Clean Water Services

THIRD ADDENDUM TO INVITATION TO BID
FOR THE DURHAM WRRF PHASE 6B DIGESTER PROJECT NO. 7203

CLEAN WATER SERVICES

ISSUED: OCTOBER 14, 2025

Clean Water Services' Invitation to Bid for the Durham WRRF Phase 6B Digester Project No. 7203 dated September 17, 2025 (ITB) is hereby amended as follows:

1. **Drawings**

   a. Delete the following drawings and replace them with the drawings included in Exhibit A of this Addendum:

      1. 005-CX-101
      2. 005-CG-101

      Digester 3 and the associated secant pile wall have been shifted approximately 2 feet and 4 feet to the west, respectively. The shift is necessary to provide sufficient clearance between the digester and the existing electrical duct bank that was located during recent potholing activities. The pipe bridge connecting Digester Complex (DC2) control building and Digester 3 will be slightly shorter. The bridge itself will remain in the same location, but Digester 3 will shift 2 feet to the west, resulting in the bridge connecting to the digester in a slightly different position. Yard piping runs between Digester 3 and the DC2 control building will also be slightly shorter, with minor routing adjustments to accommodate the digester shift.

   b. Delete the following drawing and replace it with the drawing included in Exhibit A of this Addendum:

      1. 005-CY-101

   c. Add Drawing 008-I-708 included in Exhibit A of this Addendum.

   d. Delete the following drawings and replace them with the drawings included in Exhibit A of this Addendum.

      1. 005-CR-101
      2. 005-CR-102

Modify the limits of pavement grind and inlay and pavement dig-out and replacement as shown on Drawings 005-CR-101 and 005-CR-102.

e. Delete "FOR FUTURE EQUIPMENT" from Sheet Keynote 3 on Drawing 725-E-112.

f. Delete "SOLIDS BUILDING ELECTRICAL ROOM" (in the upper right-hand side of the block diagram) on Drawing 750-E-601 from the location heading for the electrical panels and modify their locations as follows:

1. Solids Building Heat Trace Controller and IP-11003: Solids Building Main Floor Electrical Room.
2. 750PP4401 and 750LCP3501: Solids Building Upper Basement Electrical Room.

2. Specifications

a. Add the following immediately after "01782 CWM Equipment Information Sheet ..... 1-2" in the Table of Contents

"CWM Recommended Spare Parts.....1-1"

b. Add the following in Section 01782 Operation and Maintenance Data after Part 3.02.A.1.:

"2. Recommended Spare Parts."

c. Add the following Supplement 2 to Section 01782 Operation and Maintenance Data included in Exhibit B of this Addendum:

1. Recommended Spare Parts

d. Delete the paragraph in Section 01782 Operation and Maintenance Data, Part 1.02.G.3.d. and replace with the following:

"d. Spare parts and pricing information listed out per Article Submittals, Paragraph F, Item 13. Information submitted using the form provided at the end of this Section."

e. Delete Section 01640 Supplement 2 Training Matrix and replace it with the supplement included in Exhibit B of this Addendum.

f. Delete Section 02265 Secant Pile Excavation Support System and replace it with the section included in Exhibit B of this Addendum.

g. Add the following in Section 11385 Digester Mixer, after Part 1.03.B.8.

"9. Documentation of final fabricated or machined dimensions and tolerances of mixer shaft, impeller hubs, and impellers. The manufacturer is to provide a letter

certifying that the mixer shaft and appurtenances have been fabricated and machined to meet the manufacturer's specified dimensions and tolerances."

h. Add the following in Section 11385 Digester Mixer, after Part 3.01.A.

"B. Each equipment unit shall be leveled, aligned, and shimmed into position. When leveling the unit, use the machined surface of the output shaft. At a minimum, a level with an accuracy of 0.005 inches per foot shall be used to level the unit. The unit shall be leveled before the mixer shaft is connected to the output shaft. Shimming between machined surfaces will not be permitted."

i. Delete the paragraph in Section 15202 Process Valves and Operators, Part 2.05.A.2 in and replace it with the following:

"2. Type V130 Resilient Seated Gate Valve 2 Inches to 12 Inches:

a. Ductile iron body, resilient seat, bronze stem and stem nut, threaded or flanged ends, non-rising stem, 2-inch square operating nut in accordance with AWWA C509, minimum design working water pressure 200 psig, full port, fusion-epoxy coated inside and outside per AWWA C550.
b. Manufacturer and Product: M&H Valve; AWWA C509."

j. Add the following immediately after "16510 RSH Lighting: LED Luminaires ..... 1- 7" in the Table of Contents

"16611 RSH Uninterruptible Power Supply.....1-9"

k. Add the following specification section included in Exhibit B of this Addendum:

1. Section 16611 – Uninterruptible Power Supply

l. Add the following in Section 16262 Variable Frequency Drives 0.50-50 Horsepower, after Part 1.03.B.1.

"2. VFD System is defined as follows:
a. VFD in a standalone enclosure.
b. VFD installed in a motor control center.
c. VFD as a component in vendor-furnished equipment."

m. Delete the paragraphs in Section 16262 Variable Frequency Drives 0.50-50 Horsepower Parts 1.04.A, B, and C, and replace them with the following:

"A. Design requirements: Each VFD system consists of all components required to meet the performance, protection, safety, testing, on-site startup with all required documentation, and certification criteria of this Section.

B. The final VFD size shall be based on the full load current of the approved submittals of the driven load.

1. The VFD system:
    a. Fully integrated package.
    b. Includes all material necessary to interconnect all VFD system elements, even if shipped separately.

C. Any modifications to a standard product necessary to meet this Section shall be made by the following entities:

1. The VFD shall be capable of operating standard NEMA Design B motors. It is the responsibility of the VFD manufacturer, panel builder or system integrator to ensure that the drive will not damage motor insulation due to high carrier frequency, reflected wave, dv/dt or other drive electrical characteristics based upon the installed conditions:
    a. Provide equipment necessary to mitigate potential damage to motor insulation.

2. VFD installed in a motor control center:
    a. Each VFD shall be completely factory pre-wired, assembled, and then tested as a complete system by the MCC manufacturer to ensure a properly coordinated, fully integrated drive system.

3. VFD installed in a standalone enclosure:
    a. Each VFD will be installed in a dedicated standalone enclosure that is sized to allow for cooling and spatial considerations. The panel builder or integrator will provide a standalone unit that is completely wired, assembled, and tested as a complete system. The variable frequency drive will be one from the list of manufacturers in this specification, including all supporting components.

4. VFD installed in vendor-furnished equipment.
    a. Vendor furnished equipment will include a variable frequency drive from the list of manufacturers in this specification. Vendor furnished equipment shall be completely wired, assembled, and tested as a complete system."

Except as modified in this Addendum, the ITB will remain in effect as originally written.

