORTH VALLEY RESERVOIR DRIVEWAY
82	22/23	WATER	$882,461.00		Emergency Connection & Controls at WTP
83	22/23	WATER	$179,977.00		Seismic Improvements - Waterline Replace
84	22/23	WATER	$239,970.00		HB 2001 Waterline - Main, 4th, Lincoln & 8th
85	22/23	WATER	$441,544.00		HB 2001 Waterline - River
86	22/23	MULTIPLE	$208,811.00		Public Works Maintenance Facility Master Plan
87	22/23	MULTIPLE	$60,000.00	ODOT	N COLLEGE ST BIKE LANES AND SIDEWALKS
88	22/23	MULTIPLE	$103,500.00	GAS, STORMWATER, TRANSPORTATION SDCs	N SPRINGBROOK RD

IMPORTANT NOTICE TO ALL USERS:

DISCLAIMER AND LIMITATION OF LIABILITY
This information is not guaranteed to be accurate and may contain errors and omissions. The City of Newberg provides NO WARRANTY AS TO THE MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE FOR ANY INFORMATION HEREIN.

This map is created from various data sources and is subject to change without notice. This map is intended for general planning purposes only.

Coordinate System: NAD83 Oregon North
Projection: Lambert Conformal Conic
Datum: North American 1983
false easting: 8,202,099.7375
false northing: 0.0000
central meridian: -120.5000
standard parallel 1: 44.3333
standard parallel 2: 46.0000
latitude of origin: 43.6667
Units: Foot
Document Path: O:\GIS\MapRequest\Kareen\CIP 2022_2023_Tabloid.mxd
Date Saved: 3/28/2022 4:46:33 PM
Author: Keith McKinnon, GIS Analyst

MULTI-FUNDED PROJECTS

The following project summary sheets were developed from a variety of sources. The projects affect all of the enterprise funds and include things like improvements to facilities, capital projects that address more than one system and major software purchases.

MULTI FUNDED PROJECTS	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27
Public Works Maintenance Facility Master Plan	$ 114,419	$ 208,811	$ 160,684	$ 166,308	$ 172,128	$ 178,153
N College Street Bike Lanes and Sidewalks/Waterline Relocation/Additional Valves	$ 60,000	$ 910,000	$ -	$ -	$ -	$ -
N Springbrook Road	$ 39,500	$ 103,500	$ 321,368	$ 1,243,898	$ 286,880	$ 356,305
NE Chehalem Drive Water & Wastewater Ext	$ 1,680,000	$ 258,750	$ -	$ -	$ -	$ -
N Elliott Road: 99W to Newberg High School	$ 3,014,639	$ 3,000,000	$ -	$ -	$ -	$ -
E Crestview Drive: 99W to Springbrook Road	$ 1,735,111	$ -	$ -	$ -	$ -	$ -
TOTAL MULTI FUNDED PROJECTS	**$ 6,643,669**	**$ 4,481,061**	**$ 482,052**	**$ 1,410,206**	**$ 459,008**	**$ 534,458**

MULTI-FUNDED PROJECT

Maintenance Facility Project

A master plan has been completed on what the newly expanded maintenance yard could look like. The rest of the improvements include major site work, covers for large equipment, a fleet building and additional office space. A fully functional maintenance facility is critical to serve the existing and long-term day to day needs of the City and to adequately respond to natural disasters with the needed man power and equipment.

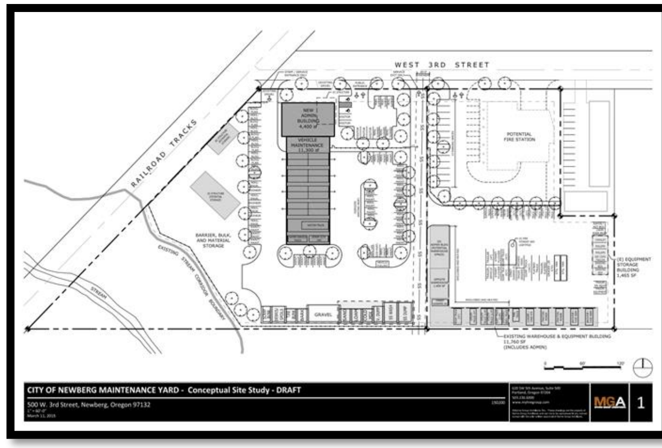


FIGURE 1 CONCEPTUAL PUBLIC WORKS MAINTENANCE YARD PLAN

PROPOSED FUNDING

The project is to be funded by utility funds, and system development charges.

MEDIUM PRIORITY PROJECT

The council has identified increased sustainability as priorities for Newberg. The proposed improvements will further this goal. Along with responding to council goals the project will:

- Increase health and safety
- Reduce costs
- Provides for existing and future capacity

HISTORY OF THE PROJECT

In 2015, it was determined that the City had outgrown the existing 2.1 acre maintenance yard and purchased property next to the existing location to expand the yard by 3.9 acres. A facility plan was then conducted to determine the specific needs on this site.

STATE MANDATED FEATURES

NA

CONTACT

maintenance@newbergoregon.gov

MULTI-FUNDED PROJECT

N College Street Bike Lanes & Sidewalks/Waterline Relocation/Additional Valves

The 2007 ADA/Pedestrian/Bike Route Improvement Plan identified the project as a primary critical pedestrian and bikeway route. The incomplete sidewalk connections are unsafe as it forces pedestrians onto the roadway shoulders. The City has entered into an Intergovernmental Agreement with ODOT on this project. Final design and right-of-way acquisition will be underway soon. The construction should occur in 2023.

As a part of this project the City's existing water line will need to be lowered as it is too shallow. This work is scheduled to begin soon and will be coordinated with the waterline valve project. The waterline project will utilize ODOT's topographic survey.

PROPOSED FUNDING

The project will be funded by ODOT Surface Transportation Project Fund (STP), gas tax revenues, and water rates.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability and improved diversity, equity, and inclusion as priorities for Newberg. Improving roads and constructing sidewalks and bike lanes will provide better access to the City and encourage more walking and bike use. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs
- Coordinates with larger planned projects
- Has additional funding opportunities available

HISTORY OF THE PROJECT

One of the reasons for flooding in 2014, when the waterline in College Street broke, was the lack of valves on the existing line to shut the flow of water off. This project will be a continuation of the project that was completed four years ago and would add valves in strategic locations to minimize future problems.

MANDATED FEATURES

The state and federal governments require that bike facilities and ADA facilities be constructed on any roadway that will be constructed, reconstructed or relocated.

- ORS366.514, enacted in 1971, requires that roadways being built, or reconstructed, include both pedestrian and bicycle facilities.
- The ADA law requires newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities.

CONTACT

paul.chiu@newbergoregon.gov

FIGURE 2 LOOKING NORTH ON COLLEGE STREET

MULTI-FUNDED PROJECT

N Elliott Road;
99W to Newberg High School

This project will construct street improvements to provide sidewalks and bike lanes. It will also include water line, wastewater line, storm drainage improvements and street lighting.

