Subsurface Utility Engineering Investigation Report

Multnomah County | Earthquake Ready Burnside Bridge Project

Portland, OR

June 27, 2022

Earthquake Ready Burnside Bridge Subsurface Utility Engineering Investigation Report

Prepared for

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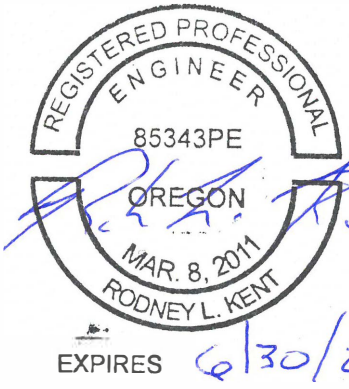
Contract# DCS-SVCSGEN-857-2019-conv
HDR Project #10144814

CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.



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Acronyms, Initialisms, and Abbreviations

ASCE	American Society of Civil Engineers
BES	City of Portland Bureau of Environmental Services
CMP	corrugated metal pipe
CSO	combined sewer overflow
EQRB	Earthquake Ready Burnside Bridge
EM	electromagnetic
FHWA	Federal Highway Administration
MCGPR	Multi-Channel Ground Penetrating Radar
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
QL	Quality level
PBOT	Portland Bureau of Transportation
PPR	Portland Parks and Recreation
PWB	Portland Water Bureau
RCP	reinforced concrete pipe
ROW	right-of-way
SSCO	Sanitary Sewer Clean Out
SUE	Subsurface utility engineering
TDEM	Time Domain Electromagnetic
UE	Utility engineering
UMS	Utility Mapping Services, Inc.
UPRR	Union Pacific Railroad

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1 Introduction

This report (Task: 14.17 Subsurface Utility Engineering) summarizes the results of the first of a multi-phased utility engineering (UE) effort. This effort is specifically focused on utility designating and depiction of existing utilities up to and including quality level (QL) B data completed in accordance with the ASCE C-I 38-02 standard guidelines[1] This work was performed by Utility Mapping Services, Inc. (UMS) under a subcontract agreement with HDR Engineering, Inc. (Client) for Multnomah County, OR (Owner) in connection with Earthquake Ready Burnside Bridge (EQRB) National Environmental Policy Act and Type Selection Phase (Project). The purpose of this professional investigation is to acquire a conglomerate of geophysical and observation field data and record information, reasonably interpret the presence of existing utility infrastructure within the specified project limits identified by the Client/Owner, obtain accurate dimensions and 3D position coordinates at inverts and other discrete locations where utilities are accessible for direct observation, and develop standardized depictions with reliability qualifiers (quality levels) in accordance with ASCE C-I 38-02[2] under the direct oversight and direction of a qualified professional engineer. Guidelines, definitions, limitations, etc. described in the EQRB Subsurface Utility Engineering Services Work Plan dated September 7th, 2021 (Revised on September 23rd , 2021) and “accepted” on September 23rd, 2021, are also applicable to this report.

Professional judgment has been exercised to reasonably investigate, develop, and present findings in a pragmatic manner for the ensuing project design and bid document preparation, while staying within the allotted budget and schedule. The users of this data are reminded that this information is for design purposes only, and not intended to be used in-lieu of the Oregon One-Call (Call 811) utility locating process. The contractor is legally required to call One-Call a minimum of two business days prior to construction. The data presented here are time sensitive and represent the interpretation of the obtained data at the time of the field investigation (September 2021 - March 2022). Although, field personnel attempted to designate any new utility alignments that were observed being installed during this timeframe, a possibility exists that recently installed utilities are not included with this submittal. UMS cannot be responsible for recent installations and changes that occurred without our knowledge. The data, interpretation and corresponding utility depictions presented in this submittal are to be considered a work in progress and should be updated and revised with new observation data as information becomes available throughout the project development and delivery effort.

This report documents records acquisition, field investigation, data interpretation, and depiction. Particular attention has been given to special conditions including questionable interpretations, unusual installations or contradictory information obtained from record data and field findings. The information included herein should enable: 1) systematic determination of conflicts between existing utilities and proposed design and

[1] American Society of Civil Engineers, ASCE C-I 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data, 2002, 20.

[2] Ibid.

construction; and 2) proactive activities between the project development team and utility owners to value engineer resolutions.

The results of the subject utility investigation and depiction are presented in digital deliverables (Section 8), Preliminary Existing Utilities.dwg and Preliminary Existing Utilities Sheets.pdf. Results of the advanced geophysical methods (i.e., Vivax-Metrotech Spar 300, Multi-Channel Ground Penetrating Radar (MCGPR), Time Domain Electromagnetic (TDEM), Downhole LiDAR and Video Inspection) utilized during the investigation can be found in the Advanced Geophysics Report and associated deliverables. To assure meaningful and proper usage, and to minimize risk of misinterpretation, this data must be kept, regarded, and interpreted in a collective, integral manner and in accordance and with understanding of ASCE C-I 38-02 standard guidelines. Refer to Appendix A for an overview of the utility investigation process.

The specified project boundaries for the utility designating effort are identified in the Contract# DCS- SVCSGEN-857-2019-conv and EQRB Subsurface Utility Engineering Services Work Plan; project limits are shown below in Figure 1. Please note coverage of some facilities may extend outside these project limits to capture surface features and appurtenances (e.g., manholes, inlets, pedestals, power poles, etc.) that help better establish utility alignments, such as storm drains, power lines, etc.

2 Project Specific Scope of Work

The project scope of work and work plans for the Subsurface Utility Engineering (SUE) Investigation included records research, field operations, data management, quality assurance review and CADD development tasks, to produce deliverables outlined in Section 8 of this report.

2.1 Utility Designating and Depiction

Phase 1 of a multi-phase Utility Engineering (UE) effort has been conducted for this project and is summarized in this report.

Utility Designating typically encompasses developing qualified utility depictions up to QL B based on systematic geophysical investigative measures and professional judgment. This project effort includes investigating and depicting buried utilities and surface appurtenances within specified project limits identified by the Client/Owner. Aerial features will be addressed by others (i.e., non-UMS staff) on the Project Team. Utility Designating effort is focused on developing standardized 2-D and 3-D data, where required, and corresponding depictions of existing utilities. The work included the following activities, although advanced geophysical equipment will be discussed in a separate report as footnoted below:

- 2-D QL B Utility Acquisition and Depiction – records research, designating field effort and data acquisition, characterization, and depiction of existing utility infrastructure data to develop a reliably qualified base map and data set from which to develop and support future design, coordination, and construction decisions.

- 3-D QL B designating of discrete conductive utilities using Spar 300 utility surveying equipment[3].
- 3-D QL B utility designating of known and unknown subsurface features using multi-channel ground penetrating radar (MCGPR) equipment[4].
- QL B utility designating of known and unknown subsurface feature using TDEM.[3]
- Downhole LiDAR of complex drainage structures to obtain QL A data for pipe offsets, inverts, and sizes. [3]
- Video Inspections to obtain QL B alignments and confirm blind connections through the use of a Sonde.[3]
- Preparation of an Existing Utilities CADD reference file (Autodesk Civil 3D) 2-D line work with attribution data including assessed QLs to convey varying reliability of depicted features.
- Preparation of a 3-D QL B Existing Utilities CADD reference file containing 3-D QL B line work for utilities surveyed using Spar 300 survey equipment.
- Preparation of a 3-D QL B multi-channel ground penetrating radar anomaly CADD reference file. This effort included comparison of utilities identified with SUE QL B effort and incorporation of MCGPR anomaly data into the Existing Utilities CADD reference file where anomalies correlated with known utility installations.

2.2 Project Limits

The project limits defined for utility designating and depiction effort were defined by the scope of work attached to the Subconsultant Agreement Attachment B (Contract# DCS-SVCSGEN-857-2019-conv) and the EQRB Subsurface Utility Engineering Services Work Plan. The specified project boundaries for the utility designating effort as identified in the Contract# DCS-SVCSGEN-857-2019-conv and EQRB Subsurface Utility Engineering Services Work Plan; project limits are shown below in Figure 1.

The project limits are generally bound by NW/SW 3rd Avenue on the west side and NE/SE Grand Avenue on the east side. On the east and west side, SW/SE Ash and Ankeny Streets define the southern extents of the project. The north project limits on the west side are bound by NW Couch Street and the east side is bound by NE Davis Street. However, the east side includes an additional area to the north on NE 2nd Avenue, Union Pacific Railroad (UPRR) and Oregon Department of Transportation (ODOT) right-of-way (ROW). There are numerous property and ROW owners within the project limits including: ODOT, City of Portland, UPRR, TriMet, and private properties. Within all areas shown in Figure 1 and Figure 2, UMS performed a QL B field investigation and corresponding designating of existing utilities.

Note: Investigation on the bridge was limited to utilities connecting to the bridge, i.e., communication/electric risers and downspouts. Underwater utilities were not investigated.

[3]EQRB: Task 14.17 Advanced Geophysics Report-MCGPR, TDEM, Spar 300, and Downhole LiDAR

[4] Ibid.

Figure 1. Project Area

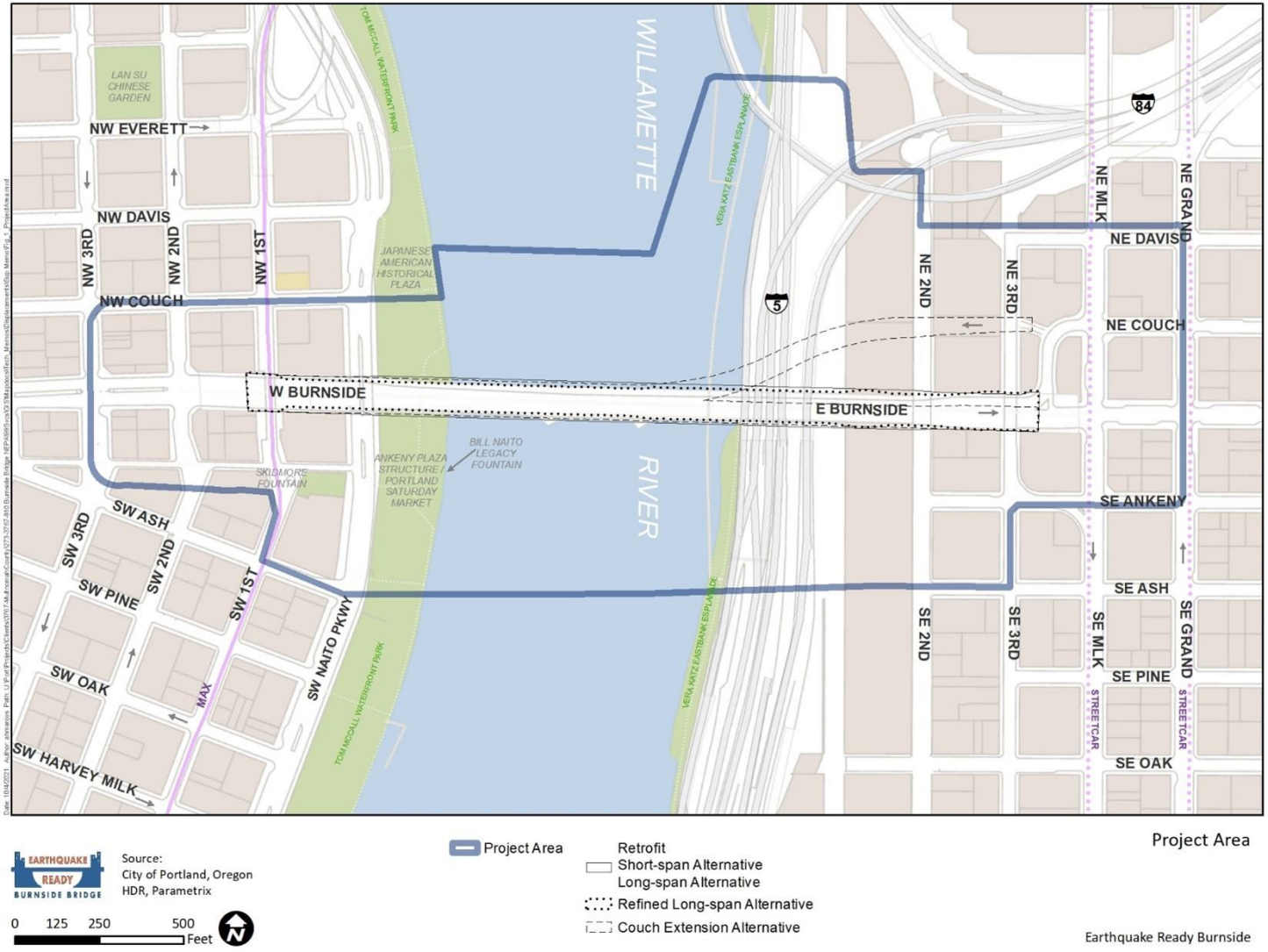
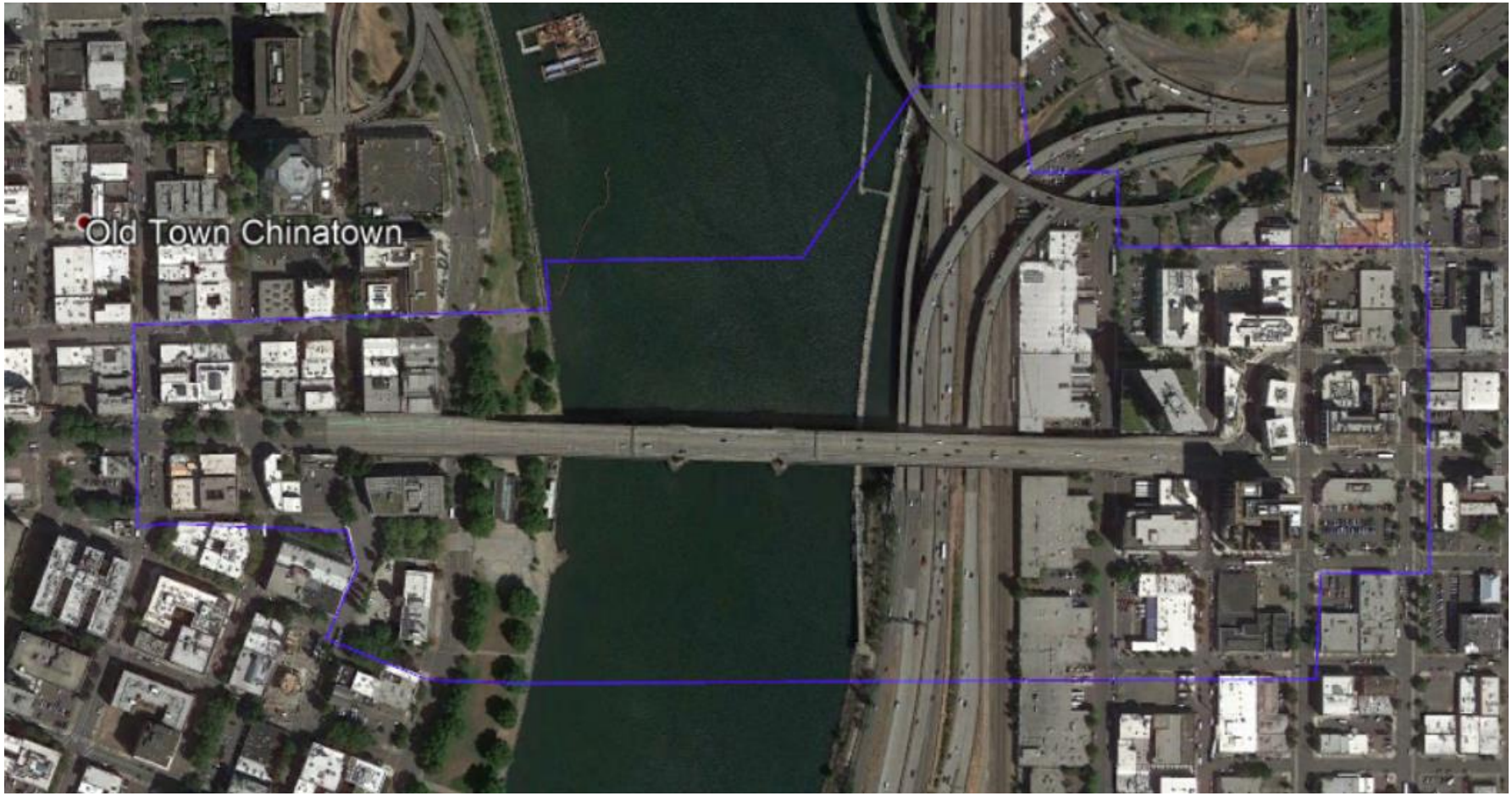