Clarifications, which do not modify the ITB, are as follows:

1. Question 1: According to the geotechnical report prepared by Jacobs, Boring B-01 which is located within the extents of the secant ring, shows that the soils become wet at 8.5' BGS and all soil descriptions below 8.5' remain wet. However, according to table 4-2, the VWP shows that the groundwater level is not higher than 34.8' BGS or elevation 129'. Is there an error in the soil descriptions in the boring log? The photos would suggest that ground water is present at 8.5' BGS but that contradicts with the stated

ground water table elevations. Additional clarification is required as this has significant effects on the secant shoring and dewatering designs.

Answer 1: Additional groundwater data as recorded using a vibrating wire piezometer installed at the location of boring B-01 between the dates of October 27, 2023 and March 10, 2025 is being provided to bidders in the form of plots showing depth to groundwater and elevation of groundwater over the stated time period. The plots also include data showing daily precipitation as measured at the Durham, Oregon (KORPORTL411) weather station. Groundwater monitoring records do not preclude the potential for perched groundwater to be present. Bidders should use the additional groundwater records along with groundwater records and observations included in the Geotechnical Data Report (Jacobs, 2024) to make their assessment about subsurface conditions.

2. Question 2: In part 1.01-A of Section 02265, the secant system is referred to as a permanent installation. However, based on review of the drawings and later mention in 3.11-D, it appears that the intent is to backfill the space between the digester and the secant system and remove the top of the secant piles, which would suggest that the secant system is a temporary shoring system only. Please confirm if the secant system is intended as a temporary shoring system for means of SOE or if it is meant to provide permanent support. If it is permanent, please provide earth pressure diagrams for the permanent condition.

   Answer 2: Reference to a permanent secant support of the excavation system has been removed. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

3. Question 3: Section 02265, Part 1.03-C.1(g) requires that drilling output reports to be submitted for project record. This would only be available if the contractor chooses to use CFA or cased CFA methods to install the secant piles. If the contractor chooses to use cased Kelly drilling methods, please confirm that this specification does not apply.

   Answer 3: Section 02265, Part 1.03-C.1(g) has been deleted. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

4. Question 4: Section 02265, Part 1.04-A.1(j) defines interior surface protrusions or bulges as a defect that will require satisfactory repair or replacement. Given the soft soils in the upper 20 to 30', bulges are expected to occur and based on the drawings there is not a waterproofing system or interior liner that is cast on the secant piles. As a result, bulges or protrusions should not be considered a defect in the pile and should only be required to be removed if they negatively affect or impact work for construction of the digester. Please confirm this is acceptable.

   Answer 4: Section 02265, Part 1.04-A.1(j) has been amended to identify protrusions or bulges if they negatively affect or impact the construction of the digester or the placement of fill between the digester and the secant system. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

5. Question 5: Section 02265, Part 1.04-G defines a secondary pile as an alternating and reinforced pile. 2.03-B requires that secondary secant piles have a minimum of 12 square inches of reinforcing steel from top to bottom of pile. The plans and specifications state that the secant pile system is a contractor designed system. Please remove these references to reinforcing steel as reinforcing steel should only be required if the contractor's engineer deems it necessary.

   Answer 5: Reference to reinforced secondary piles has been removed. Reinforcing details will be per the Contractor's design. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

6. Question 6: Section 02265, Part 1.05-A requires a Secant Pile Shaft Information and Narrative Plan that is stamped by an Oregon licensed Structural engineer. Please consider a modified approach:

   a. Contractor to submit a secant pile design package including detailed construction plan set and design report/calculations package (item 7) stamped by an Oregon licensed Professional Engineer.

   b. Contractor to submit a secant installation narrative plan (items 1-6 and 8-22) that has been reviewed by secant pile design engineer.

   Answer 6: Section 02265, Part 1.05-A has been amended. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

7. Question 7: Section 02265, Part 1.05-A.17, please define SECLs as listed in the specification.

   Answer 7: "SECL" has been removed and replaced with "Digester 3". Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

8. Question 8: Section 02265, Part 2.01-B.1(f) defines minimum secant pile tip elevation as 132 feet and also states that tip elevation must be deep enough to prevent bottom heave and control ground water inflow. Given the secant ring diameter in excess of 100', it is impractical to assume that secants can be installed to a depth that is sufficient to prevent groundwater inflow and prevent bottom heave without the use of an internal dewatering system. However, as asked previously, based on the data provided by the VWP, the ground water table is lower than the deepest extent of excavation shown in plan sheet 005-CS-001.

   Answer 8: Section 02265, Part 2.01-B.1(f) has been revised. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum. Note that dewatering requirements (see Section 02240 Dewatering for requirements) remain if seepage of groundwater into the excavation occurs.

9. Question 9: Section 02265, Part 2.04-B states a minimum concrete compressive strength of 4,500 psi. Given that the secant system is contractor designed system, please confirm

that this specification does not apply and the minimum compressive design strength shall be determined by the design engineer.

Answer 9: Section 02265, Part 2.04-B has been revised to remove the minimum unconfined compressive strength of concrete. A requirement to state the minimum 28-day unconfined compressive strength of concrete has been added to Paragraph 1.05-A.7. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

10. Question 10: Section 02265, Part 2.04-A states that concrete shall conform to section 03300. Given the secant system is a design-build system, please confirm that concrete specification should confirm to secant engineer of record's specifications.

    Answer 10: Section 02265, Part 2.04-A has been deleted. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

11. Question 11: If the contractor intends to use water only as means to control bottom heave with a cased secant pile excavation, please confirm that items 1 through 5 in Section 02265, Part 2.05-A do not apply and can be waived.

    Answer 11: Section 02265, Part 2.05-A.6 has been amended to address the comment and make clear that water use is allowed in fully cased secant piles. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

12. Question 12: Additional reference is made to fully automated pile drilling and construction monitoring in Section 02265, Part 3.02-A. If the contractor is using cased Kelly drilling techniques, this system does not apply nor is it available. Please confirm the use of automated pile drilling and construction monitoring systems are not required for cased Kelly methods.

    Answer 12: The reference to fully automated continuous monitoring has been removed. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

13. Question 13: Section 02265, Part 3.02-F.3 makes reference to rig-mounted GPS. If the contractor does not intend to use rig mounted GPS, please confirm that this does not apply.

    Answer 13: The reference to GPS has been removed. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

14. Question 14: Section 02265, Part 3.03-C, confirm that water can be issued in lieu of slurry if the pile is cased full depth.

    Answer 14: The section has been amended to accommodate the use of water. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

15. Question 15: In Section 02265, Part 3.04-D, please provide details on what pile monitoring and analysis is required to be provided to the Project Representative for review prior to placement of reinforcement or concrete. For reference, secant pile construction will commence at an average rate of 4-6 piles/day per rig and there is not sufficient time for review by a third party during construction.

    Answer 15: This comment appears to refer to Section 02265, Part 3.04-B. Part 3.04-B has been revised. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

16. Question 16: Section 02265, Part 3.04-E requires that concrete be placed no later than 4 hours after completion of drilling, however 3.03-C allows for piles to be left drilled to depth overnight if cased full depth with water head. Please confirm which applies.