PROPOSED FUNDING

The project will be funded by gas tax revenues, wastewater fees, water fees, stormwater fees and system development charges. There will also a contribution from the State's Active Transportation Program to upgrade the signal at 99W.

HIGH PRIORITY PROJECT

N Elliott Road intersects at one of a few traffic signals along Highway 99W and connects to the south entrance of Newberg High School. It also links residents to Mabel Rush Elementary, the Chehalem Aquatic and Fitness Center, as well as YC Transit buses and local businesses on OR99W.

The Council has identified increased sustainability and improved diversity, equity, and inclusion as priorities for Newberg. Improving roads and constructing sidewalks and bike lanes will provide better access to the high school and encourage more walking and bike use. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs

HISTORY OF THE PROJECT

The Transportation System Plan has identified this project as a high priority as it provides direct access to the high school. The adopted ADA/Bike/Ped Plan and the Newberg Community Vision document also identifies N Elliott Road as a critical route.

MANDATED FEATURES

The state and federal governments require that bike facilities and ADA facilities be constructed on any roadway that will be constructed, reconstructed or relocated.

- ORS366.514, enacted in 1971, requires that roadways being built, or reconstructed, include both pedestrian and bicycle facilities.
- The ADA law requires newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities.

CONTACT

paul.chiu@newbergoregon.gov

MULTI-FUNDED PROJECT
N Springbrook Road

This project will provide sidewalks and bike lanes north of 99W. It will also install a signal at the intersection of N Haworth and N Springbrook Road wastewater upgrades and storm drainage.

PROPOSED FUNDING
This project will be funded by gas taxes, stormwater fees and transportation system development charges. There are also fees that have been paid by developers specifically for the installation of a signal at N Haworth & N Springbrook.

MEDIUM PRIORITY PROJECT
The Council has identified increased sustainability and improved diversity, equity, and inclusion as priorities for Newberg. Improving roads and constructing sidewalks and bike lanes will provide better access and encourage more walking and bike use. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs
- Coordinates with larger planned projects
- Has additional funding opportunities available

HISTORY OF THE PROJECT
There are existing storm drainage issues along this section of N Springbrook Road. The intersection at N Haworth and N Springbrook meets the necessary warrants for the installation of a signal to replace the existing Four-Way Stop traffic control.

MANDATED FEATURES
The state and federal governments require that bike facilities and ADA facilities be constructed on any roadway that will be constructed, reconstructed or relocated.

- ORS366.514, enacted in 1971, requires that roadways being built, or reconstructed, include both pedestrian and bicycle facilities.
- The ADA law requires newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities.

CONTACT
engineering@newbergoregon.gov

FIGURE 3 INTERSECTION OF N SPRINGBROOK AND E HAWORTH

MULTI-FUNDED PROJECT

NE Chehalem Drive
Water & Wastewater Extension Project

This project extends the public wastewater line from the existing terminus on the east side of Chehalem Creek on Hwy 240 to NE Chehalem Drive and then north on NE Chehalem Drive towards the intersection with W Columbia Drive.

This master plan project (M-18) would extend the public water line from the existing terminus on the east side of Chehalem Creek on Hwy 240 to NE Chehalem Drive. The new waterline will connect with an existing waterline on NE Chehalem Drive south of Hwy 240. A future project (M-19) would extend the waterline on NE Chehalem Drive to W Columbia Drive.

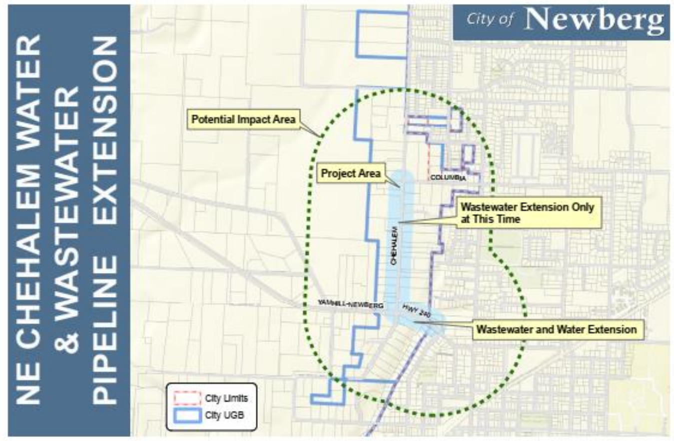


FIGURE 4 EXTENDING THE PUBLIC WASTEWATER LINE

Visit the NE Chehalem Drive Water and Wastewater Extension Project webpage

PROPOSED FUNDING

This will be paid for out of system development charges.

MEDIUM PRIORITY PROJECT

This project will provide additional capacity for future development. Fire flow deficiencies in the area of W Illinois are also addressed with this project.

HISTORY OF THE PROJECT

There have been several development inquiries in this area and the wastewater and water line extensions would allow for orderly future development. The 2017 Water Master Plan identified that this area has a fire flow and pressure deficiency. The cost and complexity of designing, constructing and permitting utility crossings of the un-named tributary of Chehalem Creek has been identified as prohibitive for private development of the water and wastewater extensions to this portion of the City's Urban Growth Boundary (UGB).

MANDATED FEATURES

NA

CONTACT

brett.musick@newbergoregon.gov

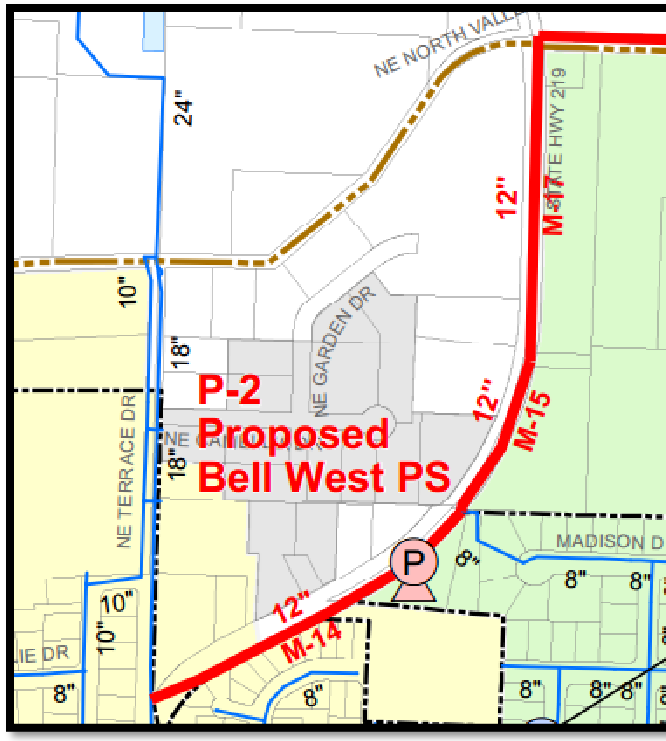
WATER PROJECTS

The Water Program provides planning, design and construction of improvements for the City's public water utility system. This program area includes the well field, storage reservoirs, water treatment plant, pump stations, and water distribution system.