Figure 2. SUE Project Limits (outlined in blue)



2.3 Utility Ownership and Utility Records Provided for Investigation

Table 1 provides a listing of contact data for representatives of utility infrastructure owners identified within the project limits.

Table 1. Utility Ownership and Representative Contact Information

Company	Name	Address	Email	Phone
AT&T Corporation	Steve Duppenthaler	AT&T Corporation National Eng & Const 11241 Willows Rd NE, Ste 130 Redmond, WA 98052	Sd1891@att.com	425-286-3822
AT&T Corporation	David Sakamoto	AT&T Corporation c/o PIVOTAL 4001 Main St, Ste 110 Vancouver, WA 98663	dsakamoto@pivotalcomm.com	360-882-4268
AT&T Corporation	Terrence Walker	AT&T Corporation c/o PIVOTAL 4001 Main St, Ste 110 Vancouver, WA 98663	twalker@pivotalcomm.com	360-606-7318
Burnside Skatepark	Sage Bolyard		sagebolyard@yahoo.com	503-341-7963
City of Portland Bureau of Environmental Services	Dave Nunamaker	City of Portland Bureau of Environmental Services 1120 SW 5th Ave., Room 1000 Portland, Oregon 97204	Dave.Nunamaker@portlandoregon.gov	503-823-7266
City of Portland Water Bureau	Tanna Hiatt	City of Portland Water Bureau 1120 SW 5th Ave., Room 600 Portland, OR 97204	Tanna.Hiatt@portlandoregon.gov	503-823-6036
Comcast Cable Communications Management, LLC (Conflicts)	Todd Royer	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	Todd_Royer@comcast.com	Office: 503-813-0481 Cell: 971-801-5610
Comcast Cable Communications Management, LLC (Conflicts)	Richard Maroney	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	Richard_Maroney@comcast.com	Cell: 971-801-5695

Company	Name	Address	Email	Phone
Comcast Cable Communications Management, LLC (Pole Transfer Group)	Michael Allen	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	Michael_Allen@comcast.com	541-230-0219
Comcast Cable Communications Management, LLC (All Design and Mapping)	Kevin Kopp	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	Kevin_Kopp@comcast.com	503-596-3727
Comcast Cable Communications Management, LLC (All Design and Mapping)	Cole Gubrud	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	cole_gubrud@kbmail.net	
Comcast Cable Communications Management, LLC (All Design and Mapping)	Shane Langley	Comcast Cable 7900 NE Killingsworth St Portland, OR 97218	Shane_Langley@kbmail.net	
Lumen (Local)	David Dodd	Lumen 8021 SW Capitol Hill Rd, Rm 110 Portland, OR 97219	David.Dodd@Lumen.com	Office: 503-242-8849 Cell: 503-616-6291
Lumen (National)	Caleb King	Lumen OSP Relocations 100 South Cincinnati Ave, Ste 1200 Tulsa, OK 74103	Relocations@Lumen.com	918-547-0007
Multnomah County Bridge Section	Megan Neill	Multnomah County Bridge Services Section 1403 SE Water Ave Portland, OR 97214	Megan.Neill@multco.us	503-360-6222
NW Natural	Jeremy Lorence	NW Natural 220 NW 2nd Ave Portland, OR 97210	Jeremy.Lorence@nwnatural.com	Office: 503-226-4211 x6772 Cell: 503-781-4467
ODOT Region 1 Electrical (Manager)	Johnny Sapp	Oregon Dept. of Transportation 9200 SE Lawnfield Rd Clackamas, OR 97015	Johnny.R.SAPP@odot.state.or.us	971-673-6240

Company	Name	Address	Email	Phone
ODOT Signals	Lisa De Mers	Oregon Dept. of Transportation 9200 SE Lawnfield Rd Clackamas, OR 97015	Lisa.C.DEMERS@odot.state.or.us	971-673-6201
ODOT Illumination	Duc Phan	Oregon Dept. of Transportation 9200 SE Lawnfield Rd Clackamas, OR 97015	Duc.V.PHAN@odot.state.or.us	503-969-1031
ODOT ITS	Jason Stadelman	Oregon Dept. of Transportation 3700 SE 92nd Ave Portland, OR 97266	Jason.J.Stadelman@odot.state.or.us	503-201-1854
PacifiCorp	Rebecca Chin	PacifiCorp 825 NE Multnomah St Portland, OR 97232	Rebecca.Chin@pacificorp.com	503-867-5509
PacifiCorp	Bob Gravely	PacifiCorp 825 NE Multnomah St Portland, OR 97232	Bob.Gravely@pacificorp.com	503-568-3174
PacifiCorp	Cary Bailey	PacifiCorp 825 NE Multnomah St Portland, OR 97232	Cary.Bailey@pacificorp.com	
PacifiCorp	Dean Montgomery	PacifiCorp 825 NE Multnomah St Portland, OR 97232	Dean.Montgomery@pacificorp.com	
PacifiCorp	John Moudy	PacifiCorp 825 NE Multnomah St Portland, OR 97232	John.Moudy@pacificorp.com	503-880-1479
Portland Bureau of Transportation	Caitlin Reff	Portland Bureau of Transportation 1120 SW 5th Ave, Ste 1331 Portland, OR 97204	Caitlin.Reff@portlandoregon.gov	503-823-6951
Portland Bureau of Transportation	Jason Grassman	Portland Bureau of Transportation 1120 SW 5th Ave, Ste 1331 Portland, OR 97204	Jason.Grassman@portlandoregon.gov	503-823-8669

Company	Name	Address	Email	Phone
Portland Bureau of Transportation, Portland Streetcar	Andrew Plambeck	Portland Streetcar, Inc. 1031 NW 11th Ave, Portland, OR 97209	Andrew.Plambeck@portlandstreetcar.org	
Portland Bureau of Transportation, Signals, Street Lighting, and ITS Division	Charles Radosta	Portland Bureau of Transportation 1120 SW 5th Ave, Ste 1331 Portland, OR 97204	Charles.Radosta@portlandoregon.gov	Office: 503-823-5573 Cell: 503-823-8133
Portland Bureau of Technology Services	Rob Durkin	Portland Bureau of Technology Services 111 SW Columbia St. #400 Portland, OR 97201	Rob.Durkin@portlandoregon.gov	503-823-6243
Portland Bureau of Technology Services	Winfried Vogt		Winfried.Vogt@portlandoregon.gov	
Portland Fire & Rescue	Shawn Roberti		Shawn.Roberti@portlandoregon.gov	
Portland General Electric	Nick Heade M2882503	Portland General Electric PO Box 3340 Portland, OR 97208	Nicholas.Heade@pgn.com	503-701-1980
Portland General Electric	Benjamin Baker M2882503	Portland General Electric PO Box 3340 Portland, OR 97208	Benjamin.Baker@pgn.com	Office: 503-736-5534 Cell: 503-985-6323
Portland Parks and Recreation	Sandra Burtzos	Portland Parks and Recreation Asset Management 1120 SW 5th Ave Portland, OR 97204	Sandra.Burtzos@portlandoregon.gov	
TriMet	John Griffiths	TriMet Project Development & Permitting 1800 SW 1st Ave, Ste 300 Portland, OR 97201	GriffitJ@trimet.org	
UPRR Fiber Group (via Rail process, not utility process)	Gary E. Voogd		gevoogd@up.com	

Company	Name	Address	Email	Phone
UPRR Design Rep (via Rail process, not utility process)	Terrel Anderson	RailPros 318 7th Street Sparks, NV 89431	Terrel.anderson@railpros.com	775-846-4151
Verizon	Jeremy Noble	Verizon Northwest Fiber Access Engineering 2550 NE Alocleck Dr. Hillsboro, OR 97124	Jeremy.noble@verizon.com	
Verizon	David Soloos	Verizon Northwest Fiber Access Engineering 2550 NE Alocleck Dr. Hillsboro, OR 97124	David.soloos@verizon.com	Cell: 503-679-6610
Verizon	Robert Newbre	Verizon Northwest Fiber Access Engineering 2550 NE Alocleck Dr. Hillsboro, OR 97124	Robert.newbre@verizon.com	Cell: 503-314-0826
Verizon	Mic Woodman	Woodman Telcom Group	mic@woodmantelco.com	Office: 801.618.4664 Cell: 801.599.9869
Wave (Astound Broadband)	Jeff McConville			
Zayo Group	Joseph Kleinsasser	Zayo Group 4400 NE 77th Ave Vancouver, WA 98662	Joseph.Kleinsasser@zayo.com	360-524-7928
Zayo Group	Chris Ybarra	18110 SE 34th St, Bldg 1 Vancouver, WA 98683	Christopher.ybarra@zayo.com	971-940-0244

3 Project Survey Control

Project control data was supplied by the Client prior to the start of the field work and is listed below:

- Horizontal Datum: Oregon Coordinate Reference System (OCRS) Portland Zone projection, NAD 83 (2011) Epoch 2010, International Feet
- Vertical Datum: NAVD88 (Geoid 12A); Elevations are U.S. Survey Feet
- Daily survey control point check-ins with RTK GPS were completed on established control points provided by the Project Team.

Usage of the term “survey” within this utility investigation report is strictly in reference to engineering survey methods employed for georeferencing utilities respective to project survey control established by others and do not infer professional land surveyor certification. Engineering survey methods mean depicted utilities are based on position observations tied to project survey control points which were established by others (presumably professional land surveyors) and projected to project horizontal datum coordinates. Likewise, elevations presented in this investigation for utility infrastructure are referenced to existing survey control points which were established by others.

Note: UMS found it necessary to set temporary control points to facilitate line-of-sight survey operations. These supplemental points were necessary to complete utility designating in areas where GPS/GNSS survey equipment could not be utilized and where existing project control points did not support the use of line-of-sight equipment from their position due to stationary obstructions or a lack of line-of-sight to another control point for a backsight.

4 Achieved ASCE C-I 38-02 Quality Levels for Depicted Utility Infrastructure

The achieved QLs for the utility designating effort are summarized in Table 2. The project scope included designating buried infrastructure as practical to achieve a target QL B. Direct engineering survey grade observations were obtained wherever a facility was exposed and accessible. To keep the investigation pragmatic, facilities that could not be readily detected using standard electromagnetic (EM) inductive tools were depicted as QL C and D during this utility designating field investigation. This iterative mapping procedure was used to allow the Client and Owner an opportunity to evaluate the necessity of additional SUE investigative work and minimize expenditure of resources during supplemental SUE investigation efforts to achieve a higher quality level designation on utilities in question. **In some situations, QL B objectives could not be met due to geophysical limitations such as excessive depth of facility, lack of tracer wire, non-conductive nature of pipe material, lack of surface features, lack of access, and/or insufficient records. Resulting quality levels are listed in Table 2 and depictions are annotated on the Existing Utilities CADD reference file**.