    Answer 16: Section 02265, Part 3.03-C has been revised to remove allowance for secant borings to be left drilled overnight. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

17. Question 17: Section 02265, Part 3.04-F requires a maximum 2 hour placement. While most piles will be poured within 2 hours, that are factors that are beyond the contractor's control in this time window. Please confirm that placements in excess of 2 hours will be allowed if the contractor can demonstrate that mix remains in a workable state within the pour duration the contractor requests.

    Answer 17: Section 02265, Part 3.04-F has been amended. See revisions which require the Contractor to provide procedures to be used to extend the placement period and document workability. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

18. Question 18: Section 02265, Part 3.05-A makes an additional reference to pile installation monitoring, please confirm this only applies to CFA or cased CFA installation methods.

    Answer 18: Section 02265, Part 3.04-A has been amended. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

19. Question 19: Section 02265, Part 3.05-C requires that appropriate inspection devices are used to demonstrate cleaning, diameter, depth, and verticality. Are these methods to be determined by the contractor and its secant system designer or is the engineer intending to specify certain devices and methods?

    Answer 19: These are to be determined and implemented by the Contractor.

20. Question 20: Section 02265, Part 3.07-C again makes reference to automated continuous monitoring. Please confirm this only applies to Cased CFA or CFA methods of installation.

    Answer 20: There is no Section 02265, Part 3.07-C, and it appears to refer to Part 3.06-B. The specification has been amended to remove reference to automated continuous

monitoring. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

21. Question 21: Section 02265, Part 3.10-A makes reference to a contractor designed ring beam at the top of secant piles. Is a internal ring beam required by specification? Again, the secant system is specified as a design build system, please confirm a ring beam is only required by the contractor's design engineer requires it.

    Answer 21: A ring beam is not required, and the reference to the ring beam has been removed. Note that there are requirements for the secant system design to accommodate the close proximity of an existing duct bank located east of Digester 3. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

22. Question 22: On the basis that the secant shoring system is for temporary SOE only, the leakage specifications should be modified from the current ½ gallon per minute specification. Based on a shored area of 7,200 SF (~24' average cut, 102' ID), ½ gallon permit leakage is unattainable. Instead, the leakage specification should be based on the following:

    a. Leakage control to prevent ground loss outside of the secant shoring system

    b. Total leakage limited by the amount contractor is able to control, pump, treat, and discharge from the excavation.

    Answer 22: Section 02265, Part 3.10-E and 3.11-C have been amended. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

23. Question 23: Section 02265, Part 3.11-A requires secants to be cleaned, pressure washed, and a roughened surface exposed. If the secants are only temporary SOE, please confirm that pressure washing and exposing a roughened surface is not required.

    Answer 23: Section 02265, Part 3.11-A has been amended. Refer to Section 02265 Secant Pile Excavation Support System included in Exhibit B of this Addendum.

24. Question 24: Section 11383, Part 2.02 WGB Refurbishing: They want to refurbish existing WGB. They only want Electronic controller and ignition system for replacement, not entire flare. Capacity mentioned 88,150 scfh gas and 8" size. This flow is unusual. Please provide flare nameplate data.

    Answer 24: The existing flare is to be refurbished as specified in 11383, 2.02, rather than replacing the entire flare. Capacity specified in 2.02.A.3 is the understood nameplate capacity of the existing Varec 244W 8" flare unit. This capacity also matches the capacity table in the Varec Biogas 244W brochure.

25. Question 25: Section 11383, Part 2.05 Flame arrester and thermal shut off valve: Required with WGB and the size given is 12" for an 8" flare?

Answer 25: Provide a 12" unit as specified in 11383, 2.05. A 12" unit is specified to achieve lower pressure loss versus a smaller size unit.

26. Question 26: Section 11383, Part 2.06 Back pressure regulator: required with WGB and the size given is 10" for an 8" flare?

    Answer 26: Provide a 10" unit as specified in 11383, 2.06. A 10" unit is specified to achieve lower pressure loss versus a smaller size unit.]

27. Question 27: Section 11383, Part 2.03 Condensate trap: Flow capacity mentioned 45,000 scfh at ½" WC maximum pressure drop and the size required is 10". As per the calculation the size should be 14" for this flow. Is that possible the actual flow could be different? Please provide flow without accounting for pressure drop.

    Answer 27: The specified flow capacity and pressure drop performance point was taken from the Varec Model 233 brochure. The brochure figure shows that the 10" model exceeds the specified performance point. Design flow capacity from Digester 3 is 500 actual cubic feet per minute.

28. Question 28: Section 11203, calls out that the controls are by the contractor. We have supplied a lot of Franklin Miller grinders to the plant and recently they have been supplying the controls in-house. Do you know who is to supply the controls and what they are to include if FM is to supply them?

    Answer 28: Controls are to be provided by the Contractor. Reference Part 2.06 of Section 11203 and Drawing 008-I-605.

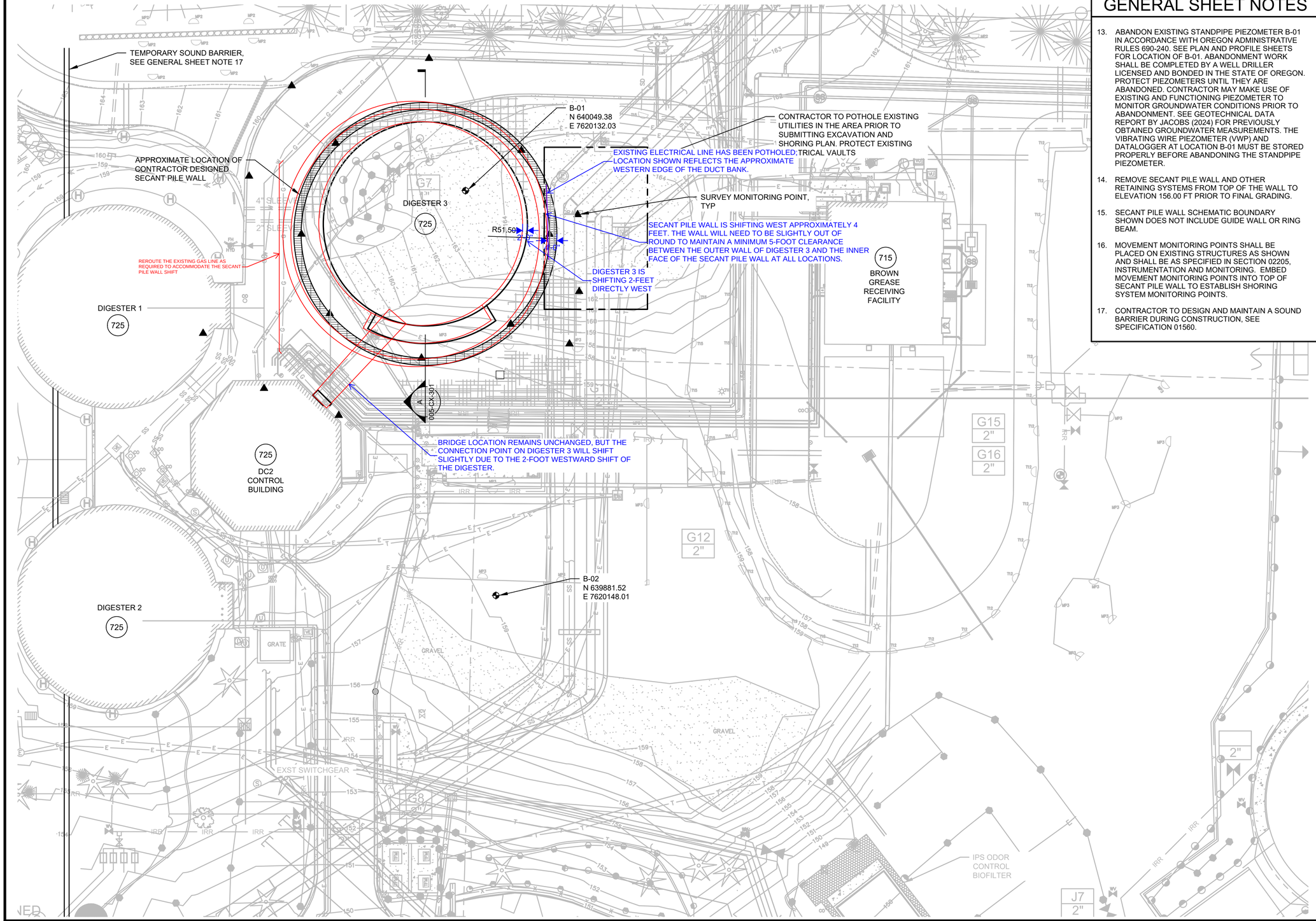
29. Question 29: Section 11203 also asks for an OR PE stamp for structural computations (page 902) - is this for seismic or ??