The following project list was developed from the 2017 Water Master Plan and other associated studies while considering the available funds from the water utility rates and system development charges. A new project shown as a new groundwater treatment plant will be a main component of the five year plan along with the HB2001 projects. The redundant water supply project will move forward with geotechnical evaluations and engineering work related to a new water intake.

WATER PROJECTS	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27
Redundant Water Supply	$ 579,563	$ 3,198,018	$ -	$ -	$ -	$ -
Bell West Pump Station - Zone 2 constant pressure	$ 170,000	$ 1,051,000	$ -	$ -	$ -	$ -
Upsize existing mains and construct new distribution loop	$ 232,000	$ 258,750	$ -	$ 110,872	$ 286,881	$ -
NE Zimri Drive Zone 3 distribution backbone within UGB	$ -	$ -	$ -	$ -	$ -	$ -
N College Street - N Terrace Street - proposed Bell West P	$ 30,000	$ 720,000	$ -	$ -	$ -	$ -
Routine Main Replacement Program	$ 250,000	$ -	$ -	$ -	$ -	$ -
North non-potable water line and Otis Springs pumping im	$ -	$ 103,500	$ 374,929	$ -	$ -	$ -
Fixed Base Radio Read	$ 365,790	$ 207,000	$ -	$ -	$ -	$ -
Decommission Well #1	$ -	$ 103,500	$ -	$ -	$ -	$ -
WTP Filter Covers	$ 188,000	$ -	$ -	$ -	$ -	$ -
Nvalley Reservoir Driveway	$ -	$ 239,970	$ -	$ -	$ -	$ -
Emergency Connection & Controls at WTP	$ -	$ 582,451	$ -	$ -	$ -	$ -
Seismic Improvements at Water Reservoirs	$ -	$ -	$ -	$ -	$ -	$ 730,352
Seismic Improvements - Waterline Replace	$ 168,826	$ 179,977	$ 191,865	$ -	$ 218,047	$ -
HB 2001 Waterline - Main, 4th, Lincoln & 5th	$ -	$ 239,970	$ 365,822	$ -	$ -	$ -
HB 2001 Waterline - Blaine St	$ -	$ -	$ -	$ -	$ 1,180,362	$ -
HB 2001 Waterline - Meridian	$ -	$ -	$ -	$ -	$ 639,605	$ -
HB 2001 Waterline - 7th, Pacific, 9th & Paradise	$ -	$ -	$ 319,775	$ 545,433	$ 581,459	$ -
HB 2001 Waterline - River	$ 281,377	$ 441,544	$ -	$ -	$ -	$ -
HB 2001 Waterline - 5th	$ 166,575	$ -	$ -	$ -	$ -	$ -
HB 2001 Waterline - 11th & Boston Square	$ 55,150	$ -	$ -	$ -	$ -	$ 1,336,752
HB 2001 Waterline - Vermillion	$ 12,381	$ -	$ -	$ -	$ -	$ -
AWIA	$ 50,000	$ -	$ -	$ -	$ 229,505	$ -
GWTP New	$ -	$ 517,500	$ 1,874,644	$ 5,820,769	$ 5,163,854	$ -
TOTAL WATER PROJECTS	**$ 2,549,663**	**$ 7,843,179**	**$ 3,127,034**	**$ 6,477,074**	**$ 8,299,712**	**$ 2,067,104**

WATER PROJECT
Bell West Pump Station



The proposed pump station is needed to supply adequate fire flow and constant service pressure to the Zone 2 expansion area. Once the Bell Road Reservoir is constructed, this pump station will be used to supply a future reservoir.

Additionally, this project extends waterlines from N Terrace Drive to the intersection of N College and NE Valley Road and then to the east down NE Bell Road. This will help supply water for future Zone 2 development.

PROPOSED FUNDING

This project will be funded for out of water rate revenues and system development charge funds.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs

HISTORY OF THE PROJECT

The Oak Knoll Water Booster Pump Station at 3613 N Ivy Drive was installed in 2000 to provide a constant water pressure (Pressure Zone 2) to serve 42 homes along Knoll Drive at the city's northern water service area. Since then, 16 homes along W Madison Drive, and Veritas School, were added and served by the city's potable water system. Any additional connections to this system could impact the operation of the existing Oak Knoll Booster Pump Station.

MANDATED FEATURES

NA

CONTACT

paul.chiu@newbergoregon.gov

WATER PROJECT

Decommission Wells #1 and #2

This project would properly decommission the wells that are no longer being used per state standards.

PROPOSED FUNDING

This will be paid for out of water rate and system development charge funds.

MEDIUM PRIORITY PROJECT

This is a regulatory requirement that must be completed by the City.

HISTORY OF THE PROJECT

Wells #1 & #2 have reached the end of life and are not being utilized.

MANDATED FEATURES

This is regulated by OAR 690-220-0030.

CONTACT

engineering@newbergoregon.gov

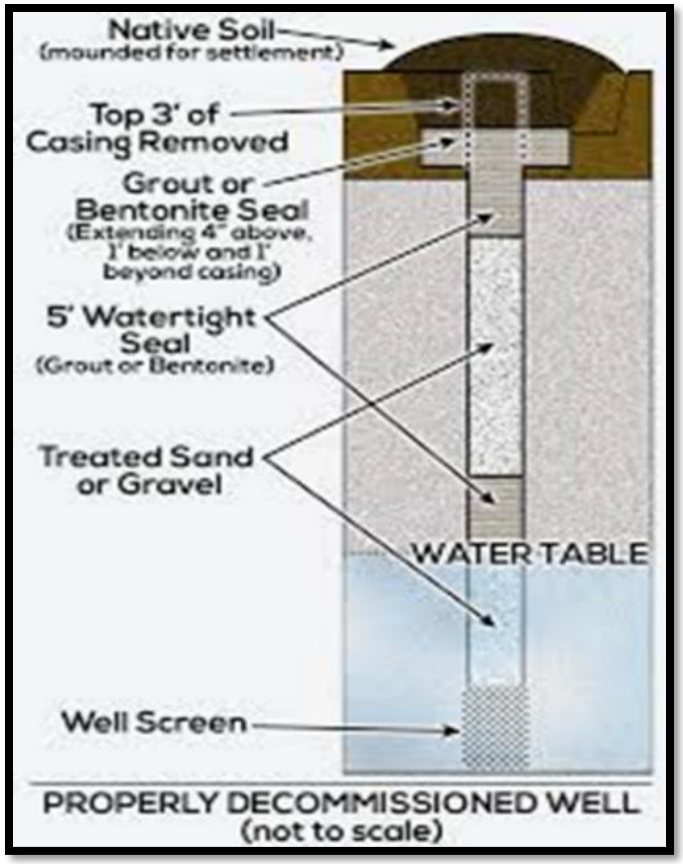


FIGURE 21 DECOMMISSION WELLS 1 & 2

WATER PROJECT

Downtown Fire Flow Project

This project is to replace several non-looped sections of 1 and 2 inch diameter water mains along Hancock Street through downtown Newberg.