Table 2. Achieved ASCE C-I 38-02 Quality Levels for Utility Designating and Depiction

Utility Type	Depicted Mains and Primaries	Depicted Services and Secondary Laterals
Storm Sewer	Discrete survey grade observations* at accessible inverts. Buried segments depicted as QL B, QL C, and QL D	QL B for "roddered" segments, QL C between identified inverts, elsewhere QL D as available on utility records
Sanitary Sewer	Discrete survey grade observations* at accessible inverts. Buried segments depicted as QL A, QL B, QL C, and QL D	QL B for "roddered" segments, QL C between identified inverts, elsewhere QL D as available on utility records
Combined Sewer	Discrete survey grade observations* at accessible inverts. Buried segments depicted as QL B, QL C, and QL D	QL B for "roddered" segments, QL C between identified inverts, elsewhere QL D as available on utility records
Telecommunications	Discrete survey grade observations* of surface appurtenances, drops, and poles. Aerial installations will be mapped by others. Buried segments depicted as QL B and QL D	QL B for readily traceable segments, elsewhere QL D as available on utility records
Cable Television	Discrete survey grade observations* of surface appurtenances, drops, poles. Aerial installations will be mapped by others. Buried segments depicted as QL B and QL D	QL B for readily traceable segments, elsewhere QL D as available on utility records
Natural Gas	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B and QL D	QL B for readily traceable segments, elsewhere QL D as available on utility records
Traffic Signals	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B and QL D	N/A
TMS (Traffic Management System)	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B	N/A
Street Lighting	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B	N/A
Water	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B, QL C, and QL D	QL B for readily traceable segments, QL C between surface feature, elsewhere QL D as available on utility records
Irrigation	Discrete survey grade observations* of surface appurtenances. Buried segments depicted as QL B and QL D	QL B for readily traceable segments or elsewhere QL D as available on utility records
Power	Discrete survey grade observations* of surface appurtenances, drops, poles. Aerials will be mapped by others. Buried segments are depicted as QL B and QL D	QL B for readily traceable segments, elsewhere QL D as available on utility records
Petroleum	N/A	N/A

* Refers to engineering survey observations tied to project survey control established by others.

5 Utility Engineering Services Performed

Protocols as established by UMS and ASCE for SUE investigations were followed for this project. Field operations entailed reconnaissance, field designating, drainage work/manhole logging, and engineering survey campaigns.

5.1 Utility Designating

Utility designating work included field meets and reconnaissance, collating information from records obtained from the utility owners, relating records with observable surface features, and geophysical surveys. The work performed was ***not a "100 percent geophysical sweep" of Project Area limits***, but a retracing of distinct, identified, detectable buried utility alignments within the Project Area to achieve quality level depictions as summarized in Table 2. The utility designating work also encompasses systematic searches using passive and inductive EM methods for unidentified utility infrastructure. Hydraulic investigative work included logging and engineering survey observations of drainage and sewer pipes and structures such as inlets, culverts/pipe ends, and manholes. Acoustic methods were used in some cases to establish the connectivity between structures. Note: Some locations were inaccessible due to lack of Right of Entry (Section 6.2).

6 Supplemental Comments Regarding Existing Facilities

Users of this information are reminded that resulting utility depictions with this submittal are representative for conditions at the time of the field investigation (completed March 2022) and are a pragmatic interpretation based on the systematic designating effort executed. Limitations may still exist as later discussed in this report.

6.1 Utility Summaries

The following utility specific sections are general, non-inclusive overviews of utilities encountered within the project limits. In all cases, please refer to the Existing Utilities CADD reference file for utility details and location specific quality level attributes.

Utility designating and locating investigations have produced considerable data and digital information which is depicted in the Existing Utilities CADD reference file and related project database. The following provides a descriptive summary of the depicted utilities and discusses the quality levels of that information.

For this investigation, QL A coordinate observations are tied through engineering survey methods to project survey control (established by others). QL B designations are similarly tied to project horizontal coordinates, but elevations are at the ground surface (paint marks) for the depictions on the Existing Utilities CADD reference file. QL C alignments are interpolated between visible, identified, and accessible surface features and access points (e.g., pole drops, manholes, vaults, drain inlets and outlets, etc.), consequently the CADD depictions will not reflect ground surface undulations. QL D CADD depictions are hand-drawn based purely on record data and reasonable

conjecture stemming from somewhat limited field observations; these depictions are relatively imprecise and will not reflect ground surface undulations. **For descriptions of QL D depicted utility alignments and features, or other unique observations relating to each utility type and owner, see Section 6.2 and corresponding annotations on the Existing Utilities CADD reference file.**

While completing the Phase 1 effort, crews searched the area for readily apparent surface features indicating utility services (sewer cleanouts, water curb stops, etc.). This information, along with available utility record data, was used to depict the services within the SUE project limits. However, a possibility exists that services within the project limits which aren't readily apparent, or are not depicted on the utility record information, are not shown on the utility CADD file.

6.1.1 Drainage (Sanitary Sewer, Combined Sewer, Combined Sewer Overflow and Storm Sewer)

City of Portland's Bureau of Environmental Services (BES), TriMet, Portland Parks and Recreation (PPR), Private and ODOT drainage installations were investigated and depicted as part of SUE investigation. BES drainage installations consist of sanitary sewer, combined sewer, combined sewer overflow (CSO) and storm sewer, which are located throughout the Project Area. The combined sewer contains both sanitary sewer and storm sewer.

During the utility investigation, nearly 500 individual structures were investigated and mapped. Over 200 of these structures were not present on BES or ODOT drainage records. A substantial effort to map all structures and alignments noted on the records was performed, with only a handful of structures not found by UMS crews during the investigation.

This project contains an unusual amount of large drainage facilities within the project limits. BES has facilities throughout the Project Area including the Ankeny Pumphouse located just south of the Burnside Bridge on the west side of the project. ODOT has storm drain facilities located along the I-5 corridor, I-84 Interchange, ramps and along their ROW. TriMet has storm drain facilities located along NW/SW 1st Avenue and within the Skidmore Station that flow into BES facilities. PPR has numerous facilities located within the Tom McCall Waterfront Park. Scattered throughout the project are private sewer and storm facilities that flow into BES facilities. Field crews expended a significant effort and resources to obtain information on all alignments within the project including downhole LiDAR, field investigation, use of a sonde and conductive "rodder", and EM designating. All drainage pipes over 30-inches in diameter are discussed in Section 6.2. The QL C pipe connectivity between manholes is based on correlating field crew observations with available record data. When pipe connectivity was not apparent, pipes were "roddered" and designated by EM methods to obtain a QL B alignment. This includes numerous pipes out of manholes that were either stub outs or appeared to terminate a short distance from the vault.

Pipe sizes, apparent flow directions, and pipe materials were recorded at accessible structures. As structures were mapped, the BES ID from the corresponding record information was assigned to each structure, if available. A separate UMS sequential numbering system was also used to make field efforts more streamlined. For any

structure that was found in the field and on BES records, both the UMS # and BES ID are shown in the structure labels on a layer in the Existing Utilities CADD reference file.

Refer to Section 6.2 for more detailed information.

6.1.2 Natural Gas

NW Natural owns most of the natural gas installations which were designated throughout the Project Area during the SUE investigation effort. There are some gas services in the Tom McCall Waterfront Park that are PPR property. Crews used EM methods to designate the installations composed of conductive pipe material. For the plastic piping, crews used recovered tracer wire connection points to designate the utility alignment; however, for the non-conductive plastic pipe, the QL B depiction on the Existing Utilities CADD reference file represents the tracer wire alignment, which may not necessarily align with the actual pipe. Refer to Section 6.2 for more detailed information.

6.1.3 Water

Portland Water Bureau (PWB) potable water installations were designated throughout the Project Area. The Existing Utilities CADD reference file presents QL B, QL C and QL D depicted alignments. **Because of PWB policy, only ownership and quality levels are annotated on the Existing Utilities CADD reference file water notes layer. Size, material, and service line labels were created in a separate PWB Confidential layer that must be turned on for complete information viewing. The Existing Utilities CADD reference file should be considered a confidential file, not for public use. A separate, non-confidential CADD reference file has been created that does not contain linework or annotations for PWB facilities 12 inches or larger as per PWB policy. This non-confidential file is the file to be shared with the public as needed.**

Some segments of water main, fire-hydrant supply lines and services were designated using inductive EM methods to directly detect and trace conductive water pipes or tracer-wire installed along PVC water installations. QL C designated alignments have been established by interpolating between observed surface appurtenances, such as water main valves, and correlating with utility record information. Remaining water system elements have been transcribed as QL D alignments based on a combination of record information and observed surface features. Observed features such as water main valves and water service valves were also used to develop QL D depictions of water services. The pipe size information noted on the Existing Utilities CADD reference file is based on record information. Refer to Section 6.2 for more detailed information.

Note: Water valve depth measurements to the top of nut were recorded by the field crew and are included in Appendix B.

Irrigation lines, control boxes, sprinkler heads were in general not designated or mapped during this SUE investigation. If any irrigation facilities were incidentally found during survey operations, they were surveyed and included on the Existing Utilities CADD reference file. Also, the transcribing of irrigation lines from records (QL D) was not included in the scope of work and has not been included on the Existing Utilities CADD reference file.

6.1.4 Fiber Optic, Telephone and CATV

Telecommunications installations were observed throughout the project corridor. These facilities are owned by AT&T, Lumen (including Level 3), Comcast, MCI/Verizon, Portland Bureau of Technology Services, Wave (Astound Broadband) and Zayo. These installations were primarily designated QL B during the SUE Phase 1 investigation. Some installations and services have been depicted QL D, typically due to a lack of facility access or inability to identify an access location to utilize EM locate equipment, or for facilities depicted on records as reportedly inactive or abandoned. Utility designating results for each owner are further described in the sections below.

Lumen

Lumen, formerly known as CenturyLink, owns telephone and fiber optic installations throughout the project corridor. Organizations within the Lumen umbrella that own/operate facilities within the corridor are Lumen National, Lumen Local, and Level 3. UMS field crews were able to designate and depict most Lumen installations as QL B. In some locations, field crews observed indications of retired or abandoned facilities, including cut cables in vaults, manholes or pedestals, or EM signals which abruptly ended while tracing cable routes. These occurrences have been noted within the Existing Utilities CADD reference file. Occasional QL D depictions exist where field crews were unable to locate existing telephone or fiber installations. These QL D depictions are primarily due to a lack of access to conductive features (cable or tracer wire) to designate the facility route.

Several notable Lumen duct banks containing large fiber optic and telephone cables were mapped during this effort. These duct routes have been designated QL B and can be observed within the project limits**.** Notable alignments are along SW Ankeny Street from SW 3rd Avenue to Naito Parkway, along NW Couch Street from NW 3rd Avenue to Naito Parkway, and on both approaches to the bridge on Burnside Street.

Lumen Local service records were provided to UMS for this project. However, these records proved to differ from some of the QL B designated alignments mapped during this project. Some notable examples of these differences are described in Section 6.2.

Comcast

Comcast owns fiber optic and CATV installations that are located throughout the project corridor. Most of the Comcast fiber optic and CATV installations were designated QL B, although numerous services were depicted QL D on Existing Utilities CADD reference file, based solely on record information. Refer to the Utility Discrepancies, Issues and Notes in Section 6.2 for more detailed information on these installations.

MCI/Verizon

MCI/Verizon owns fiber optic cables within the Project Area, including large count fiber optic cable on the east side under the Burnside Bridge on E 2nd Avenue near the Burnside Skatepark. Buried MCI/Verizon fiber optic was designated QL B except for the facilities described in Section 6.2.

Portland Bureau of Technology Services

Portland Bureau of Technology Services fiber optic installations are located on both the east and west side of the project and were designated QL B.

TriMet

TriMet communication cables are routed along the light rail tracks on NW/SW 1st Avenue and within Skidmore Station servicing ticket machines, sign boards and track control. These communication cables are generally located in conduits with control power or power to operate pieces of equipment and are labelled as power on the Existing Utilities CADD reference file.

Wave (Astound Broadband)

Effective January 2022, Wave Broadband began doing business as Astound Broadband. Field efforts for this investigation were well underway at the time of the name change, resulting in data being collected and processed with the previous Wave Broadband name. Any references to Wave Broadband in the CAD reference files or in this report refer to facilities now owned by Astound Broadband.

Wave (Astound Broadband) owns fiber optic installations located on the eastside of the project. UMS field crews were able to designate and depict most Wave (Astound Broadband) installations as QL B. One QL D depiction does exist where field crews were unable to designate the existing fiber installation. This QL D depiction is due to a lack of access to conductive features (cable or tracer wire) to designate the facility route. Refer to Section 6.2 for more detailed information.

Zayo

Zayo owns fiber optic installations throughout the project corridor. UMS field crews were able to designate and depict most Zayo installations as QL B. Occasional QL D depictions exist where field crews were unable to trace out the existing fiber installations. These QL D depictions are primarily due to a lack of access to conductive features (cable or tracer wire) to designate the facility route.