    Answer 29: Structural computations are required for the design of the anchors to secure the grinder to its foundation. Anchorage system shall be designed in accordance with Section 01612, Anchorage and Bracing.

30. Question 30: Section 02265- 2.03B Reinforcing Steel. If the contractor's structural design analysis for the support of excavation meets all load-bearing and safety requirements without the additional reinforcing steel, is the 12 square inch minimum still mandatory?

    Answer 30: Refer to the answer to Question 5 above.

END OF ADDENDUM



GENERAL SHEET NOTES

13. ABANDON EXISTING STANDPIPE PIEZOMETER B-01 IN ACCORDANCE WITH OREGON ADMINISTRATIVE RULES 690-240. SEE PLAN AND PROFILE SHEETS FOR LOCATION OF B-01. ABANDONMENT WORK SHALL BE COMPLETED BY A WELL DRILLER LICENSED AND BONDED IN THE STATE OF OREGON. PROTECT PIEZOMETERS UNTIL THEY ARE ABANDONED. CONTRACTOR MAY MAKE USE OF EXISTING AND FUNCTIONING PIEZOMETER TO MONITOR GROUNDWATER CONDITIONS PRIOR TO ABANDONMENT. SEE GEOTECHNICAL DATA REPORT BY JACOBS (2024) FOR PREVIOUSLY OBTAINED GROUNDWATER MEASUREMENTS. THE VIBRATING WIRE PIEZOMETER (VWP) AND DATALOGGER AT LOCATION B-01 MUST BE STORED PROPERLY BEFORE ABANDONING THE STANDPIPE PIEZOMETER.
14. REMOVE SECANT PILE WALL AND OTHER RETAINING SYSTEMS FROM TOP OF THE WALL TO ELEVATION 156.00 FT PRIOR TO FINAL GRADING.
15. SECANT PILE WALL SCHEMATIC BOUNDARY SHOWN DOES NOT INCLUDE GUIDE WALL OR RING BEAM.
16. MOVEMENT MONITORING POINTS SHALL BE PLACED ON EXISTING STRUCTURES AS SHOWN AND SHALL BE AS SPECIFIED IN SECTION 02205, INSTRUMENTATION AND MONITORING. EMBED MOVEMENT MONITORING POINTS INTO TOP OF SECANT PILE WALL TO ESTABLISH SHORING SYSTEM MONITORING POINTS.
17. CONTRACTOR TO DESIGN AND MAINTAIN A SOUND BARRIER DURING CONSTRUCTION, SEE SPECIFICATION 01560.

GENERAL SHEET NOTES

1. NOTIFY ENGINEER IF FIELD CONDITIONS VARY FROM WHAT IS SHOWN ON DRAWINGS.
2. DISPOSE OF DEBRIS OFFSITE. LIMIT OFFSITE DISPOSAL TO LOCATIONS THAT ARE APPROVED BY FEDERAL, STATE, AND LOCAL AUTHORITIES.
3. MAINTAIN EMERGENCY VEHICLE ACCESS AT ALL TIMES.
4. CONTRACTOR TO PLACE TWO ADDITIONAL SURVEY MONITORING POINTS AT THE WESTERN FENCELINE NEAR THE DURHAM ACCESS ROAD. LOCATION OF THE ADDITIONAL SURVEY MONITORING POINT IS NOT WITHIN THE EXTENTS OF THIS PLAN AND IS NOT SHOWN.
5. THE INTERIOR DIAMETER OF CONTRACTOR DESIGNED SECANT PILE RETAINING WALL LIMITS SHOWN IS THE MINIMUM TO BE USED FOR CONSTRUCTION.
4. SECANT PILE WALL TO BE DESIGNED IN ACCORDANCE WITH THE AASHTO BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION AND FHWA NHI-10-016 DRILLED SHAFTS: CONSTRUCTION PROCEDURES AND LRFD DESIGN METHODS, AND THE PROJECT DESIGN CRITERIA LISTED IN SPECIFICATIONS SECTION 02265, SECANT PILE EXCAVATION SUPPORT SYSTEM.
5. CONTRACTOR TO PERFORM DESIGN, CONSTRUCTION, AND MONITORING FOR SECANT PILE WALL AND OTHER SHORING OR GROUNDWATER CUTOFF SYSTEMS. THE DESIGN DRAWINGS AND CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF OREGON.
6. THE CONTRACTOR-DESIGNED SHORING IS SHOWN SCHEMATICALLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING IF ADDITIONAL EXCAVATION SUPPORT IS NEEDED TO PROTECT EXISTING FACILITIES AND ALLOW FOR CONSTRUCTION OF PROPOSED FACILITIES. SHORING SYSTEMS RELYING ON VIBRATORY HAMMER FOR INSTALLATION OR EXTRACTION ARE NOT ALLOWED.
7. PROVIDE FENCING, BARRICADES, AND/OR FALL PROTECTION AT TOP OF SECANT PILE WALL AND ANY ADDITIONAL SAFETY MEASURES AS NEEDED TO MAINTAIN SITE SAFETY.
8. DESIGN SHORING TO ACCOMMODATE CONSTRUCTION OF PIPES AND UTILITIES PENETRATING THE SHORING.
9. FIELD LOCATION OF EXISTING PIPING TO BE VERIFIED A MINIMUM OF 14 DAYS PRIOR TO ANY INITIATION OF DESIGN AND LAYOUT OF WALL PER OREGON OSHA.
10. PROTECT EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION. LIMIT EQUIPMENT AND STOCKPILE LOADS OVER EXISTING UTILITIES TO NO MORE THAN 500 POUNDS PER SQUARE FOOT.