PROPOSED FUNDING

This project will be paid for out of water rate revenues and system development charge funds.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will increase health and safety.

HISTORY OF THE PROJECT

Fire flow deficiencies occur in this area and the project will also improve fire hydrant spacing and coverage. This project will coordinate with the adopted 2016 Downtown Improvement Plan.

MANDATED FEATURES

NA

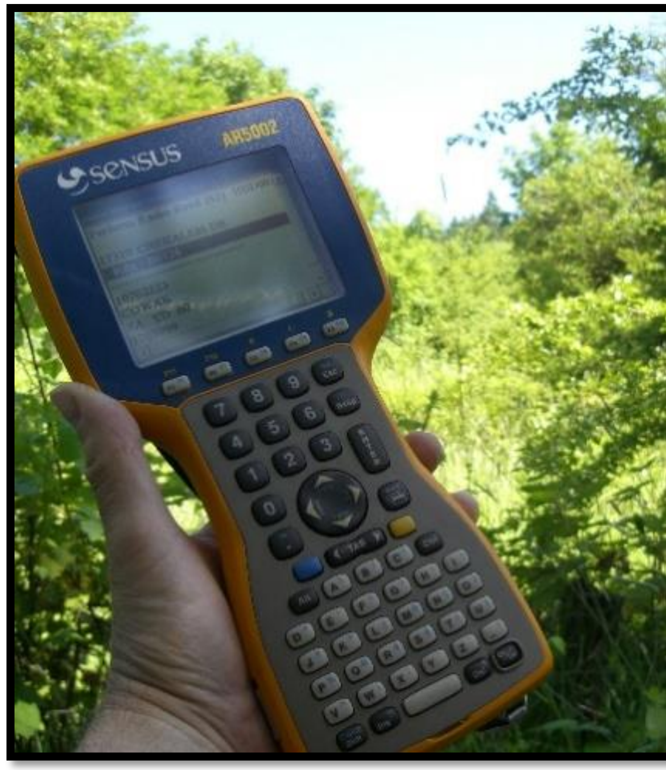
CONTACT

engineering@newbergoregon.gov

FIGURE 22 REPLACING DEFICIENT PIPE AND INADEQUATE FIRE HYDRANTS ON HANCOCK STREET

WATER PROJECT
Fixed Based Radio Read

Advanced metering infrastructure (AMI) is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers. The project will consist of the installation of two lattice towers, the RNI/Customer portal and the replacement of meters and meter boxes.



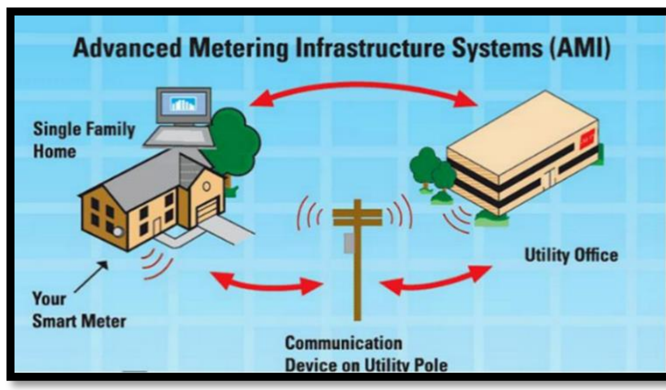


FIGURE 23 READING METERS CURRENTLY (TOP) VS ADVANCED WATER METERING READING INFRASTRUCTURE SYSTEM (BOTTOM)

PROPOSED FUNDING
This project will be paid for out of water rate and SDC funds.

HIGH PRIORITY PROJECT
The Council has identified increased sustainability and improved diversity, equity, and inclusion as priorities for Newberg. Along with responding to council goals the project will:

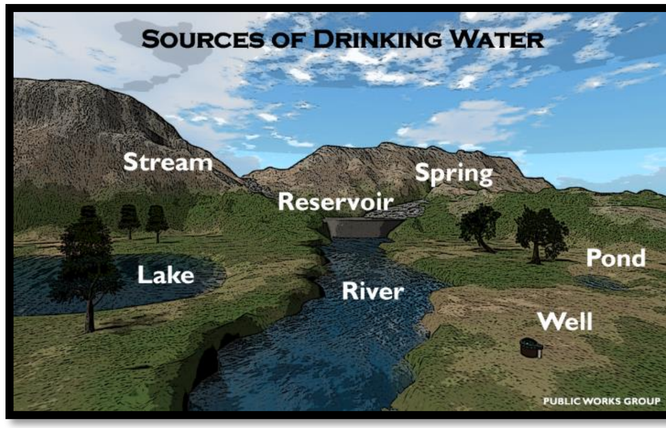
- Increase health and safety
- Reduce costs

HISTORY OF THE PROJECT
The existing meter reading system requires that someone drive through the entire city to read the meters. The fixed based system will allow for the meters to be read from the utility billing office in real time. This will cut down on labor costs and could detect a leak sooner. Rate payers will also have the ability to gain access to hourly real-time and historical water use information. Operations and treatment plant staff will have access to real time data.

MANDATED FEATURES
NA

CONTACT
kaaren.hofmann@newbergoregon.gov

WATER PROJECT
Redundant Supply



The City's current water supply is the well field on the south side of the Willamette River. To address supply vulnerability and long-term water resiliency, per the 2017 Water System Master Plan, the City should pursue another source north of the Willamette River. This project would include water rights, exploration, property acquisition and potentially the construction of a secondary treatment plant.

Phase 1 & 2 of the project are completed. Phase 3 is underway.

FIGURE 24 EXPLORING FUTURE WATER SUPPLY

PROPOSED FUNDING

This will be paid for out of water rate revenues and SDC funds.

HIGH PRIORITY PROJECT

Providing for a Safe and Reliable Water System for our citizens is a necessary function of the City. Development of an additional water supply and a seismically resilient system focuses on customer service and sustainability of one of our most valuable resources. Along with responding to Council goals the project will:

- Increase health and safety

HISTORY OF THE PROJECT

The City's 2017 Water Master Plan notes that the City's water supply source is vulnerable to flooding, ground movement, seismic activity or other natural disasters. If something was to occur to that source, the City would be unable to provide water to its residents.

MANDATED FEATURES

NA

CONTACT

kaaren.hofmann@newbergoregon.gov

WATER PROJECT

Fire Flow - Various

There are several more fire flow upgrades projects noted in the 2017 Water Master Plan. The priorities will be decided based on other projects and opportunities.

PROPOSED FUNDING

These projects will be funded by the SDC and water rate funds.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will increase health and safety.

HISTORY OF THE PROJECT

The 2017 Water Master Plan identified several locations that need to be upgraded to provide increased fire flows.