Refer to Section 6.2 for more detailed information on all telecommunication installations.

6.1.5 Power, Luminaries, Traffic Signal Installations

Portland General Electric, Portland Streetcar and TriMet own buried power installations designated within the Project Area. ODOT, Portland Bureau of Transportation (PBOT), Multnomah County and private owners each own street lighting installations within the project limits. ODOT and PBOT traffic signals installations were also designated within the Project Area. Overhead power lines are not shown on the Existing Utilities CADD reference file developed by UMS. The overhead power lines will be integrated into the dataset by others on the A&E Team. Refer to Section 6.2 for more detailed information.

6.2 Utility Discrepancies, Issues and Notes

6.2.1 General Issues and Notes

Field crews were unable to access the following properties due to lack of right-of-entry to complete a full investigation: the Subaru Lots along Grand Avenue, American Medical Response facilities on SE 2nd Avenue, fenced off portions of the Pacific Coast Fruit Company property on NE 2nd Avenue, the property on the east side of SE 2nd Avenue between Ankeny Street and Ash Street and the partitioned off University of Oregon Store in Skidmore Station. **UMS recommends investigating these properties during a Supplemental SUE Investigation if any construction is going to be conducted in these areas or if required for design purposes.**

Tents and other structures of homeless along sidewalks and within the project limits prevented a complete investigation and survey of some structures (i.e., handholes, streetlights and vaults). Also, some alignments had larger gaps in designated and surveyed points due to the access to these areas. Every attempt was made to revisit these areas to ensure all utility features were adequately investigated but the tents remained in some areas during the entire duration of the field effort.

A construction project was on-going during the entire field effort on NE Davis Street, between Martin Luther King, Jr. (MLK) Boulevard and Grand Avenue. UMS worked with the construction firm to gain access to the area several times to designate utilities within the fenced off area but several of the areas were inaccessible due to the construction project (i.e., laydown areas and ramps). In addition, the contractor was installing new utilities to provide services to the building.

6.2.2 Drainage (Sanitary Sewer, Combined Sewer, CSO and Storm Sewer)

When referencing structures below, the first number (i.e., MH1494) represents the identification information given to each structure by the UMS field crew and is available on the Existing Utilities CADD reference file as the point number of the structure or on the structure label levels. The second code (i.e., APG155) represents the number in Portland Maps, if available, and can be found on the structure label levels in the Existing Utilities CADD reference file or on the Portland Maps website at the following link:

https://www.portlandmaps.com/detail/sewer/-13655288.912917294_5704230.994380982_xy/

Due to congestion on the printed Existing Utility Sheets, labels for structure numbers, both internal and Portland Maps, invert elevations, rim elevations, and flow direction are not shown. To view this information, see the Existing Utilities CADD reference file structure label levels.

42-inch Storm ODOT (I-84 Trunk Line Drainage) north of Burnside Bridge

The 42-inch storm sewer was surveyed, and invert measurements recorded at MH1494 (APG155) and culvert 1495 (APG156) during the ODOT I-5 Rose Quarter Improvement Project and transferred to this project. An additional manhole MH992 (not shown on records) was discovered during the field investigation, along with MH1016 (APG154) which is the tie back structure. The 42-inch reinforced concrete pipe (RCP) pipe between

the two surveyed points is represented with a QL C alignment. There are no deviations from a straight-line alignment along this pipe in records nor were any observed in the field by UMS crews.

264-inch East Side CSO

The 22-foot (264-inch) diameter East Side CSO alignment was transcribed QL D based solely on records. Per conversations with BES regarding the accuracy of the existing data, the Project Team had elected to utilize as-built data provided by BES to establish the pipe alignment.

168-inch CSO Tunnel

The 14-foot (168-inch) diameter CSO Tunnel along Naito was transcribed QL D based solely on records, with the exception of MH692 (ANQ283) located on the center of the Ankeny Shaft, which was used as a QL A anchor point. Downhole LiDAR was performed at MH692 (ANQ283) and MH693 in attempt to understand the structures and pipe configurations entering and exiting the vaults. The Project Team had elected to utilize “as built” data provided by BES to establish the pipe alignment due to the depth of the alignment and distance between accessible manholes. Based on conversations with BES regarding the accuracy of the existing data, the Project Team believes that “as-built” is accurate to utilize for the project.

Pipe connecting 78 x 84-inch Concrete Horseshoe Combined Interceptor to 168-inch CSO Tunnel

An irregular pipe of varying shape and size connects the 78 x 84-inch Concrete Horseshoe Combined Interceptor to the 168-inch CSO Tunnel as determined by downhole LiDAR at MH696 (ABL554), MH694 (not shown on records) and MH692 (ANQ283). The pipe alignment is depicted as a QL C alignment on the Existing Utilities CADD reference file.

30- and 42-inch Force Mains Ankeny Pumphouse across Willamette River

The 30 and 42-inch force mains at the Ankeny Pump Station, which extend north before crossing east across the Willamette River, were surveyed QL A along a portion of the bulkhead where the pipes are exposed under Burnside Bridge. The remainder of the alignment was mapped QL D, generally based on records. However, records show the pipes further west than the QL A survey points. The QL D alignment mapped is derived from engineering judgement using the QL A survey points as “anchor” points for the record data.

48-inch Iron and 24-inch HDPE pipe in Tom McCall Park (Odor Treatment System)

A 48-inch Iron pipe extends north out of MH693 (not shown on Portland Maps) to Ankeny Pump Station where it “tees” with a 16-inch pipe extending east towards the Pump Station and a 24-inch HDPE pipe which continues north to the Odor Treatment Facility, located just north of Burnside Bridge. A conductive “rodder” was used to designate

(QL B) the 48-inch pipe a short distance from MH693. The remainder of the pipe alignment has been drawn QL D from records.

Downhole LiDAR data were acquired at MH693 (not shown on Portland Maps). Invert elevations and pipe offset positions were calculated from Downhole LiDAR at MH693.

78 x 84-inch Concrete Arch CSO under Ankeny Pump Station

A 78 x 84-inch Concrete Arch CSO extends from Ankeny Pump Station to the outflow located in the seawall to the east of the pump station. The field crew was unable to find any access points for the CSO pipe, nor were they able to visually see the outflow point along the seawall. The CSO pipe is drawn in QL D per records.

78 x 84-inch Concrete Horseshoe Combined Interceptor SW Naito Parkway to Ankeny Pump Station

A 78 x 84-inch Concrete Horseshoe Combined Interceptor extends from Naito Parkway to Ankeny Pump Station through Tom McCall Park. The 78 x 84-inch Combined Interceptor is fed from the north by a 54 x 62-Inch Concrete Rectangular Box Combined Interceptor and the south by a 72 x 78-Inch Concrete Rectangular Box Combined Interceptor, which join just west of MH641 (ABL554).

Several methods were utilized to obtain an alignment for the 78 x 84-inch Combined Interceptor including the following: review of utility records, QL B designating with a floated conductive wire, QL B designating with a “rodder”, and downhole LiDAR at MH641 (ABL554), MH696 (ABL554) and MH950 (ABL556).

A short portion of the pipe alignment was obtained by “roddering” from MH641 (ABL554) to the east, but these data were discarded in the final alignment based on the results of the downhole LiDAR QL A points.

Downhole LiDAR data were acquired at manholes listed above, and invert elevations and pipe offsets were calculated to obtain QL A positional data. The pipe is designated QL A at the manholes and QL C along the alignment between structures.

54 x 62-Inch Concrete Rectangular Box Combined Interceptor on Naito Parkway from Burnside Bridge to SW Ankeny Street

A 54 x 62-Inch Concrete Rectangular Box Combined Interceptor extends along Naito Parkway. This facility starts from under Burnside Bridge at MH614 (ABL543), and continues just north of Ankeny Street, where it sweeps to the east into the 78 x 84-inch Concrete Horseshoe Combined Interceptor, located east of MH641 (ABL554).

The field crew attempted several different methods of designating this installation using EM equipment. This included a floating conductive wire and a conductive “rodder”. However, they were unsuccessful in obtaining a QL B alignment due to the high flow in the pipe and the shape of the structure, which limited their ability to successfully map it.

Downhole LiDAR was performed at both manholes on this alignment, MH641 (ABL554) and MH614 (ABL543). The downhole LiDAR at MH614 (ABL543) calculated the invert based on subtracting the height of box pipe from records from the top of pipe, due to the pipe being full of effluent. The downhole LiDAR at MH641 (ABL554) was unable to acquire data on the alignment. This is due to a 90-degree sweep in the pipe as it extends

northward from MH641 (ABL554), which is offset. A small section of the box pipe was mapped up to the location of the wall where the two alignments converge from the north and south.

The pipe alignment for this segment of pipe is QL D based on records through the 90-degree sweep to the QL A point, where the two pipes converged from the north and south. Invert measurements and survey positions at the manholes are QL A.

48 x 56-Inch Concrete Rectangular Box Combined Interceptor on Naito Parkway from NW Couch Street to Burnside Bridge

A 48 x 56-Inch Concrete Rectangular Box Combined Interceptor extends along Naito Parkway from NW Couch Street, MH883 (ABL487) to under Burnside Bridge, MH614 (ABL543).

Downhole LiDAR data were acquired at MH614 (ABL543), and invert positions calculated based on subtracting the height of box pipe from records from the top of pipe, due to the pipe being full of effluent.

The pipe alignment for this segment of pipe is QL C based on a combination of records, LiDAR data at MH614 (ABL543) and field measurements.

72 x 78-Inch Concrete Rectangular Box Combined Interceptor on Naito Parkway from SW Ash Street to SW Ankeny Street

The 72 x 78-Inch Concrete Rectangular Box Combined Interceptor extends along Naito Parkway from SW Ash Street, MH828 (ABL569), to just north of SW Ankeny Street, where it sweeps to the east into the 78 x 84-inch Concrete Horseshoe Combined Interceptor, at a point located east of MH641 (ABL554).

Several methods were utilized to obtain an alignment for the 72 x 78-Inch Combined Interceptor including the following: review of utility records, QL B designating with a floated conductive wire, QL B designating with a “rodder”, and downhole LiDAR at MH641 (ABL554).

The field crew was successful at “roddering” the pipe to obtain a QL B alignment for the entire alignment. The downhole LiDAR at MH641 (ABL554) produced results that depicted the convergence point where two Combined Interceptors meet and the west wall of the alignment through part of the 90-degree sweep to the east allowing the pipe to be offset based on pipe size. The alignment has QL A points at the manholes and sweep and is considered QL B for the entire length.

30-inch ODOT/BES Storm extends parallel to NE 2nd Avenue to Burnside Bridge then west to Outflow

The 30-inch RCP ODOT Storm extends south from MH924 (APF846), located along the NE Davis Street alignment between NE 2nd and 3rd Avenue. The pipe continues to manhole APF845, then to under Burnside Bridge in the skate park, where it turns west at MH847 (APF844) and continues to MH843 (ABL530). The ownership changes to BES at MH843 (ABL530) and the 30-inch RCP alignment continues to MH1434 (ABL451) where the pipe material changes from RCP to corrugated metal pipe (CMP). For this point the pipe then continues to the outfall.

MH924 (APF846), at the northern end of the alignment, is filled with dirt to within 1.2-feet of the lid, so no pipes were visible. All the pipe sizes and material are QL D based solely on record information. The storm pipe feeding this manhole from the north is also QL D, along with an abandoned pipe to the northeast. It appears that this storm alignment was rerouted north into the 42-inch ODOT storm alignment.

According to records, APF845, is located within the new building just to the north of Burnside Bridge. The field crew searched in the building and parking garage for the manhole but did not find evidence of it. As a result, APF845 was drawn in QL D according to records.

MH847 (APF844), located under Burnside Bridge in the skate park, was “roddered” to the northeast to obtain the alignment of the 30-inch RCP. The stake park and bridge made it difficult to designate and survey more than one QL B point on the alignment. The alignment extends in a more easterly direction than what records depict. The drainage from the skate park also flows into this manhole.

According to records, ownership changes from ODOT to BES at MH843 (ABL530). The 30-inch RCP extending west was “roddered” and designated QL B to obtain the deviation in the alignment. In addition, downhole LiDAR data were acquired at this manhole to obtain QL A positions of invert elevations and pipe offsets.

At MH1434 (ABL451), the pipe material type changes from a 30-inch RCP to a 30-inch CMP and is a QL C alignment from the manhole to the outfall.

72 x 74-inch Monolithic Concrete Horseshoe Sanitary Interceptor along SE/NE Grand Avenue then west along NE Davis Street

The 72 x 74-inch Monolithic Concrete Horseshoe Sanitary Interceptor extends from the southern project limit at MH796 (ABL839), along SE/NE Grand Avenue to MH788 (ABL846), then west along NE Davis Street. At a point labelled ABL614, north of MH834 (ABL523), records indicate a change in pipe shape, material, and size, to a 72-inch RCP, which was observed at MH925 (ABL643) (see below for information on the 72-inch RCP).

Several methods were utilized to obtain an alignment for the 78 x 84-inch Combined Interceptor including the following: review of utility records, QL B designating with a floated conductive wire, QL B designating with a “rodder”, and downhole LiDAR at all three manholes within the project limits.

The field crew attempted QL B designating with a floated conductive wire and “roddering” but were unsuccessful due to the depth of the manholes and high flow rates. Therefore, where the pipe completes a 90-degree sweep from NE Grand Avenue to NE Davis Street, the alignment is QL D.