LEGEND:

- ▲ MOVEMENT MONITORING POINT, TYP
- ◆ EXISTING MONITORING WELL/GEOTECHNICAL BORING

N

0 20 40 60

SCALE IN FEET

DRN: BG	ORIG DATE: AUGUST 2025				
DSN: AS	DWG #: 005-CX-101				
CHK: MB	CAD FILE #: 005-CX-101_D3704507.dwg				
APPD: CM	SCALE: AS NOTED				

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

REV #	DATE	DRN	APPD	DESCRIPTION
1	10/25	AS	CM	ADDENDUM 3

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME: CLEAN WATER SERVICES DURHAM WRRF
PHASE 6B DIGESTER

SHEET TITLE: SITE DEVELOPMENT CIVIL EXCAVATION PLAN AREA 1

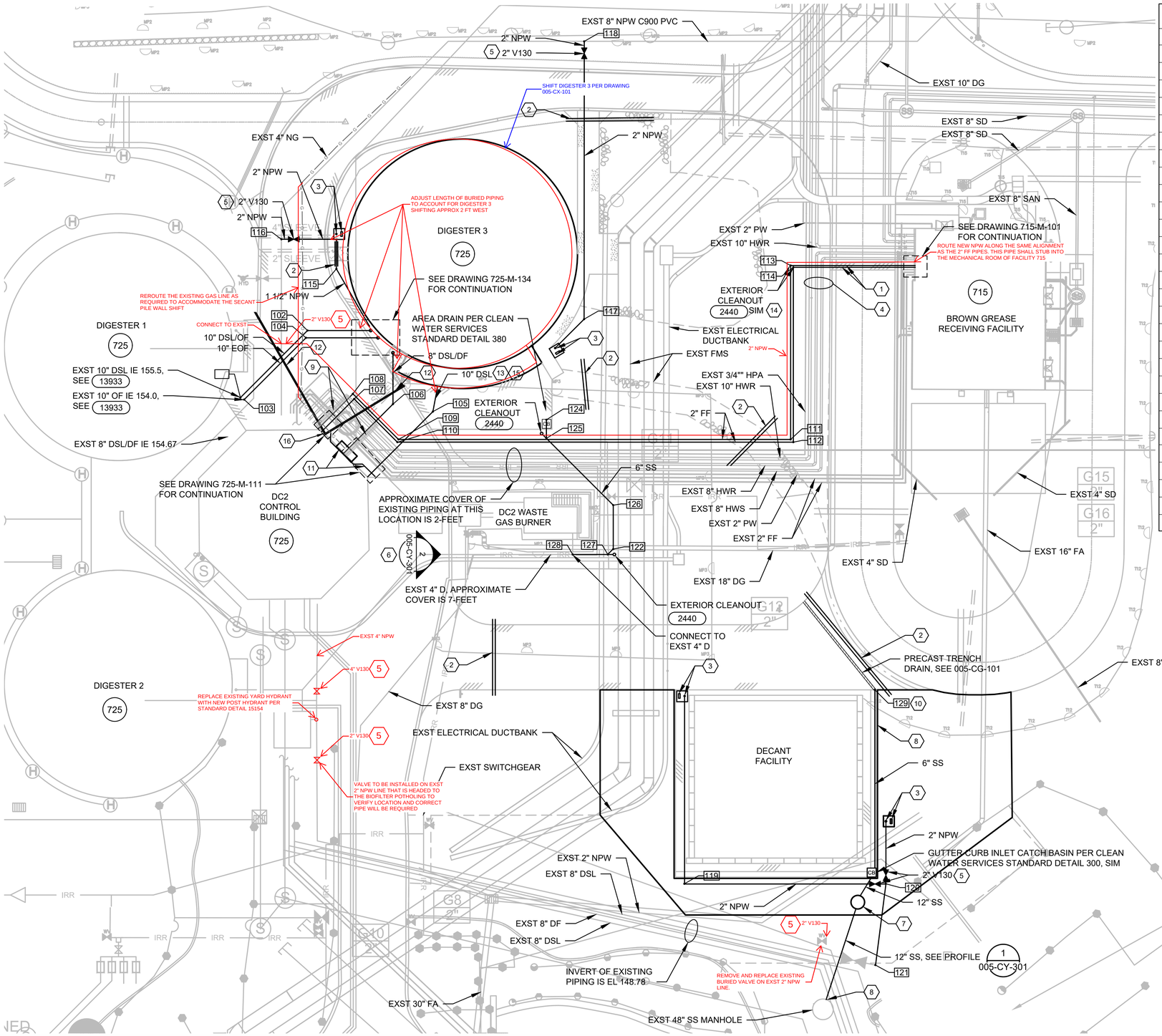
SHEET:	33 of 172
PLOT DATE:	2025-08-07
PLC #:	
CWS PROJ #:	7203

Jacobs

DWG #: 005-CX-101

REGISTERED PROFESSIONAL ENGINEER
100595PE
Digital Signature
OREGON
SEPTEMBER 13, 2022
AUSTIN SITTEL
EXP. 06/30/26
ENGR STAMP:

FINAL DESIGN



PIPING COORDINATE TABLE

POINT NO	NORTHING	EASTING	CL ELEV	DESCRIPTION
101	639982.66	7620036.79	155.92	10" DSL, CONNECT TO EXST
102	640007.39	7620061.52	156.17	10" DSL, 45° BEND
103	639981.93	7620038.18	154.42	10" OF, CONNECT TO EXST
104	640004.70	7620060.96	156.17	10" OF, 45° BEND
105	639977.51	7620107.76	132.57	10" DSL,33.75° BEND
106	639980.26	7620093.03	156.17	8" DSL, 45° BEND
107	639982.17	7620078.73	156.80	2" FF, CONNECT TO EXST
108	639984.06	7620078.25	156.80	2" FF, 45° BEND
109	639967.23	7620095.08	156.60	2" FF, 45° BEND
110	639966.23	7620094.66	156.60	2" FF, 45° BEND
111	639967.23	7620239.65	154.10	2" FF, 90° BEND
112	639966.23	7620240.65	154.10	2" FF, 90° BEND
113	640031.35	7620239.65	155.67	2" FF, 90° BEND
114	640030.71	7620240.65	155.67	2" FF, 90° BEND
115	640030.11	7620072.17	156.17	1-1/2" NPW, 45° BEND
116	640041.03	7620051.89	156.17	3" NPW, CONNECT TO EXST
117	640011.57	7620163.50	158.30	1-1/2" NPW, 45° BEND
118	640113.97	7620163.54	161.12	1-1/2" NPW, CONNECT TO EXST
119	639803.42	7620200.50	154.50	1-1/2" NPW, 90° BEND
120	639803.42	7620274.73	153.11	1-1/2" NPW, TEE
121	639773.48	7620270.90	148.78	1-1/2" NPW, CONNECT TO EXST
122	639926.81	7620174.25	153.54	6" SS, 45° BEND
124	639974.49	7620149.62	155.53	6" SS
125	639967.64	7620149.62	155.28	6" SS, 45° BEND
126	639943.00	7620174.26	153.94	6" SS, 45° BEND
127	639924.81	7620172.25	153.24	6" SS, 45° BEND
128	639924.81	7620159.30	152.67	6" SS, CONNECT TO EXST
129	639874.92	7620270.71	157.33	6" SS