MANDATED FEATURES

NA

CONTACT

engineering@newbergoregon.gov

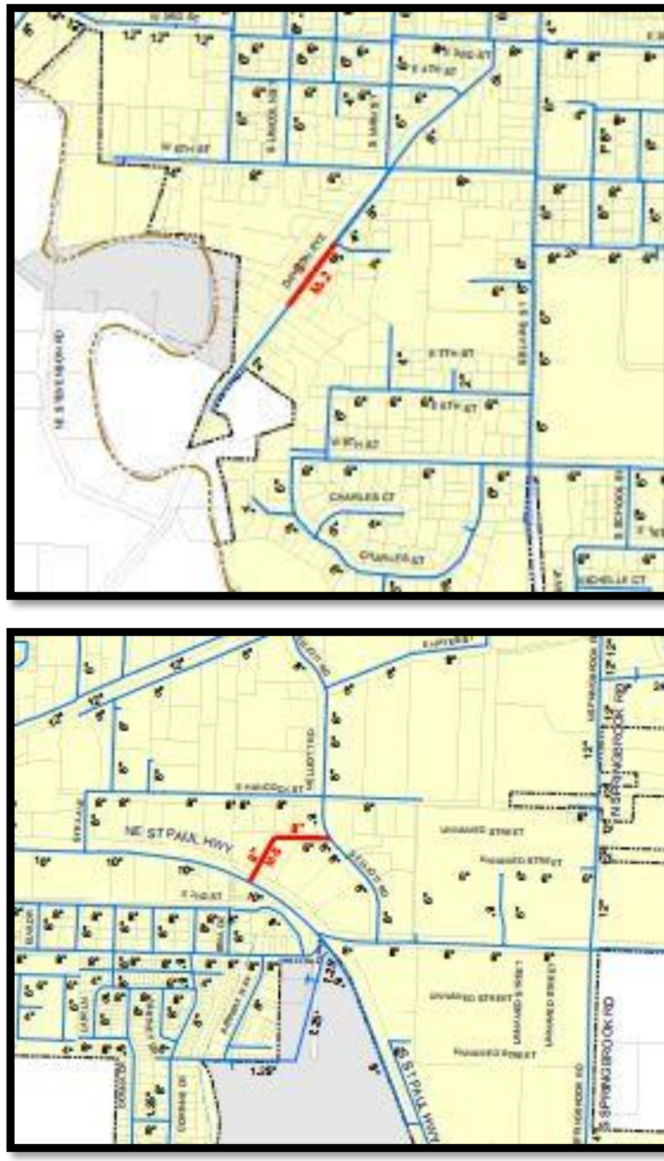


FIGURE 25 FIRE FLOW UPGRADES

WATER PROJECT

North Valley Reservoir Driveway

The access to the North Valley Reservoirs is currently gravel and has drainage issues. This project would correct the drainage issues and pave the access to allow the City to access this important asset in all-weather situations.

PROPOSED FUNDING

This project will be funded by water rate revenues.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs

HISTORY OF THE PROJECT

The existing access is gravel with an undersized culvert. The City is responsible for maintenance of this access.

MANDATED FEATURES

NA

CONTACT

engineering@newbergoregon.gov

FIGURE 26 NORTH VALLEY RESERVOIR ACCESS ROAD

WATER PROJECT

Routine Water Main Replacement

As existing pipes age and reach the end of life, they need to be replaced. It is better to replace pipes on a routine basis than as an emergency repair. This project also includes the replacement of water pipes to be more resilient in a natural disaster.

PROPOSED FUNDING

This project will be funded by water rate revenues.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Replacing pipes on a routine basis is better for the residents and the environment. Along with responding to Council goals the project will:

- Increase health and safety
- Reduce costs
- Coordinates with larger planned projects

HISTORY OF THE PROJECT

The 2017 Water Master Plan identified water lines that were near the end of life and need to be replaced. Additionally, the seismic plan indicated that the critical water pipes be replaced to become more resilient. Staff is coordinating these projects with other utility and transportation projects.

STATE MANDATED FEATURES

The seismic resilience study was guided by the Oregon Resilience Plan and meets relevant requirements of OAR Chapter 333, Division 061-0060(5)(a)(J). This information is being incorporated into the technical update of the Water Master Plan.

CONTACT

engineering@newbergoregon.gov

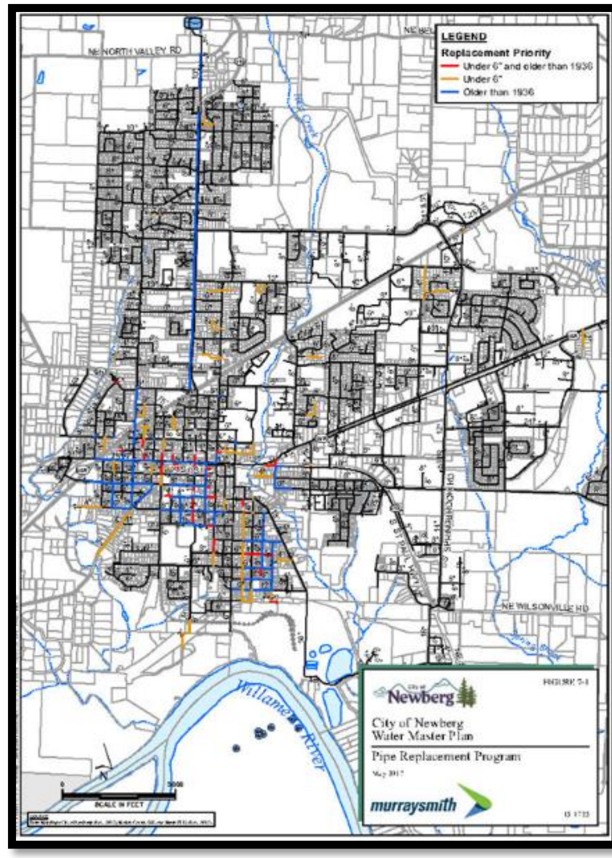
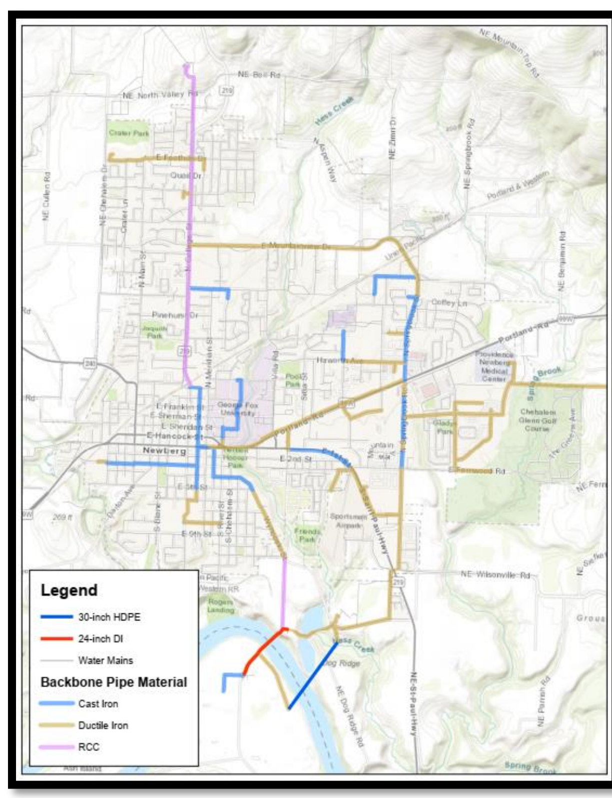


FIGURE 27 CITY WATER SERVICE



WATER PROJECT

New Ground Water Treatment Plant

Our existing ground water treatment plant was originally constructed in 1953 and it was expanded and upgraded in 1961, 1970, 1980, 1997 and 2006. The current plant is vulnerable to damage in a seismic event and there is a need to cover the treatment plant filters to meet State requirements for airborne contamination of treated water. Instead of spending over $8,000,000 for these improvements, it has been determined that it makes more fiscal sense to construct a new ground water treatment plant to meet the City's needs.