Downhole LiDAR were completed at MH796 (ABL839), MH788 (ABL846), and MH925 (ABL643). Due to the excessive manhole depths and offset pipe at MH796 (ABL839) and MH788 (ABL846), the pipe offsets could only be obtained to the outer east wall at MH796 (ABL839). Due to limited access, the LiDAR was unable to obtain inverts, pipe size or acquire any data on the 90-degree sweep from NE Grand Avenue to NE Davis Street. The LiDAR data acquired at MH925 (ABL643) allowed UMS to establish an “anchor” point for the 72x74-inch pipe on the west end of the alignment. The pipe was

then drawn in extending due east to create the east/west alignment along NE Davis Street.

72-inch RCP Sanitary Interceptor extends along NE Davis, between NE 3rd Avenue and NE 2nd Avenue, then extends north out of project limits

A change in pipe shape, material, and size, occurs at a point between NE MLK Boulevard and NE 3rd Avenue on NE Davis Street. The pipe changes to a 72-inch RCP Sanitary Interceptor from a 72 x 74-inch Monolithic Concrete Horseshoe Sanitary Interceptor (discussed above). According to records, at point labelled ABL614 in Portland Maps, and north of MH834 (ABL523), a 72-inch RCP extends along NE Davis Street. The pipe continues along the NE Davis Street alignment to MH925 (ABL643) located between NE 2nd Avenue and NE 3rd Avenue. From MH925 (ABL643), a 72-inch RCP extends north and out of project limits.

Downhole LiDAR data were acquired at MH925 (ABL643) to obtain invert elevations, and pipe QL A positions of this large structure. The pipe position established from LiDAR of the 72-inch RCP extending east was used to “anchor” this QL D alignment. The 72-inch RCP extending north out of this structure is QL B through the bend and then extends a short distance QL D and out of project limits.

102-inch Monolithic Concrete Sanitary Interceptor extends along NE Davis Street from NE Grand Avenue to MH925 (ABL643)

The 102-inch Monolithic Concrete BES Sanitary Interceptor extends along NE Davis Street from NE Grand Avenue to MH925 (ABL643), located between NE 2nd Avenue and NE 3rd Avenue. This alignment was transcribed QL D based solely on record information. The only access point to this pipe within, or near, project limits is at MH925 (ABL643). Downhole LiDAR data were acquired at this vault. This information was used to create the centerline position and “anchor” point for the west end of the QL D alignment. The remainder of the pipe is drawn QL D following a straight east-west alignment, beginning at this LiDAR anchor point and correlating with the BES records.

30-34-inch Brick Combined Sewer extends along SE 3rd Avenue from under Burnside Bridge to SE Ash Street

The 30-34-inch brick combined sewer extends along SE 3rd Avenue from under Burnside Bridge to SE Ash Street, between blind tie points identified as ABL532 and ABL609 on Portland Maps. This pipe was designated QL C between the surveyed manholes (QL A) located along the pipe alignment.

Records indicate that the alignment is a 28-inch circular Vitrified Clay pipe between MH840 (ABL531) and the blind tie point ABL532. However, field observations at MH840 (ABL531) indicate that the pipe is a 28-inch Brick pipe. The pipe size increases to 30inch between MH840 (ABL531) and MH762 (ABL596). According to records, this occurs at blind tie ABL532 where a 16-inch RCP sweeps into the alignment. Downhole LiDAR at MH838 (ABL533), and a QL B “roddered” data along the pipe, were acquired to complete this 90-degree sweep. Downhole LiDAR data confirmed the 30-inch size on the north invert at MH762 (ABL596). LiDAR data also captured the eastward offset position of the pipe relative to the manhole cover at MH762 (ABL596). This offset was incorporated into

the Existing Utilities CAD Reference file. Field observations for the south invert of the pipe at MH762 (ABL596) state the pipe is 36-inch Brick as opposed to the record data which indicated 30-inch Brick.

Near the intersection of SE 3rd Avenue and SE Ankeny Street, an 18-inch PVC pipe exits the east side of MH764 (ANQ444) and sweeps into the 36-inch Brick alignment. This 90-degree sweep was “roddered” to obtain a QL B alignment and the pipe offsets were measured by the field crew.

The alignment along SE 3rd Avenue continues as a 36-inch Brick pipe, as it extends southward through MH763 (ABL601) and MH765 (ABL608), where LiDAR measurements were recorded. The most southerly QL A point on the pipe was generated from LiDAR data collected at MH766 (AQK720). The location is at the blind tie point (ABL609) between the 36-inch brick pipe and the incoming 15-inch RCP combined sewer pipe, located just south of SE Ash Street.

18-inch Plastic extends along E Burnside Street from MLK Boulevard to 3rd Avenue

An 18-inch plastic pipe, as observed by the field crew, extends from MLK Boulevard along E Burnside Street to under the Burnside Bridge on 3rd Avenue. The records indicate this as a 16-inch cured-in-place pipe. Downhole LiDAR were acquired at both MH806 (APU904) and MH838 (ABL533). This information was used to obtain invert and offset pipe positions, confirm size of pipe, and to determine the position of the sweep into and out of MH838 (ABL533). This information was also used to identify other pipes intersecting the structure under Burnside Bridge.

ODOT Drainage south of Burnside Bridge

The ODOT drainage south of the Burnside Bridge is arranged in three networks of structures which drain to different outfalls. However, UMS has identified some differences between the utility records and actual conditions, along with additional alignments which are not shown on the record information provided to UMS.

The first network of ODOT drainage pipes is located just south of the bridge, and drains both northbound and southbound I-5, the ramp from westbound I-84, and the I-5 southbound ramp to 26 East (300B) City Center. A 12-inch CMP outfall is located in Eastbank Esplanade which drains the network. An additional drop inlet (DI), DI958 (not shown on records), was designated and surveyed by the field crew. AQJ642 (D5011) was not included in the field effort; crews were completing night operations at the time and did not observe this structure. As a result, it is depicted as QL D on the utility reference CADD file. Near the abutment of I-5, a couple of 6-inch and 8-inch CPP underdrains are depicted as QL D, based on correlating utility records with field observations. Extending north and northwest out of MH979 (AQJ642) are an 8 and 10inch steel pipe, depicted as QL D, that are not shown on records. Due to the location of structure in travel lanes, limited time was available to complete a QL B investigation in a safe manner.

The second network of ODOT drainage pipes is along the northbound I-5 ramp to eastbound I-84. All drop inlets along this stretch match records and were investigated and surveyed, with one additional drop inlet being discovered, DI951. Field crews

searched the area for two manholes, AQJ575 and AQJ574, along with drop inlet AQJ578, at the ODOT service road paralleling the ramp. However, there was no visible structures or discernible toning with a magnetic locator indicating evidence of these structures. As a result, they are depicted QL D on the utility reference CADD file.

The third network of ODOT drainage pipes is located just north of the project limits, along the north and southbound lanes of I-5. This system drains out an 18-inch CMP into Eastbank Esplanade. A 10-inch RCP extends south out of MH980 (AQJ590) and is depicted as QL D. Crews searched the area for manhole AQJ591, but did not find evidence of this structure; it is depicted QL D. Extending out MH970 (AQJ634) and MH971 (AQJ635) are 6-inch pipes of varying materials, that are believed to be underdrains which are depicted QL D.

Domed Drop Inlet in Rain Garden NE MLK Boulevard just north of E Burnside Street

A domed drop inlet, DI804 (APN762), located in the rain garden along NE MLK Boulevard just north of E Burnside Street, does not match records. Records indicate 12-inch PVC pipe extending south to DI805 (APH605). However, during the field investigation, crews used a “rodder” to designate the 12-inch PVC pipe (QL B) which extended southwest towards the building. Crews searched the area but did not find evidence of the DI805 (APH605), which was depicted on records.

Drop Inlet on NW corner of MLK Boulevard and E Burnside Street

Field crews utilized a conductive “rodder” to designate (QL B) an 8-inch RCP extending northwest out of DI805 (APH605). This alignment appears similar to an abandoned pipe shown on records.

30-inch CMP at NE Couch Street and MLK Boulevard

The field crew investigated a 30-inch CMP located on the lot south of NE Couch Street and NE MLK Boulevard, between MH917 and MH918. It is believed that the 30-inch CMP is part of a stormwater filtration system. The piping is not shown on records and has been designated QL C on the Existing Utilities CADD file.

36-inch CMP in the Fire Station Parking Lot

The field crew investigated a 36-inch CMP in the fire station parking lot located northwest of the intersection of SW 1st Avenue and SW Ash Street. This pipe extends north and south out of MH1014. Field crews could not establish the end points of the 36-inch CMP due to the nonconductive nature of the pipe material and a lack of visible surface features. As a result, they have been drawn in QL D. Further investigation, possibly during Phase 2 operations, may be necessary to establish the pipe alignment. It is believed that the 36-inch CMP is part of a stormwater filtration system, however the piping is not shown on records.

10-inch CMP Outfall and Downspouts below Burnside Bridge on the Eastside

The field crew designated (QL B) a 10-inch CMP extending from Culvert 1436 to survey point 46846, located under Burnside Bridge on the eastside of the project. This

installation is not shown on records. There are two downspouts coming off Burnside Bridge from DI51734 and DI51735. Field crews designated (QL B) the two downspouts to a point at which the EM signal was no longer discernible. Due to a lack of record information, UMS could not verify the connectivity of these installations. As result, they remain unconnected on the Existing Utilities CADD reference file.

8-inch RCP Storm Pipe on MLK Boulevard

Records indicate a 10-inch storm pipe extends northwest out of DI810 (APN759), located near the southwest corner of the intersection of E Burnside Street and MLK Boulevard. This pipe continues to MH804 (APU904). Field crews found an 8-inch RCP extending east out of DI810 (APN759) which was “roddered” as far as the field crew could push the cable. The designated QL B alignment extends east and then turns north. From the last known roddered point, the pipe appears to continue north to a blind tie point, since no pipes were observed entering from the south into MH804 (APU904). The last segment of pipe has been drawn in QL D on the Existing Utilities CADD file.

Storm Drainage in Tom McCall Park

Storm Drainage in Tom McCall Park was investigated to determine connections of larger diameter pipes to manholes using a conductive “rodder”.

Small drop inlets (i.e., 12-inch x 12-inch) and clean outs which are scattered throughout the park were surveyed, however, small diameter pipes (i.e., 4 to 6-inch PVC) were not “roddered”. These structures were used as “anchored” points and were combined with PPR records to establish QL D alignments for pipes located south of the Burnside Bridge. All pipe alignments under the Burnside Bridge were investigated by the UMS field crew, with the QL B alignments depicted on the Existing Utilities CADD file.

Storm and Sanitary Sewage Drainage on Private Property

American Medical Response owns two gated parking lots with limited access south of Burnside Bridge along SE 2nd Avenue. The parking lot just to the south of Burnside Bridge was investigated by the UMS field crew. No drainage structures were observed, and none are indicated on records. The drainage structures in the parking lot located on SE 2nd Avenue, south of SE Ankeny Street, were surveyed but were not fully investigated to determine alignments and no alignments are shown to join BES drainage records. The BES records did not show any sanitary sewer services to this building, nor were there any apparent sanitary sewer structures observed in the immediate area.

The drainage structures for the parking lot for the building located at 110 SE 2nd Avenue were surveyed and a cursory investigation indicated all pipes went towards the building. No alignments are shown on BES drainage records. Due to the lack of pipe connections, these structures will appear to be “floating” on the CADD file. The sanitary sewer line was “roddered” from the southeast corner of SE 2nd Avenue and SE Ash Street intersection to the sanitary sewer clean out located on the property. This alignment is depicted as QL B.

In the gated parking lot located just north of the Burnside Bridge on Pacific Coast Fruit Company site, the field crew observed two large drop inlets (DI946 and DI947) which were inaccessible due to the stormwater filtration systems. The pipe connectivity for

these structures has been drawn in QL D based on engineering judgment, assumed pipe connections, and the location of a clean out. However, this should be considered approximate only. Further investigation, possibly during SUE Phase 2 operations, may be necessary to confirm the pipe alignment.

Downspouts on buildings were surveyed but are not always connected to BES facilities and may appear to be “floating” throughout the Project Area.

Unique Findings

There is a tunnel which starts at MH908 located on the southeast corner of W Burnside Street and 2nd Avenue. The tunnel continues to the southwest down some stairs and turns west across part of 2nd Avenue. From this point, the tunnel turns and heads north across W Burnside. This appears to be an old pedestrian tunnel for street cars and contains some of the traffic signal alignments. There is no visually apparent access for the tunnel north of W Burnside Street. The tunnel was not fully investigated due to crew safety concerns associated with confined space entry.

Within the project limits, UMS believes three tanks exist to filter stormwater on the following properties: the Subaru parking lot just north of SE Ankeny Street, the sidewalk area north of the building east of NE MLK Boulevard and south of NE Couch Street, and in the parking lot behind fire station located north of SW Ash St and 1st Avenue. These tanks are of unknown size.

A lid labeled “Steam” was investigated by field crews at the intersection of W Burnside Street and 3rd Avenue. The manhole, survey point 51680, was full of dirt and did not appear to be in use.

QL D Structures and Alignments

The manhole, ARD087, located on NE 2nd Avenue, just north of the Burnside Bridge, was covered with a steel plate during field operations. This prevented the field crew from accessing the structure to verify the pipe extending to the east. The manhole and pipe connectivity were drawn in QL D on the CADD file.