GENERAL SHEET NOTES

1. NOTIFY ENGINEER IF FIELD CONDITIONS VARY FROM WHAT IS SHOWN ON DRAWINGS.
2. DISPOSE OF DEBRIS OFFSITE. LIMIT OFFSITE DISPOSAL TO LOCATIONS THAT ARE APPROVED BY FEDERAL, STATE, AND LOCAL AUTHORITIES.
3. THE LOCATION OF EXISTING UNDERGROUND PIPES AND ELECTRICAL CONDUITS ARE SHOWN BASED ON THE BEST INFORMATION AVAILABLE. NO EXPLORATORY EXCAVATION HAS BEEN DONE TO VERIFY THE EXACT LOCATIONS. CONTRACTOR SHALL EXCAVATE AND LOCATE EXISTING PIPES AND ELECTRICAL CONDUITS PRIOR TO BEGINNING WORK IN THE AREA AND SHALL VERIFY THEIR LOCATION RELATIVE TO THE PLANS. THIS SHALL BE DONE IN ADVANCE OF THE WORK, SEE SPECIFICATION SECTION 01140, WORK RESTRICTIONS AND CONSTRUCTION SEQUENCE.
4. MAINTAIN EMERGENCY VEHICLE ACCESS AT ALL TIMES.
5. MANHOLE INVERTS AND GRAVITY PIPING SLOPES ARE SHOWN ON DRAWING 005C-CY-301.
6. FOR SURFACE RESTORATION OF PAVEMENT, SEE DWG 005-CL-101 OUTSIDE OF PAVED AREA RESTORE SURFACE TO EXISTING CONDITIONS. TRENCH WIDTH TO BE MINIMUM 24 INCHES GREATER THAN OUTSIDE DIAMETER OF PIPE, SEE (2310).
7. SUPPORT AND PROTECT ALL EXISTING PIPELINES THAT ARE NOT IDENTIFIED FOR DEMOLITION DURING TRENCHING OPERATIONS.

SHEET KEYNOTES

1. PIPE CROSSING, SEE (2335)
2. TWO 4" SCHEDULE 40 PVC PIPE SLEEVES WITH 24" OF COVER, INSTALL 24" BEYOND HARD SURFACE. INSTALL 2"x2"x4' STAKES AT THE END OF EACH PIPE SLEEVE AND BRASS SURVEY MARKER IN CURB OR ROAD EDGE.
3. INSTALL HYDRANT AND HOSE RACK PER CIVIL LAYOUT DRAWING.
4. APPROXIMATE COVER OF PIPING AT THIS LOCATION IS 4-FEET.
5. BURIED GATE VALVE BOX, SEE (15640)
6. DISCONNECT EXISTING ABOVE GRADE 18" DG AND CAP WITH BLIND FLANGE.
7. 60" DIAMETER WATER QUALITY MANHOLE, WITH A 36" SUMP PER CLEAN WATER SERVICES STANDARD DETAIL 250.
8. CONNECT TO EXISTING MANHOLE PER CLEAN WATER SERVICES STANDARD DETAIL 030.
9. APPROXIMATE LOCATION OF EXISTING ANCHOR BLOCK, FIELD VERIFY.
10. COORDINATE TRANSITION OF PRECAST TRENCH DRAIN TO THE DOWNSTREAM PIPING WITH THE PRECAST TRENCH DRAIN MANUFACTURER TO ENSURE COMPATIBILITY OF MATERIALS, PROPER CONNECTION DETAILS, AND ALIGNMENT.
11. BRIDGE FOOTING, SEE DRAWING 725-S-431. POTHOLE PAVEMENT BELOW PROPOSED BRIDGE FOOTING TO VERIFY THERE ARE NO UTILITY CONFLICTS. SEE PHOTO DETAIL 4/005-CY-301 FOR GAS LINE AND IRRIGATION REROUTING.
12. INSTALL 4" SCH 40 PVC SLEEVE ACROSS ROAD FOR REPLACEMENT OF IRRIGATION WIRES.
13. THE 10" DSL IS LOCATED AT A SIGNIFICANT DEPTH; REFER TO THE PIPING COORDINATE TABLE FOR EXACT ELEVATIONS. INSTALLATION MAY REQUIRE SPECIAL EXCAVATION METHODS AND PENETRATIONS THROUGH THE SECANT PILE EXCAVATION SUPPORT SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGNING AND IMPLEMENTING ALL NECESSARY EXCAVATION AND SUPPORT MEASURES.
14. PROVIDE A FLANGE X CAMLOCK END ADAPTER WITH A DUST CAP IN LIEU OF A WATERTIGHT PIPE PLUG.
15. AT THE END OF THE 10" DSL ENCASEMENT, UTILIZE MECHANICAL JOINT WALL PIPE, SEE (15602) SIM.
16. INSTALL A 12"X18" JUNCTION BOX DIRECTLY UNDER THE NEW CONTROLLER LOCATION WITH SLEEVE ENDS EXPOSED FOR FUTURE WIRE INSTALLATION.

N

0 20 40 60

SCALE IN FEET

DRN: BG	ORIG DATE: AUGUST 2025			
DSN: AS	DWG #: 005-CY-101			
CHK: MB	CAD FILE #: 005-CY-101_D3704507.dwg			
APPD: CM	SCALE: AS NOTED			

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

REV #	DATE	DRN	APPD	DESCRIPTION
1	10/25	AS	CM	ADDENDUM 3

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME: CLEAN WATER SERVICES DURHAM WRRF
PHASE 6B DIGESTER

SHEET TITLE: SITE DEVELOPMENT CIVIL YARD PIPING PLAN AREA 1

SHEET:	41 of 172
PLOT DATE:	2025-08-11
PLC #:	
CWS PROJ #:	7203

Jacobs

DWG #: 005-CY-101

REGISTERED PROFESSIONAL ENGINEER
100595PE
Digital Signature
OREGON
SEPTEMBER 13, 2022
AUSTIN SITTEL
EXP. 06/30/26
ENGR STAMP:

FINAL DESIGN

GENERAL SHEET NOTES

1. NOTIFY ENGINEER IF FIELD CONDITIONS VARY FROM WHAT IS SHOWN IN DRAWINGS.
2. DISPOSE OF DEBRIS OFFSITE. LIMIT OFFSITE DISPOSAL TO LOCATIONS THAT ARE APPROVED BY FEDERAL, STATE, AND LOCAL AUTHORITIES.
3. MAINTAIN EMERGENCY VEHICLE ACCESS AT ALL TIMES.
4. SEE SHEET 005-CL-101 FOR TOPSOIL AND COMPOST REQUIREMENTS IN FUTURE LANDSCAPED AREAS.