PROPOSED FUNDING

This project will be funded by water rate revenues and will need to be financed for a portion of the work.

HIGH PRIORITY PROJECT

This is a regulatory requirement.

HISTORY OF THE PROJECT

This was determined after more investigation into constructing the required seismic improvements and the required covers.

MANDATED FEATURES

All will be mandated by the State.

CONTACT

kaaren.hofmann@newbergoregon.gov

WATER PROJECT

American Water Infrastructure Act

The America's Water Infrastructure Act of 2018 requires community water systems that serve more than 3,300 people to complete a risk and resilience assessment and develop an emergency response plan. The City's first assessment and response plan was completed in 2021. This is required to be reviewed every five years.

PROPOSED FUNDING

Water rate revenues.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will increase health and safety and complies with a federal and state mandate.

HISTORY OF THE PROJECT

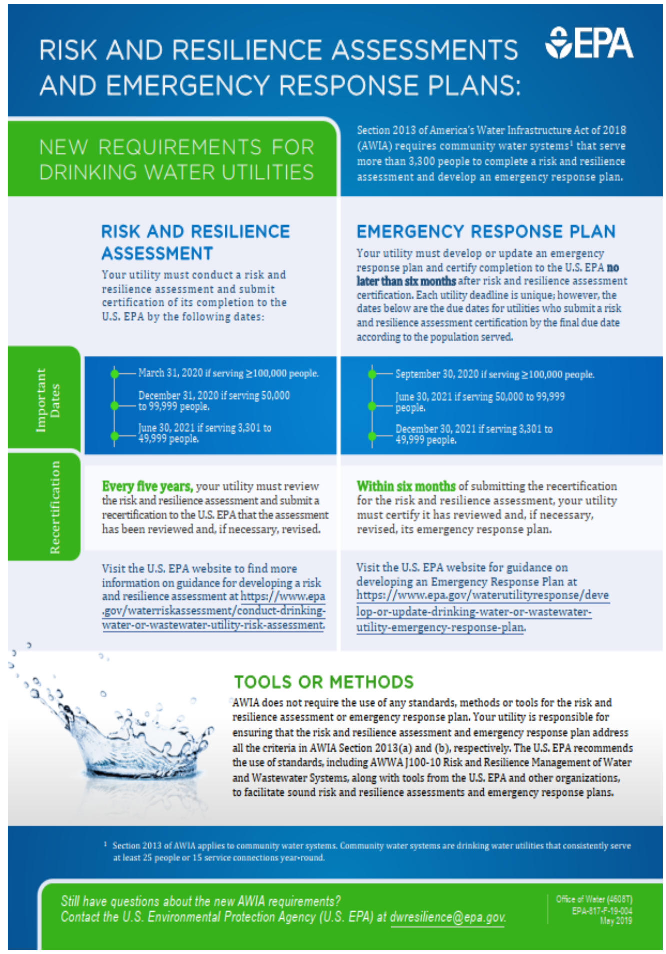
This is a requirement from the Environmental Protection Agency. This assessment and plan is a replacement of the existing Water Vulnerability Study that was completed in the early 2000s.

MANDATED FEATURES

NA

CONTACT

engineering@newbergoregon.gov



RISK AND RESILIENCE ASSESSMENTS AND EMERGENCY RESPONSE PLANS:

EPA

NEW REQUIREMENTS FOR DRINKING WATER UTILITIES

Section 2013 of America's Water Infrastructure Act of 2018 (AWIA) requires community water systems[1] that serve more than 3,300 people to complete a risk and resilience assessment and develop an emergency response plan.

RISK AND RESILIENCE ASSESSMENT

Your utility must conduct a risk and resilience assessment and submit certification of its completion to the U.S. EPA by the following dates:

EMERGENCY RESPONSE PLAN

Your utility must develop or update an emergency response plan and certify completion to the U.S. EPA **no later than six months** after risk and resilience assessment certification. Each utility deadline is unique; however, the dates below are the due dates for utilities who submit a risk and resilience assessment certification by the final due date according to the population served.

Important Dates

- March 31, 2020 if serving ≥100,000 people.
- December 31, 2020 if serving 50,000 to 99,999 people.
- June 30, 2021 if serving 3,301 to 49,999 people.

- September 30, 2020 if serving ≥100,000 people.
- June 30, 2021 if serving 50,000 to 99,999 people.
- December 30, 2021 if serving 3,301 to 49,999 people.

Recertification

Every five years, your utility must review the risk and resilience assessment and submit a recertification to the U.S. EPA that the assessment has been reviewed and, if necessary, revised.

Within six months of submitting the recertification for the risk and resilience assessment, your utility must certify it has reviewed and, if necessary, revised, its emergency response plan.

Visit the U.S. EPA website to find more information on guidance for developing a risk and resilience assessment at https://www.epa.gov/waterriskassessment/conduct-drinking-water-or-wastewater-utility-risk-assessment.

Visit the U.S. EPA website for guidance on developing an Emergency Response Plan at https://www.epa.gov/waterutilityresponse/develop-or-update-drinking-water-or-wastewater-utility-emergency-response-plan.

TOOLS OR METHODS

AWIA does not require the use of any standards, methods or tools for the risk and resilience assessment or emergency response plan. Your utility is responsible for ensuring that the risk and resilience assessment and emergency response plan address all the criteria in AWIA Section 2013(a) and (b), respectively. The U.S. EPA recommends the use of standards, including AWWA J100-10 Risk and Resilience Management of Water and Wastewater Systems, along with tools from the U.S. EPA and other organizations, to facilitate sound risk and resilience assessments and emergency response plans.

[1] Section 2013 of AWIA applies to community water systems. Community water systems are drinking water utilities that consistently serve at least 25 people or 15 service connections year-round.

Still have questions about the new AWIA requirements?
Contact the U.S. Environmental Protection Agency (U.S. EPA) at dwresilience@epa.gov.