Field crews searched for the drop inlet, AQC510, located in the rain garden on SE Grand Avenue, south of E Burnside Street. However, they did not find any evidence of this structure. Next, crews searched for the pipe connectivity at the adjacent structure, MH780 (ABL732), but did not observe the connecting pipe. Both the drop inlet and pipe have been depicted QL D on the CADD file.

At the time of the field investigation, the manhole, APY882, located on NE Davis Street, just west of MLK Boulevard, was covered by a parked car. This prevented the field crews form logging and surveying this structure. As a result, it has been drawn in QL D on the CADD file.

Crews searched for, but did not find, a Sanitary Sewer Clean Out (SSCO), ABL535, located in the old University of Oregon Store and Saturday Market storage area, behind the partitioned of area on the westside of the Skidmore Station. The SSCO is depicted QL D on the CADD file.

A drop inlet, D5053, located on the southwest corner of SW Ankeny Street and SW 1st Avenue, was depicted QL D based on TriMet records. Crews searched the area but did

not find any visual indications of the drop inlet. In addition, this structure is not shown on Portland Maps. However, crews did locate two 8-inch RCPs which reportedly connect to the drop inlet, based on TriMet records. The first pipe extends south from rom MH649 (ABL548); the second pipe extends northwest from MH655 (ABL550).

Two drop inlets (39732/AQF756 and D5012/AQT473) are located on southwest corner of SW Ash Street and SW 1st Avenue and are outside the project limits. According to records, a pipe from each inlet enters and exits the Project Area. These two 8-inch RCPs are depicted QL D on the CADD file.

Field crews logged and surveyed a new drop inlet (DI986) located on the northeast portion of the intersection of SW Ankeny Street and SW 2nd Avenue. Crews searched the area but did not find evidence of drop inlet APA371. However, they did find an 8-inch RCP extending northwest out of MH819 (ABL547) which was plugged in the manhole. The drop inlet and 8-inch RCP are depicted QL D on the Existing Utilities CADD reference file.

Drop inlet D5055 (AQY924) located on SW Ankeny Street, just east of SW 3rd Avenue, has been drawn in QL D. The structure is in an outdoor seating area and had a planter on top of it, which prevented access by the field crew. This also prevented crews from confirming the connectivity for the pipe extending south out of MH905 (ABL248), and the pipe extending northeast out of DI907 (AQZ149).

Two manholes (MH745/AMZ781 and MH953/AMZ794) located along NW 3rd Avenue are paved over and could not be accessed by field crews. As a result, the center of the manhole lid was surveyed, and the invert elevations were calculated based on records and invert information recorded at adjacent structures.

There are two QL D alignments located in the parking lot north of the Pacific Coast Fruit Company, one drawn in QL D from records and one surveyed QL D based on One-Call markings. Both are depicted QL D on the Existing Utilities CADD reference file and could not be resolved in the field due to lack of access points to insert a conductive “rodder”, and blind ties along the alignment. Also, located in the parking lot is DI996 (not shown on Portland Maps), which is connected to a clean out. Due to the configuration of the drop inlet, a conductive “rodder” could not be utilized to obtain pipe alignment data. At the manholes and drop inlets investigated by UMS field personnel, all alignments were accounted for in this area, so this alignment remains floating and unconnected.

2- ,3-, 4-inch underdrains QL D

2-, 3-, and 4-inch underdrains are located throughout the project limits. These underdrains are listed in the structure notes, but NOT mapped on the Existing Utilities CADD reference file. Crews used a conductive “rodder” to trace the alignment on a significant number of these drains at the beginning of the project, however most of the drains extend less than 3 feet from the structure, so they were not included on the Existing Utilities reference file.

Abandoned Alignments

The utility records indicate several reportedly abandoned alignments. In most cases, field crews could not verify the location of these installations. They have been transcribed QL D on the Existing Utilities CADD reference file.

Service Drains

Utility records show several service drains, both storm and sanitary, within the Project Area. In most cases, field crews could not verify the location of these installations due to a lack of apparent surface features or access points. These facilities have been transcribed QL D on the Existing Utilities CADD reference file. A possibility exists that additional services which are not shown on the utility records are located within the SUE project limits and are not depicted on the Existing Utilities CADD reference file.

Deck Drains

Throughout the project limits, on elevated roadway structures, deck drains were located which were not shown on records. These deck inlets drain through downspouts to a structure, or they blind tie into a separate pipe alignment. The field investigation attempted to designate all connections and blind ties. However, due to a lack of utility records to verify the total quantity of drains, a possibility exists that not all these facilities are depicted on the Existing Utilities CADD reference file. A “typical” connectivity depiction of each of the downspouts has been included on the Existing Utilities CADD reference file. However, this connectivity depiction does not necessarily represent the true alignment of each downspout and is for reference only.

6.2.3 Natural Gas

QL D Mainline on NE 3rd Avenue, between NE Couch Street and NE Davis Street

A section of the gas mainline on NE 3rd Avenue, between NE Couch Street and NE Davis Street, was drawn QL D due to an intermittent / lost EM signal. Crews repeated numerous attempts to designate this section of the utility installation but could not maintain a discernible EM signal. This could be due to various reasons including utility depth, utility congestion, etc.

QL D Mainline along NE 3rd Avenue between W Burnside Street and NE Couch Street

A segment of gas mainline was drawn QL D along NE 3rd Avenue, between W Burnside Street and NE Couch Street. This is due to a lack of EM signal response for this installation. The QL B pipe alignments which were designated by the field crew on either end of the QL D segment do not exactly match NW Natural records. Therefore, the resulting QL D segment was shifted relative to records to line-up with the QL B alignments.

Abandoned Valve and Pipe at SE corner of NE MLK Boulevard and Davis Street

The field crew found an apparently abandoned valve and pipe that were designated QL B at the southeast corner of the intersection of NE MLK Boulevard and NE Davis Street. However, the EM signal became intermittent and no longer discernible, which prevented the field crew from identifying the connection point of the pipe. The pipe does not appear on available utility records. The field crew noted the valve cover is labeled

"PGC, Portland Gas and Coke" and appears much older than other gas facilities found within the project. The pipe alignment was drawn QL D connecting to the NW Natural mainline stub.

QL D Gas Alignments in Tom McCall Park

Gas valves which are scattered throughout the park were surveyed and used as "anchor" points for QL D alignments south of the Burnside Bridge. These anchor points, combined with PPR records, were used to establish the pipe alignments. In all cases the pipe material was non-conductive and did not have any apparent tracer wire, which prevented crews from using EM equipment to trace out the pipe.

QL D Stubs

Several stubs shown on records were drawn in QL D, Field crews could not detect an EM signal on these installations generally due to nonconductive pipe material and/or a lack of tracer wire.

QL D Service Lines

Several gas services were drawn in QL D due to a lack of access points (meters, valves) or as a result of inconsistent / lost EM signal while attempting to designate the pipe alignment.

Pipe Sizes and Materials

Pipe size and material information for the natural gas installations is based on utility record information provided to UMS.

6.2.4 Water (The water section below is not subject to public disclosure)

Due to PWB policies, current comprehensive records were not available for the Project Area. Records were obtained from the online Portland Maps, but they only depict pipes that are 12-inches in diameter. A set of more comprehensive records were used that were originally purposed for the initial NEPA investigation several years ago. However, these records are obviously out of date in some areas and do not cover Grand Avenue. During the field investigation, UMS found additional water mains which are not shown on current records, however this may be due to the records not showing pipes 12-inches or larger.

QL D Service Lines to Buildings and Project Limits

Throughout the project there are water services that could only be designated QL B up to a valve or meter box, but not the entire distance to a building. In these cases, an annotation has been placed on the CADD file to show the point where the QL B designation ends, and the QL D alignment begins and continues into the building.

The density of water services in some corridors, along with pipe size and materials which are not conducive to EM designating, made it difficult to correlate every service line to the utility record information. In some cases, engineering judgement was used to correlate the field results to record data. When more services were shown on records

than were found through field efforts, QL D alignments were added to the SUE dataset to match records as best as possible. However, caution should be exercised when using this information. Further investigative techniques may be necessary to verify each water service.

QL D Water Alignments in Tom McCall Park

Water valves which are scattered throughout the park were surveyed and used as "anchored" points for QL D alignments south of the Burnside Bridge. The valves, along with the PPR records, were used to establish the pipe alignments. The pipes were non-conductive and did not have a tracer wire, which prevented crews from using EM equipment to trace them out.

QL D Record Alignments

Numerous water alignments are drawn in QL D based solely on record information. Field crews searched for these installations but did not find evidence of their existence. UMS believes these may be abandoned installations based how they are drawn on the records. However, there is not a legend with the records, and the labels are unclear. Therefore, UMS cannot confirm this assumption and will require confirmation from the PWB. A note is shown on the Existing Utilities CADD reference file that a Cistern is shown on records in the intersection of NW 2nd Avenue and NW Couch Street. The note on records does not indicate the size of the Cistern and the Advanced Geophysics did not detect any indications of the Cistern.

An abandoned water alignment shown on records extends along the southbound lanes of Naito Parkway, from NW Couch Street to SW Ash Street. The alignment is depicted QL D on the Existing Utilities CADD reference file.

Abandoned water pipes shown on records exist under and near the Burnside Bridge in Tom McCall Park. These alignments are depicted as QL D on the Existing Utilities CADD reference file.

A fire hydrant depicted on records, at NE corner of SW Naito Parkway and Ash Street, appears to have been removed during road construction in that area.

Based on record information, 6-inch pipe crossing NE MLK Boulevard at Couch Street is reportedly abandoned and out of service. The field crew was able to designate a portion of it QL B, but lost signal on the westernmost section. As a result, this section was drawn in QL D.

Based on the records, the 12-inch cast-iron pipe along the UPRR is reportedly abandoned and out of service. The field crew was able to detect a weak EM signal on the pipe near the northern project limits to designate a small section QL B. The rest of the pipe alignment has been drawn QL D from records.

A segment of the 8-inch ductile iron pipe extending along the walkway between NE 3rd Avenue and Couch Street, was drawn in QL D due to a lack of discernable EM signals.

Construction activities limited access to facilities along NE Davis Street, between MLK Boulevard and Grand Avenue. As such, portions of the water installations in this area have been drawn QL D.

Water valves and meters may appear to be floating due one of the following: non-conductive pipes, lack signal on conductive alignment and cemented or paved over. In all cases of floating valves, the alignments were not shown on records.

A portion of the 16-inch cast iron mainline crossing Burnside at SE/NE 2nd Avenue has been drawn QL D. Crews were unable to detect a discernible EM signal on this segment of pipe because of interference from other subsurface conductors nearby.

A segment of the 4-inch pipe on SW Ankeny, between SW 3rd Avenue and SW 2nd Avenue, was drawn in QL D due to a lack of discernible EM signal on this pipe.

A segment of the 6-inch pipe crossing NW 1st Avenue at NW Couch Street, was drawn in QL D due to a lack of discernible EM signal on this pipe.

6.2.5 Communications (The communication section below is not subject to public disclosure.)

Lumen (formerly CenturyLink) (not subject to public disclosure)

Several service cables were drawn in QL D within various parts of the project limits. This is primarily due to a lack of physical evidence, or a weak / lost EM signal while crews were attempting to designate the utility. A lost signal may be the result of a cut or broken cable.

Lumen Local records indicate there is a Lumen facility under Burnside Bridge, between the UPRR property and NE 3rd Avenue. This alignment has been designated QL B from the manhole on NE 3rd Avenue, westward to a riser between 3rd and 2nd Avenues. The remainder of the alignment extending westward to UPRR and then to the river is on the bridge. **Utility facilities within or hanging from Burnside bridge have not been mapped as part of this effort.**

Lumen (Level 3) and Zayo are co-located in an alignment extending along NW/SW 2nd Avenue in either a 4- or 24-inch abandoned gas line between SW Ankeny Street and NW Couch Street. The Zayo representative confirmed that they were in the alignment with Lumen and indicated that it was a 4-inch abandoned gas pipe.

Lumen Local records indicate there is a facility between a manhole on NE 2nd Avenue, just north of Burnside Bridge, and a pullbox/vault under Burnside between NE 2nd Avenue and NE 3rd Avenue. No evidence of the facility was found in the vault on NE 2nd Avenue. It is believed the structure between NE 2nd and NE 3rd Avenues referenced on the records is box hanging on a pillar that is accessible from the bridge decking. This structure was not investigated since it is on an elevated portion of roadway. A QL D alignment has been depicted on the Existing Utilities CADD reference file which connects the vault on NE 2nd Avenue to the riser and duct that extends to the hanging box.

A Lumen fiber optic cable in the walkway between NE 3rd Avenue and Couch Street, which crosses Couch Street, has been drawn in QL D. Field crews used a conductive rodder to designate QL B a portion of the pipe, however, they were unable to insert the rodder the entire length. The remainder of the alignment has been drawn QL D, following the telephone cables that were in the same duct run.

A Lumen duct was drawn QL D from the manhole at the intersection of E Burnside Street and MLK Boulevard, extending westward along the south side of Burnside, then south on

SE 3rd Avenue to a building, as shown on records. Field crews found no physical evidence of this alignment during the field effort.

A Lumen duct was drawn QL D from the manhole at the intersection of Burnside and MLK Boulevard, extending westward along the north side of Burnside to the manhole on NE 3rd Avenue under the Burnside Bridge, as shown on records. Field crews found no physical evidence of this alignment during the field effort.

Comcast

In general, positioning of utility alignments on the Comcast records does not agree with the results of the QL B designating. For example, records routinely show alignments on sidewalks or under buildings, when in reality they were surveyed within the roadway.