SHEET KEYNOTES

1. READJUST ELECTRICAL MANHOLE LID TO HAVE THE RIM ELEVATION MATCH GRADE.

MATCH EXST
SHIFT DIGESTER 3 PER DRAWING 005-CX-101
GRADING LIMITS
MATCH EXISTING CURB
DIGESTER 3
725
161.67
159.67
SHIFT SIDEWALK WEST APPROX 2 FT WITH DIGESTER 3.
715
BROWN GREASE RECEIVING FACILITY
DIGESTER 1
725
MATCH EXISTING
SHIFT ALIGNMENT OF CURB TO MAINTAIN A MIN 3 FT EDGE DISTANCE FROM EXTERIOR FACE OF DIGESTER 3 TO BACK OF CURB
~~MATCH EXISTING CURB~~
MATCH EXISTING
725
DC2 CONTROL BUILDING
DC2 WASTE GAS BURNER
IE 158.00
157.50
CONCRETE VALLEY GUTTER, SEE 2260
MATCH EXISTING
PRECAST TRENCH DRAIN, SEE 2480
42"x12"
TC 159.01
BC 158.01
156.20
TC 160.50
BC 160.00
MATCH EXST
IE 157.33
DECANT FACILITY
4%
DIGESTER 2
725
GRATE
EXST SWITCHGEAR
TC 159.01
BC 158.01
CATCH BASIN
TC 157.12
BC 156.12
MANHOLE
IPS ODOR CONTROL BIOFILTER
EXISTING MANHOLE

N
0 20 40 60
SCALE IN FEET

DRN: BG	ORIG DATE: AUGUST 2025			
DSN: AS	DWG #: 005-CG-101			
CHK: MB	CAD FILE #: 005-CG-101_D3704507.dwg			
APPD: CM	SCALE: AS NOTED			

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

REV #	DATE	DRN	APPD	DESCRIPTION
1	10/25	AS	CM	ADDENDUM 3

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME: CLEAN WATER SERVICES DURHAM WRRF
PHASE 6B DIGESTER

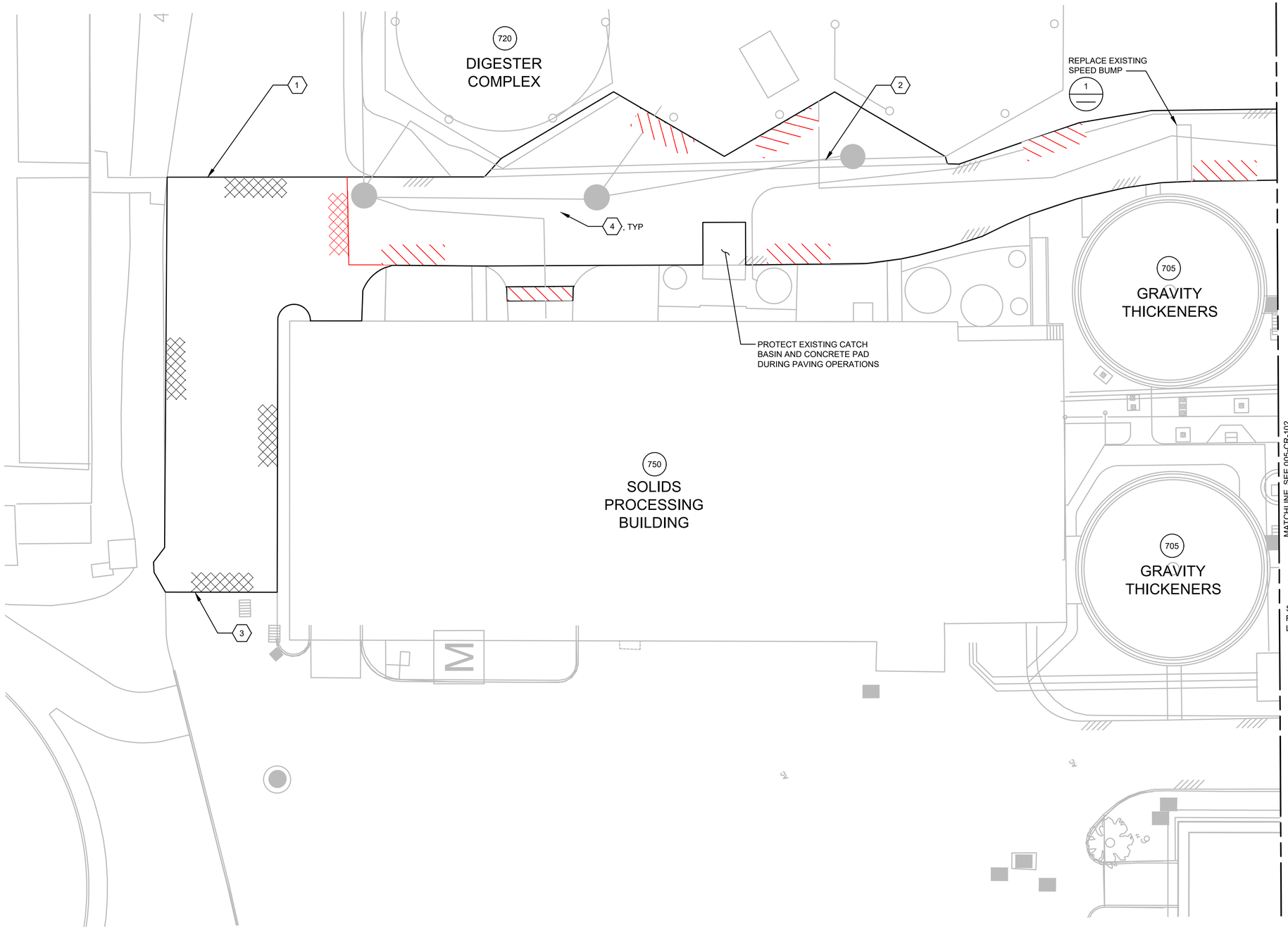
SHEET TITLE: SITE DEVELOPMENT CIVIL GRADING PLAN AREA 1

SHEET:	44 of 172
PLOT DATE:	2025-08-15
PLC #:	
CWS PROJ #:	7203

Jacobs.
DWG #: 005-CG-101

REGISTERED PROFESSIONAL ENGINEER
100595PE
Digital Signature
OREGON
SEPTEMBER 13, 2022
AUSTIN SITTEL
EXP. 06/30/26
ENGR STAMP:

FINAL DESIGN



GENERAL SHEET NOTES

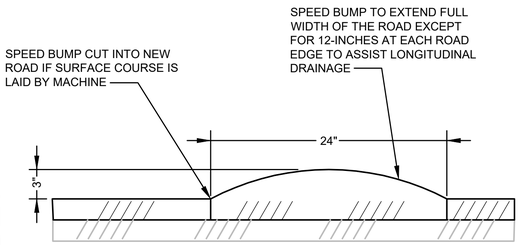
1. PAVEMENT GRIND AND INLAY IS CURB TO CURB, FULL HATCHING IS NOT SHOWN FOR CLARITY.