Office of Water (4608T)
EPA-817-F-19-004
May 2019

WATER PROJECT
Emergency Connection & Controls

This project will implement needed improvements to the water system to meet the Oregon Resilience Plan and City of Newberg Level of Service Goals. As identified in the vulnerability assessment, the Waste Treatment Plant poses several risks if a Cascadia Subduction Zone earthquake occurs. By adding a point for emergency cross-connection and installing hydraulic control valves, the plant could be isolated during an earthquake event, allowing raw water to continue into the distribution system.

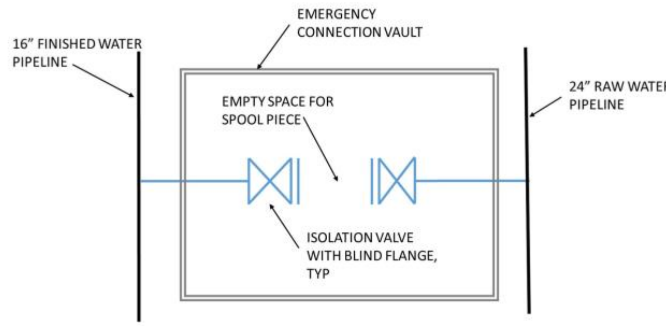


Figure 1. Raw Water Emergency Connection Vault

PROPOSED FUNDING
Water rate revenues.

HIGH PRIORITY PROJECT
The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will increase health and safety and complies with a federal and state mandate.

HISTORY OF THE PROJECT
In support of the 2017 Water Master Plan and Oregon Health Authority (OHA) guidelines, the City conducted a water system Seismic Resilience Assessment (SRA).

MANDATED FEATURES
Compliance with the Oregon Resilience Plan.

CONTACT
engineering@newbergoregon.gov

WATER PROJECT
Reservoirs Seismic Improvements

This project will implement needed improvements to the water system to meet the Oregon Resilience Plan and City of Newberg Level of Service Goals for the water reservoirs. By adding hydraulic control valves and replacing a portion of the pipe at North Valley Reservoirs, water storage at the tanks could be preserved.

Figure 3.6 – Former Chlorination Building

PROPOSED FUNDING
Water rate revenues.

HIGH PRIORITY PROJECT
The Council has identified increased sustainability as a priority for Newberg. Along with responding to Council goals the project will increase health and safety and complies with a federal and state mandate.

HISTORY OF THE PROJECT
In support of the 2017 Water Master Plan and Oregon Health Authority (OHA) guidelines, the City conducted a water system Seismic Resilience Assessment (SRA).

MANDATED FEATURES
Compliance with the Oregon Resilience Plan.

CONTACT
engineering@newbergoregon.gov

CAPITAL IMPROVEMENT PROGRAM

WATER PROJECT

HB2001 Improvements

This project will implement needed improvements to the water system to comply with HB 2001; Middle Housing requirements. This project will upsize several pipes in the area south of downtown Newberg.

PROPOSED FUNDING

Water rate revenues.

HIGH PRIORITY PROJECT

The Council has identified increased sustainability and improved diversity, equity, inclusion, and housing as priorities for Newberg.

HISTORY OF THE PROJECT

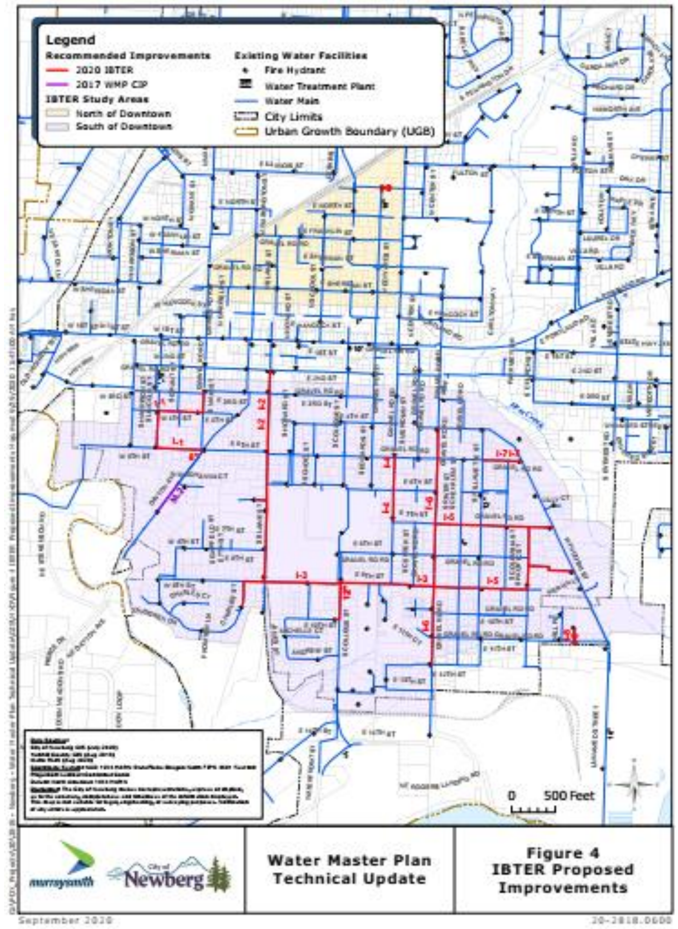
In the evaluation of providing for middle housing it was determined that several of the water pipes in the area south of downtown are not adequate to provide the required fire flow.

MANDATED FEATURES

NA

CONTACT

engineering@newbergoregon.gov



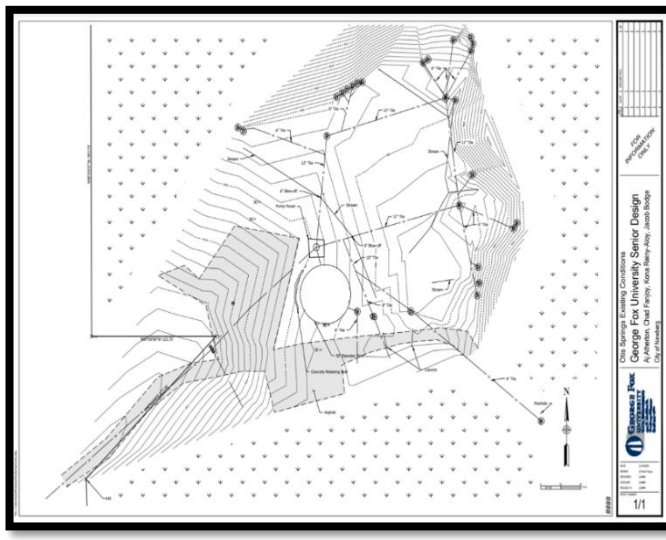
Recommended Improvements

Project No.	Project Description	Estimated Project Cost[1-4]
I-1	Install 1,733 LF of 8-inch DI Pipe in S Main Street, W 4th Street, S Lincoln Street, and W 5th Street	$486,000
I-2	Install 2,558 LF of 12-inch DI Pipe in S Blaine Street	$812,000
I-3	Install 2,962 LF of 8- and 12-inch DI Pipe in E 9th Street, Charles Street, and S College Street	$1,756,000
I-4	Install 772 LF of 8- and 12-inch DI Pipe in S Meridian Street	$440,000
I-5	Install 3,691 LF of 12-inch DI Pipe in E 7th Street, S Pacific Street, E 9th Street, and Paradise Drive	$1,167,000
I-6	Install 2,736 LF of 12-inch DI Pipe in S River Street	$868,000
I-7	Install 453 LF of 12-inch DI Pipe in E 5th Street	$148,000
I-8	Install 159 LF of 8-inch DI Pipe from E 11th Street to the Boston Square Apartments	$49,000
I-9	Install 15 LF of 8-inch DI Pipe in Vermillion Street	$11,000
	Total Cost	$5,737,000

WATER PROJECT

Otis Springs Improvements

This project will construct the necessary improvements to Otis Springs to allow for this resource to be used in the Non-Potable Water System. New pumps must be installed in order to meet the desired flow rates and standard pressures of 30-90 psi. Larger tank size is required in order to successfully fill and drain under the 9 hour irrigation period each day.