Several service cables were drawn in QL D within various sections of the project limits due to a lack of physical evidence, or a weak / lost EM signal while crews were attempting to designate the utility.

Crews designated (QL B) a line crossing W Burnside Street along NW/SW 2nd Avenue, however this installation does not appear on records.

While designating a utility alignment on NW 2nd Avenue, between NW Couch Street and W Burnside Street, the EM signal suddenly stopped. The remainder of this alignment has been drawn in QL D based on records.

A service extending to the Pacific Coast Fruit Company building was designated QL B at the north end of the building. Records depict the service located closer to the southern end of the building; however, field crews did not observe any evidence of this installation.

Records indicate a buried service on NE MLK Boulevard, between NE Davis Street and NE Couch Street, that extends from a pole, and then continues west across MLK Boulevard. This installation is actually aerial, not buried.

Records indicate there is a manhole in the intersection of NW Couch Street and NW 3rd Street, however, field crews did not find any evidence of this manhole. The structure has been drawn in QL D based on records. Additionally, a service shown on records extending south from this manhole, then east to a separate vault, has also been drawn in QL D. Crews did not find any physical evidence of this second vault. The location of the vault shown on records would place it inside a building, so it has NOT been added to the Existing Utilities CADD reference file.

A missing segment of a Comcast utility alignment extending north from the vault on NE 2nd Avenue, between Burnside and NW Couch Streets, has been drawn in QL D to connect a QL B segment to the manhole.

Ongoing construction in the area along NE Davis Street, between MLK Boulevard and Grand Avenue, limited the field crews' access to utility installations. Several Comcast facilities are shown on records as "drops" from aerial installations, which have been drawn in QL D due to the access issues.

MCI/Verizon (not subject to public disclosure)

Two items of note regarding MCI/Verizon facilities mapped are:

- Utility records show an alignment along SE and NE 3rd Avenue, between Ankeny and Couch Streets, which continues eastward along Couch Street to Grand Avenue. Field crews did not observe any evidence of this installation. Through conversation with MCI/Verizon representatives, this alignment no longer appears in their internal mapping system. It is believed that it was a proposed alignment that has since been moved to extend eastward from the intersection of SE Ankeny Street and SE 3rd Avenue, along SE Ankeny Street past Grand Avenue. This Ankeny alignment is shown on the Existing Utilities CADD reference file with an annotation that it is a QL D Proposed Verizon alignment.
- Records show an installation along NW Couch Street, between NW 1st and NW 3rd Avenues, which then extends southward along NW 3rd Avenue and into a building. Field crews did not find any evidence of this utility. Through conversation with MCI/Verizon representatives, this alignment is a planned for a future build and not currently installed. It is not shown on the Existing Utilities CADD reference file.

Multnomah County

Utility records show a fiber optic cable on Grand Avenue, along the Portland Streetcar tracks. Crews found a junction box just south of the intersection of NE Davis Street and Grand Avenue, but cables inside the box were non-conductive and no tracer wire was present. Crews attempted to insert a conductive rodder, however they could not slide it through the conduits. As a result, this alignment has been drawn in QL D.

Portland Bureau of Technology Services, Interconnect (not subject to public disclosure)

A newly installed empty conduit exists on NW Naito Parkway, between NW Couch Street and Burnside Bridge, just north of the bridge. Crews used a rodder to designate the north and south ends of the conduit QL B, however the rodder could not reach the center segment. This gap area has been drawn in QL D.

An empty conduit exists just east of SW Naito Parkway, between SW Ash Street and SW Ankeny Street. Field crews used a rodder to designate the north and south ends of the conduit QL B, however the rodder could not reach the center segment. This gap area has been drawn in QL D.

While designating a buried fiber optic duct installation across the Tom McCall Waterfront Park area, crews lost the EM signal on a portion of the installation. This segment has been drawn in QL D and connects two QL B segments.

A segment of the installation along SE 3rd Avenue, between Ankeny Street and Burnside Street, was drawn in QL C. Crews tried two attempts to survey this alignment but could not maintain the required survey tolerances. The straight-line alignment shown on the Existing Utilities CADD reference file agrees with record data and with geophysical detection results.

Wave (Astound Broadband) (not subject to public disclosure)

The Wave (Astound Broadband) fiber optic alignment on SE 3rd Avenue is not shown on records. Field crews designated the fiber (QL B) from a riser attached to a communications pole, northward to a handhole, where the cable terminates.

The Wave (Astound Broadband) service which drops from the pole located on NE MLK Boulevard and extends eastward has been drawn QL D.

Zayo (not subject to public disclosure)

Zayo records indicate additional utility alignments in the UPRR property, however the records are conflicting. UMS searched for additional manholes in the area but did not find any additional fiber optic installations. A Zayo representative stated that they are in the shared duct with Lumen (Level 3) in this area.

Lumen (Level 3) and Zayo are co-located in an alignment extending along NW/SW 2nd Avenue in either a 4- or 24-inch abandoned gas line between SW Ankeny Street and NW Couch Street. The Zayo representative confirmed that they were in the alignment with Lumen and indicated that it was a 4-inch abandoned gas pipe.

6.2.6 Power, Luminaries, Traffic Signal Installations

Portland General Electric

Utility records occasionally indicate multiple lines along the same power alignment. However, the Existing Utilities CADD reference file only depicts the alignment of the conduit, not the individual power cables. If record information was available indicating the total number of power cables, that information was included in the label for that utility alignment. If there was only one power cable on record, or if there was no power cable count available on record, the utility label will not include a power cable count.

Field crews could not detect a discernible EM signal on a segment of cable between the QL B designated alignment and the terminus manhole along the center of NW Couch Street, east of the intersection of NW Couch Street and NW 3rd Avenue. A QL D segment has been transcribed to span the gap between the QL B alignment and the manhole.

Two electric handholes appear to be floating located on the east sidewalk of SE 3rd Avenue between Ankeny Street and Burnside Street, and on the west side of NE Grand Avenue between Couch Street and Burnside Street. No cables are located in either handhole.

An alignment has been transcribed QL D from records along NW/SW 2nd Avenue. This alignment begins at the manhole on NW 2nd Avenue, north of Burnside, and continues south to the manhole on SW 2nd Avenue, South of Burnside. This alignment appears on some PGE records, but no return signal was noticeable using the passive designating methodologies required to safely map the power installations.

ODOT Street Lighting

Street lighting power that extends through the bridge decking and structures on elevated highway sections, overpasses, ramps, and flyovers was not mapped during this SUE

investigation. The luminaires and handholes on these elevated sections of roadway will appear to be “floating” due to the lack of wire connectivity between the structures.

PBOT Street Lighting

Street lighting power which extends through the bridge decking and structures on elevated roads was not mapped. The luminaires and handholes, which are not labeled, on elevated sections of roadway will appear to be “floating”, due to the lack of wire connectivity between the structures.

A segment of the street lighting along the west side of NE 2nd Avenue, in front of Pacific Coast Fruit Company, has been drawn in QL D. The alignment has been designated QL B on either side of the QL D segment, The QL D segment is the part of the alignment that appears to enter the building, then exit again to supply power to the luminaire across NE 2nd Avenue, on the east side of the road.

On the west side of NE 2nd Avenue, just north of Burnside Bridge, a segment of lighting power has been drawn QL D to connect the end of the QL B designated alignment to the luminaire.

There are aerial powered luminaires on the east side of the project that will appear to be “floating”; aerial cables/wires and connectivity were not included in the scope or work for this SUE investigation.

Private Street Lighting

There are areas throughout the project where private street lighting was mapped QL B. These areas have been identified on the Existing Utilities CADD reference file.

ODOT Traffic Signal

Visible traffic loops were surveyed where safely possible. Non-visible traffic loops, or visible traffic loops that were a safety concern due to heavy traffic volumes, were not surveyed. Similarly, wires feeding the traffic loops were designated QL B, where possible.

PBOT Traffic Signal

Visible traffic loops were surveyed where safely possible. Non-visible traffic loops, or visible traffic loops that were a safety concern due to heavy traffic volumes, were not surveyed. Similarly, wires feeding the traffic loops were designated QL B, where possible.

The traffic poles on the east and west side of SE Ankeny Street at Grand Avenue are powered by an aerial service.

6.2.7 TriMet Facilities (Skidmore Station and along NW/SW 1st Avenue)

The field crew was unable to map impedance and track bonds along the entire track corridor along NW/SW 1st Avenue and within the Skidmore Station. This is primarily due to all alignments being bonded to the tracks and not allowing a discernible EM signal. These alignments have been designated QL D on the Existing Utilities CADD reference file.

A TriMet power facility has been drawn QL D from the southern project limits to the northern project limits, along SW/NW 1st Avenue within the TriMet ROW. Vaults and a manhole were surveyed QL A, so they were used as “anchor” points for the QL D alignment. This line is high voltage DC power, so UMS did not attempt to designate it for safety reasons.

All handholes were surveyed but may appear to be “floating” due to a lack of connections to the track and impedance bonds.

OCS POLES were surveyed but may appear to be “floating” due to the lack of wire connectivity between the structures.

7 Recommendations

UMS conducted an extensive utility investigation in an attempt to obtain QL B designated alignments per ASCE C-I 38-02[5]. This effort utilized reasonable means and methods of utility designating including select use of advanced geophysical survey methods to obtain utility data at locations of the highest probability of unknown utilities or key utilities within close proximity of potential design conflicts. As the project team identifies potential utility conflicts during the design review process, additional utility data may be warranted to help confirm potential conflicts, evaluate design alternatives, protect in place measures, etc.

UMS should be engaged throughout the design process to 1) advise designer usage of the existing utility reference data from the utility designating and locating effort; and 2) provide recommendations for further utility investigations, such as test holes or additional advanced geophysical survey, as deemed prudent based on the previous SUE investigations results and potential project conflicts.

8 Submittal Information

The resulting data from the Utility Designating and Depiction effort are available in the following submittals:

Task No.	Submittal Name	Details
14.17	EQRB Burnside Bridge Subsurface Utility Engineering Investigation Report .pdf	Utility Engineering Report SUE Utility Designating and Depiction Designating (this document)
14.17	EQRB Burnside Bridge Existing Utilities.dwg	Existing Utilities Reference CADD File Utility ownership, specification, ASCE Quality Level, and notes are provided along the utilities.
14.17	EQRB Burnside Bridge Existing Utilities.pdf	SUE Existing Utility Plans

[5] American Society of Civil Engineers, ASCE C-I 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data, 2002, 20.

9 Data Limitations

UMS performed professional utility designating services in accordance with ASCE C-I 38-02[6] standard guidelines and generally accepted engineering principles and practices at this time. However, a possibility will always exist that abandoned, forgotten, non-detectable, undocumented, or newly installed utilities may not get mapped using standardized records research and geophysical survey procedures. While the ASCE C-I 38-02[7] standard guidelines greatly mitigate these issues, utilities possessing characteristics mentioned below can be missed while following standard utility designating and locating procedures:

1. Utilities lacking apparent available records and without apparent surface features.
2. Utilities with record information, which is illegible, misleading, or incomplete.
3. Utilities which are inaccurately reported or inaccurately represented by the utility owner as lying a significant distance from the true position.
4. Abandoned utilities without apparent surface features.
5. Utilities buried excessively deep, beyond detection limits of standard utility designating equipment.
6. Non-conductive utilities, without apparent surface features, which lie, for example, buried in conductive soils or beneath reinforced concrete surfacing. (Such conditions inhibit GPR detection).
7. Facilities installed subsequent to the utility designating field investigation effort.
8. Utilities in a common trench. Designating of common trench utilities can be difficult due to EM signal bleed over and difficulties in separating EM signals. Cathodic Protection connections between individual pipelines also increases the difficulty of determining individual pipe alignments.
9. QL B depictions of pipe alignments developed by means of tracer wire direct connect methods is dependent on the assumption that the tracer wire has been placed in relatively close proximity to the associated pipe. Events such as lightning strike surges along tracer wires have caused damages to pipes, so installation practices now require that tracer wire is offset a safe distance (e.g., 1 to 2 feet) from the pipes. Users are cautioned that it is the tracer wire alignment that is recorded and depicted on the Existing Utility CADD reference file and the assumption is made that this alignment represents the alignment of the target pipe sufficiently to achieve QL B designation.

A common problem occurs when the project involves facility owners and operators with insufficient records and non-conductive buried facilities, a situation often encountered with public works installations (e.g., water, storm drainage, and sanitary sewer services, and irrigation systems that have non-conductive water mains). Facilities mapped under these circumstances are often depicted as QL D during the utility designating and

[6] Ibid.

[7] Ibid.

depiction effort to keep operations and budgets at a practical level. As the design project progresses some depicted facilities deemed to be a source of sufficient risk may have to be upgraded to a higher quality level through more advanced geophysical prospecting and utility locating methods (Test Holes) to properly identify and assess utility conflicts for design and construction. Designers, utility coordinators, and contractors must realize the ASCE C-I 38-02[8] utility mapping effort is an **iterative acquisition and interpretation process**; unless subsequent endeavors are made to upgrade designated quality levels, facilities depicted at lower quality levels, such as QL D, may be completely in error.

In addition, depicted facilities and corresponding data are pertinent at the time in which field investigation operations are completed, and are subject to change. Final utility data is for mapping and asset management purposes only and reflect utility conditions at the time surveyed. Unless authorized to maintain and keep data sets current, UMS cannot be held responsible for changing utility scenarios after completion of field operations. Utilities newly installed or relocated after the field investigation may be overlooked if the Owner does not have a process for acquiring and managing standardized as-built data and updating the existing utility infrastructure depictions.

Users of this data set must understand and adhere to the limitations associated with the designated quality levels assigned to the depicted facilities. QL C and QL D depictions are based on interpolations, extrapolations, and available record data; this data can be erroneous and should not be used alone for design development and bidding purposes. Additional utility designating and locating field efforts to upgrade data to QL B and A are strongly recommended for areas where accurate final design and construction planning and bidding is required.

UMS strongly recommends users of this data, especially project engineers-of-record, become orientated with the ASCE C-I 38-02[9] standard guidelines and the corresponding data limitations inferred by the designated quality levels prior to employing the data set for design purposes. In addition, this report must always accompany the Existing Utilities CADD reference file to ensure proper interpretation and usage of the data set. Any questions regarding this submittal should be directed to the UE professional engineer-of-record.

10 State Law Caveat

A pragmatic effort has been made to systematically designate and depict buried utilities within the project limits to the extent practical for the authorized project budget. Final utility plans are for design and construction planning purposes only and reflect subsurface utility conditions at the time surveyed. Existing utility locations depicted on the plans do not supersede Oregon 811 demarcations of buried utilities or relieve the contractor from the legal requirement to contact Oregon 811 two business days prior to construction. The project design engineer should be notified of any discrepancies

[8] Ibid.

[9] Ibid.

between the utility designating / locating survey and Oregon 811 markings, and the contractor shall use appropriate caution until discrepancies are resolved.

Contractor shall call the utility notification service (Oregon 811) before excavating as required by law.

Appendix A. Utility Designating Summary

Utility Designating Process

The project utility designating investigation was performed in a systematic and practical manner, complying with policies promoted by the Federal Highway Administration (FHWA), and adhering to established standard guidelines published by the American Society of Civil Engineers (ASCE C-I 38-02) as described below.

Subsurface Utility Engineering and the ASCE C-I 38 02 Standard Guidelines

Data collection activities follow ASCE C-I 38-02[10] standard guidelines. Perhaps the most significant contribution of these standard guidelines is the development of a formalized procedure for qualifying and designating the general quality of the depicted individual facilities. Table A1 provides a summary of the four quality level (QL) definitions included in the ASCE C-I 38-02 standard with comments on the relative positional accuracy for the corresponding quality levels. Table A1 is intended for providing supplemental information only; please refer to ASCE C-I 38-02[11]for a full and official definition of the QLs and the standardized methods for collecting and depicting subsurface utilities.

Adherence to ASCE C-I 38-02 depiction standards, along with the use of records research, geophysical methods, vacuum excavation, and engineering survey combined in a phased approach and guided by professional judgment, has often been referred to as Subsurface Utility Engineering (SUE). In proper context, SUE, or more recently simply referred to as “Utility Engineering”, is a rather complex and important series of engineering tasks, procedures and associated responsibilities established to manage risk, promote efficiency, and reduce costs; the utility mapping and designation of quality levels, in fact, provides the data set with which the utility engineering process begins. In a broader sense, utility engineering involves utilizing the qualified utility data sets to conduct the following engineering activities:

- Systematically identify, itemize, and define apparent conflicts between proposed designs and existing utilities
- Optimize design development and mitigate utility conflicts
- Identify and accommodate other infrastructure, planned betterments and new installations
- Conduct effective utility coordination in which resolutions to conflicts are derived that serve the best interests of the public and all stakeholders involved
- Develop construction plans and bid documents which concisely identify and provide details of outstanding conflicts for construction planning, bidding, and execution
- Encourage value engineering and mitigation of cost implications to all infrastructure systems which provide service to commerce, government, and the general public

[10] American Society of Civil Engineers, ASCE C-I 38-02, Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data, 2002, 20.

[11] Ibid.

TABLE A1 ASCE C I 38 02 QUALITY LEVELS (QLS) FOR DEPICTING FACILITIES IN ACCORDANCE WITH SUE PROTOCOL

QL	Description	Resulting Positional Accuracy and Data Completeness
D	Information derived from existing records or oral recollections.	Data may be completely erroneous. Only the records or verbal accounts indicate the depicted utility is in the vicinity.
C	Information obtained by surveying and plotting visible above ground utility features and by using professional judgment in correlating this information to available records and QL D information. QL C is usually used to map non-conductive pipes, deep utilities, or when EM signal interference and distortion is too significant.	Positional accuracy of surface features is to within 0.1 feet; however, alignments between surface features (e.g., vaults, manholes, pedestals, etc.) is to schematic levels, providing general direction of alignment. Typically, according to FHWA studies, 15% to 30% of the utility data may be erroneous or missing.
B	Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities. QL B data should be reproducible at any point of their depiction using surface geophysical methods. This information is surveyed to applicable tolerances defined by the project and reduced onto plan documents. However, only the point of peak signal is mapped; consequently, while a QL B point can be reproducible using geophysics, the signal can be distorted due to the superposition of EM fields from adjacent conductors and not lie horizontally above the target. Experienced SUE operators help identify and mitigate these issues. However, QL A data is often recommended for design / construction work to be performed in the immediate proximity of QL B depicted utilities to provide definitive positional accuracy.	Positional accuracy statement with confidence level is not feasible unless electromagnetic (EM) fields are completely mapped and statistical analysis is used to derive alignments from the linear anomalies; in addition, sufficient ground truth sampling (e.g., test holes) is required. This level of geophysical survey and analysis effort required is often not practical or cost effective. In practice, experienced SUE designators can determine utility alignments reasonably well. Professional judgment is exercised to distinguish incidents of “bleed-over” and when apparent alignments do not make sense. Available utility records are compared with field findings to confirm completeness of the QL B data. QL B rating, as a rule of thumb, is generally estimated to +/- 1 foot horizontally for utilities less than 5 feet deep. Inductive EM signals diverge spherically, which is to say deeper targets have broader and weaker peak inductive signals; consequently, horizontal accuracy degrades with depth. Utilities over 10 feet deep are very difficult to position horizontally using standard inductive EM equipment. Vertical accuracy cannot be reliably derived using conventional inductive EM methods as computed depths are often inconsistent and can be highly misleading unless regular ground truth (i.e., test holes) are available to confirm accuracy. However, recent research indicates combined and systematic usage of independent geophysical methods can produce reliable depth information if performed with careful analysis and professional judgment.
A	Precise horizontal and vertical location of utilities obtained by the actual exposure (or verification of previously exposed and surveyed utilities) and subsequent measurement of subsurface utilities, usually at a specific point. Minimally intrusive excavation equipment is typically used to minimize the potential for utility damage. With QL A observations, a relatively precise horizontal and vertical depiction, as well as other utility attribute data, are shown on plan documents. Accuracy is typically about 0.1 feet vertical, and to applicable horizontal survey and mapping accuracy as defined or expected by the project owner and as limited by the survey equipment and methodology used to perform the measurement.	This is the only QL to which a positional accuracy statement might be made. QL A is as accurate as the reference horizontal and vertical control accuracy will permit and the methodology used to make the measurement and derive the coordinates. Note that in some cases involving inverts, direct measurements may not possible; consequently, QL A designation can only indicate that a relatively accurate position has been determined on the subject facility at that discrete location. *In some cases, an **apparent** minimum depth of clearance is provided. This is not QL A data as the utility has not been exposed. The utility apparently lies in line with the test hole but is deeper than can be reached via vacuum excavation based on the detected geophysical signal. However, the minimum depth data is provided for informational purposes for planning consideration.*

Appendix B. Water Valve Measurements

WV (water valve), DI (drop inlet)

WV#	Invert	To	Notes
WV1	3.78	top of nut	
WV2	2.08	top of nut	
WV3	3.21	top of nut	
WV4	3.62	top of nut	
WV5	2.20	top of nut	
WV6	N/A	N/A	Could not open
WV7	6.15	top of nut	
WV8	5.90	top of nut	
WV9	N/A	N/A	Could not open
WV10	0.48	top of pipe	2” DI Water Line
WV11	1.42	top of nut	
WV12	1.60	top of nut	
WV13	2.50	top of nut	
WV14	1.95	top of nut	
WV15	2.55	top of nut	
WV16	1.84	top of nut	
WV17	2.80	top of nut	
WV18	2.92	top of nut	
WV19	3.32	top of nut	
WV20	5.85	top of nut	
WV21	3.85	top of nut	
WV22	4.45	top of nut	
WV23	3.13	top of nut	
WV24	2.27	top of nut	
WV25	4.09	top of nut	
WV26	3.87	top of nut	
WV27	3.12	top of nut	
WV28	3.21	top of nut	
WV29	3.87	top of nut	
WV30	4.60	top of nut	
WV31	4.10	top of nut	

WV#	Invert	To	Notes
WV32	0.70	top of nut	
WV33	0.35	top of nut	Gas Valve cover
WV34	0.90	top of nut	
WV35	N/A	N/A	Could not open
WV36	0.50	top of nut	
WV37	0.60	Top of nut	
WV38	N/A	N/A	Could not open (Gas Valve)
WV39	0.80	top of nut	
WV40	0.80	top of nut	
WV41	N/A	N/A	Could not open
WV42	0.50	top of nut	
WV43	0.40	top of nut	
WV44	N/A	N/A	Could not open (Gas Valve)
WV45	0.40	Top of nut	
WV46	N/A	N/A	Could not open (Gas Valve)
WV47	0.50	top of nut	
WV48	N/A	N/A	Could not open (Gas Valve)
WV49	0.40	top of nut	
WV50	0.50	top of nut	Gas Valve
WV51	0.20	top of nut	Gas Valve
WV52	0.20	top of nut	Gas Valve
WV53	0.30	top of nut	
WV54	0.40	top of nut	
WV55	2.24	top of nut	
WV56	N/A		
WV63	2.80	top of nut	
WV64	2.37	top of nut	
WV65	3.74	top of nut	
WV66	1.56	top of nut	
WV67	N/A	N/A	Could not open
WV68	2.50	top of nut	
WV69	2.16	top of nut	
WV70	1.70	top of debris	
WV71	N/A	N/A	Could not open

WV#	Invert	To	Notes
WV72	3.36	top of nut	
WV73	2.02	top of nut	
WV74	2.36	top of nut	
WV76	2.36	top of nut	
WV77	N/A	N/A	Could not open
WV78	N/A	N/A	Cathodic Protection
WV79	3.15	top of nut	
WV80	3.08	top of nut	
WV81	N/A	N/A	Could not open
WV82	4.85	top of nut	
WV83	N/A	N/A	Could not open
WV84	N/A	N/A	Could not open
WV85	N/A	N/A	Could not open
WV86	N/A	N/A	Could not open
WV87	3.18	top of nut	
WV88	2.84	top of nut	
WV89	N/A	N/A	Could not open
WV90	1.52	top of nut	
WV91	N/A	N/A	Could not open
WV92	2.63	top of nut	
WV93	2.22	top of nut	
WV94	N/A	N/A	Could not open
WV95	N/A	N/A	Could not open
WV96	1.51	top of nut	
WV97	1.63	top of nut	
WV98	1.56	top of nut	
WV99	N/A	N/A	Could not open
WV100	1.70	top of nut	
WV101	2.11	top of nut	
WV102	1.44	top of nut	
WV103	N/A	N/A	Could not open
WV104	2.14	top of nut	
WV105	2.35	top of nut	
WV106	1.06	top of nut	

WV#	Invert	To	Notes
WV107	N/A	N/A	Could not open
WV108	N/A	N/A	Could not open
WV109	N/A	N/A	Could not open
WV110	N/A	N/A	Could not open
WV111	N/A	N/A	Could not open
WV112	N/A	N/A	Could not open
WV113	2.38	top of nut	
WV116	N/A	N/A	Could not open
WV117	1.54	top of nut	
WV118	N/A	N/A	Full of dirt and debris
WV119	N/A	N/A	Could not open
WV120	1.42	top of nut	
WV121	N/A	N/A	Could not open
WV122	N/A	N/A	Could not open
WV123	N/A	N/A	Could not open
WV124	N/A	N/A	Could not open
WV125	N/A	N/A	Could not access
WV126	N/A	N/A	Could not open
WV127	1.98	top of nut	
WV128	N/A	N/A	Could not open
WV129	N/A	N/A	Could not open
WV130	N/A	N/A	Clean-out
WV131	N/A	N/A	Clean-out
WV132	N/A	N/A	Clean-out
WV133	N/A	N/A	Could not open
WV134	1.15	top of nut	
WV135	1.45	top of nut	
WV136	N/A	N/A	Could not open
WV137	1.28	top of nut	
WV138	4.01	top of nut	
WV139	2.65	top of nut	
WV140	3.45	top of nut	
WV141	2.50	top of nut	
WV142	3.00	top of nut	

WV#	Invert	To	Notes
WV143	2.46	top of nut	
WV149	3.81	top of nut	
WV150	2.06	top of nut	
WV151	1.66	top of nut	
WV152	2.77	top of nut	
WV153	3.30	top of nut	
WV154	2.31	top of nut	
WV155	N/A	N/A	Cathodic Protection
WV156	2.94	top of nut	
WV157	3.19	top of nut	
WV158	1.77	top of nut	
WV159	1.25	top of nut	
WVLT1	1.70	top of pipe	2.00’ x 5.00’ Vault (4” DI)
WVLT2	1.00	top of pipe	2.00’ x 3.55’ Vault (2” DI)
WVLT3	1.45	top of pipe	2.00’ x 5.00’ Vault (4” DI)