PROPOSED FUNDING

Water rate revenues.

PRIORITY PROJECT

The Council has identified increased sustainability as a priority for Newberg.

HISTORY OF THE PROJECT

This project is in the 2017 Water Master Plan as an integral part of the Non-Potable Water System. The existing Otis Springs infrastructure and non-potable supply is not adequate for the City's proposed developments shown in Option B of the 'Water Master Plan May 2017'.

MANDATED FEATURES

NA

CONTACT

brett.musick@newbergoregon.gov

Exhibit "C" to Planning Commission Resolution No. 2022-384
Comprehensive Plan Amendment – File CPTA22-0001

Note: Existing text is shown in regular font.
Added text is shown in double underline
Deleted text is shown in ~~strikethrough~~.

The Newberg Comprehensive Plan shall be amended as follows:

VIII. 2017 WATER MASTER PLAN AND ADDDENDUM - RIVERFRONT MASTER PLAN 2021 AND ADDENDUM WATER SUPPLY PLANNING 2023

Under separate cover.

RESOLUTION NO. 2022-3845

City of Newberg

A Resolution initiating an amendment to the Newberg Comprehensive Plan, VIII. 2017 Water System Master Plan and Addendum – Groundwater Treatment Plant

Recitals:

1. The City of Newberg has been working on a Safe & Reliable Water Future program. As part of this program evaluation a new groundwater treatment plant has been identified to replace the existing water treatment plant.

2. In order to qualify for grant and loan programs to fund the new groundwater treatment plant the plant needs to be identified in the Water System Master Plan.

3. The request is to consider initiating an amendment to amend the Comprehensive Plan, VIII. 2017 Water System Master Plan.

The City of Newberg Resolves as Follows:

1. The City Council initiates an amendment to the Newberg Comprehensive Plan, VIII. 2017 Water System Master Plan and Addendum – Groundwater Treatment Plant. This starts the public process to study the proposed amendments.

2. By initiating this amendment, the City Council does not commit to taking any specific action on the proposal. It only wishes to give the amendment full consideration by the Planning Commission and City Council in public hearings.

Effective Date of this resolution is the day after the adoption date, which is: August 16, 2022.
Adopted by the City Council of Newberg, Oregon, this 15th day of August, 2022.

Sue Ryan

Sue Ryan, City Recorder

Attest by the Mayor this 18th day of August 2022.

Rick Rogers, Mayor

City of Newberg

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/7/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [ ] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [x] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

W E Worthey

Digitally signed by Will
DN: C=US, OU=Worthey, O=City of Newberg, CN=Will, E=will.worthey@newbergoregon.gov
Reason: I am the author of this document
Location:
Date: 2023.02.07 11:37:12-08'00'
Foxit PDF Editor Version: 12.0.0

2/7/23

Reviewed By: Date:

Will Worthey CM

Organization:

Fe Bates

From: Will Worthey
Sent: Tuesday, February 7, 2023 3:44 PM
To: Doug Rux; Fe Bates
Cc: James Walker
Subject: RE Referral CPTA22-0001
Attachments: Referral -CPTA22-0001.pdf

Good afternoon,

I have attached the referral but, in this case, I am seeking more information to understand the long-term consequences of this addendum. Specifically, I am seeking the answer to this question:

Does the Water master plan amendment commit the city to building a surface water treatment plant in any given time frame (as opposed to the accepted ground water treatment plant) ?

Thank you kindly,

Will Worthey
City Manager
City of Newberg
414 E. First Street
Newberg, OR 97132
Direct: 503-537-1256

Forward Together!

Doug Rux

From: Will Worthey
Sent: Wednesday, February 8, 2023 12:54 PM
To: Doug Rux; Fe Bates
Subject: Referral update
Attachments: Referral -CPTA22-0001.pdf

See attachment Kaaren has explained that there is no set time to build water plant number 2. My portion of the referral process is complete.

Will Worthey
City Manager
City of Newberg
414 E. First Street
Newberg, OR 97132
Direct: 503-537-1256

Forward Together!

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/16/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By:

Date: 2/15/23

CON-Engineering
Organization:

City of Newberg

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/7/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By:

Date: 2/6/23

Organization: Finance

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/9/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By: ____________________ Date: 2/9/23

City of Newberg
Organization:

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/7/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By:

Date: 2/7/23

Public Works Director, City of Newberg

Organization:

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/8/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By:

Date: 2/8/23

Maintenance Superintendent
Organization:

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

City of Newberg

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/6/2023
batesf

Project Information Can be found by the link below:

https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Daniel L Wilson

Reviewed By:

2/6/23

Date:

City of Newberg Operations

Organization:

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/8/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

2/8/23

Reviewed By: Date:

Organization:

COMMUNITY DEVELOPMENT LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/7/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By: ____________________ Date: 2/7/23

Yamhill County Transit
Organization:

City of Newberg

COMMUNITY DEVELOPMENT
LAND USE APPLICATION REFERRAL

The enclosed material has been referred to you for your information and comment. Any comments you wish to make should be returned to the Community Development Department prior to: Feb 21, 2023
Please refer questions and comments to: Doug Rux

NOTE: Full size plans are available at the Community Development Department Office.

APPLICANT: City of Newberg, initiated by CityCouncil Resolution No. 2022-3845

REQUEST: A Resolution recommending City Councilamend the 2017 WaterMaster Plan incorporating the AddendumWater Supply Planning2023into the Newberg Comprehensive Plan

FILE NO: CPTA22-0001

HEARING DATE: 3/9/2023

RECEIVED
2/6/2023
batesf

Project Information Can be found by the link below:
https://www.newbergoregon.gov/planning/page/water-master-plan-update-addendum-water-supply-planning-2023cpta22-0001

- [x] Reviewed, no conflict.
- [ ] Reviewed; recommend denial for the following reasons:
- [ ] Require additional information to review. (Please list information required)
- [ ] Meeting requested.
- [ ] Comments. (Attach additional pages as needed)

Reviewed By: 2/6/23

Date:

Ziply Fiber - Scott Albert Network Engineer

Organization: 503-526-3544 scott.albert@ziply.com