SHEET KEYNOTES

1. NEW SAWCUT LINE STRAIGHT ACROSS ROAD. (2 / 005-CR-501)
2. PROTECT EXISTING VALLEY GUTTER DURING PAVING OPERATIONS.
3. NEW SAWCUT LINE STRAIGHT ACROSS ROAD 2-FEET BEYOND EXST SAWCUT LINE. (2 / 005-CR-501)
4. PROTECT MANHOLES, CATCH BASINS, VALVE BOXES, ETC. DURING GRIND AND PAVING OPERATIONS.

LEGEND:

- PAVEMENT GRIND AND INLAY (3 / 005-CR-501)
- PAVEMENT DIG-OUT AND REPLACEMENT (1 / 005-CR-501)



1 SPEED BUMP
NTS

N

0 15 30 45
SCALE IN FEET

FINAL DESIGN

DRN: BG	ORIG DATE: AUGUST 2025	1	10/25	AS	CM	ADDENDUM 3
DSN: AS	DWG #: 005-CR-101					
CHK: MB	CAD FILE #: 005-CR-101_D3704507.dwg					
APPD: CM	SCALE: NTS	REV #	DATE	DRN	APPD	DESCRIPTION

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME:
CLEAN WATER SERVICES
DURHAM WRRF
PHASE 6B DIGESTER

SHEET TITLE:
SITE DEVELOPMENT
ROADWAY IMPROVEMENTS
AREA 1

SHEET: 46 of 172
PLOT DATE: 2025-08-15
PLC #:
CWS PROJ #: 7203

Jacobs
DWG #: 005-CR-101

REGISTERED PROFESSIONAL ENGINEER
100595PE
Digital Signature
OREGON
SEPTEMBER 13, 2022
AUSTIN SITTEL
EXP. 06/30/26
ENGR STAMP:

MATCHLINE, SEE 005-CR-101

705
GRAVITY THICKENERS

705
GRAVITY THICKENERS

12"
22"
18"
AC
AC
1524
1

GENERAL SHEET NOTES

1. PAVEMENT GRIND AND INLAY IS CURB TO CURB, FULL HATCHING IS NOT SHOWN FOR CLARITY.

SHEET KEYNOTES

1. NEW SAWCUT LINE STRAIGHT ACROSS ROAD 2-FEET BEYOND EXISTING SAWCUT LINE (2 / 005-CR-501)

N

0 15 30 45
SCALE IN FEET

LEGEND:

PAVEMENT GRIND AND INLAY (3 / 005-CR-501)

PAVEMENT DIG-OUT AND REPLACEMENT (1 / 005-CR-501)

DRN: BG	ORIG DATE: AUGUST 2025	1	10/25	AS	CM	ADDENDUM 3
DSN: AS	DWG #: 005-CR-102					
CHK: MB	CAD FILE #: 005-CR-102_D3704507.dwg					
APPD: CM	SCALE: NTS	REV #	DATE	DRN	APPD	DESCRIPTION

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME:
CLEAN WATER SERVICES
DURHAM WRRF
PHASE 6B DIGESTER

SHEET TITLE:
SITE DEVELOPMENT
ROADWAY IMPROVEMENTS
AREA 2

SHEET: 47 of 172
PLOT DATE: 2025-08-08
PLC #:
CWS PROJ #: 7203

Jacobs

DWG #:
005-CR-102

REGISTERED PROFESSIONAL ENGINEER
100595PE
OREGON
Digital Signature
SEPTEMBER 13, 2022
AUSTIN SITTEL
EXP. 06/30/26
ENGR STAMP:

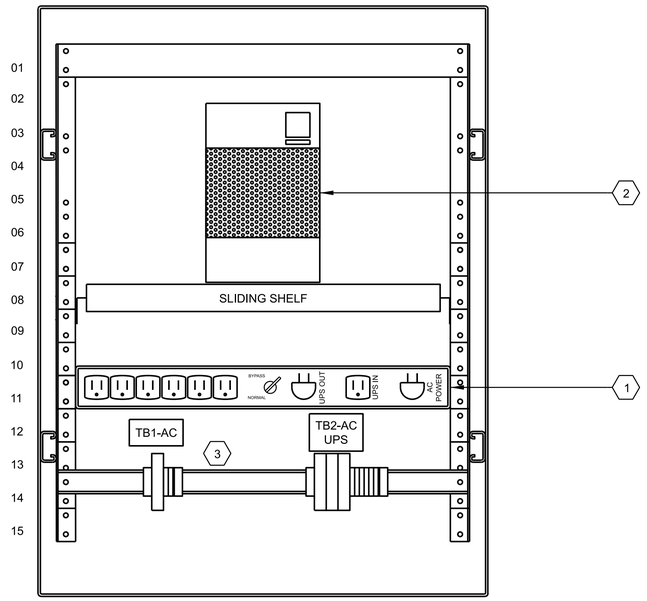
FINAL DESIGN

GENERAL SHEET NOTES

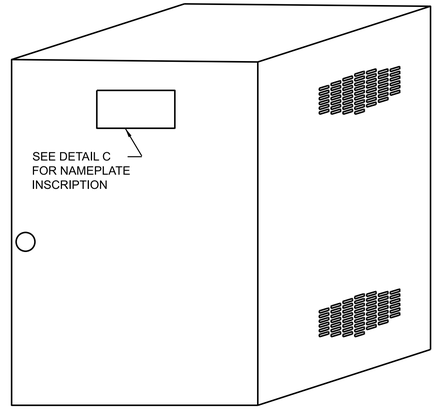
1. PROVIDE PANEL AS NEMA 1 WITH SIDE PANEL VENTS FOR AIR CIRCULATION INSIDE PANEL. PROVIDE PANEL WITH SLIDING SHELF TO ACCESS REAR UPS. PROVIDE DOOR LOCK TO PREVENT UNAUTHORIZED PANEL ENTRY.
2. FOR REFERENCE, REFER TO DRAWING 008-I-707.

SHEET KEYNOTES

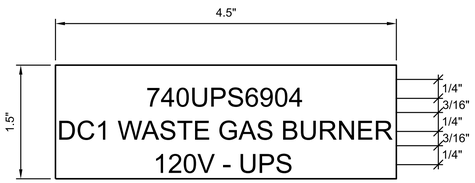
1. RACK MOUNTED UPS BYPASS SWITCH PER SECTION 16611.
2. UPS PER SECTION 16611
3. PROVIDE CIRCUIT BREAKERS AND TERMINAL BLOCKS AS SHOWN ON THIS DRAWING. ATTACH DIN RAIL TO RACK BRACKET.



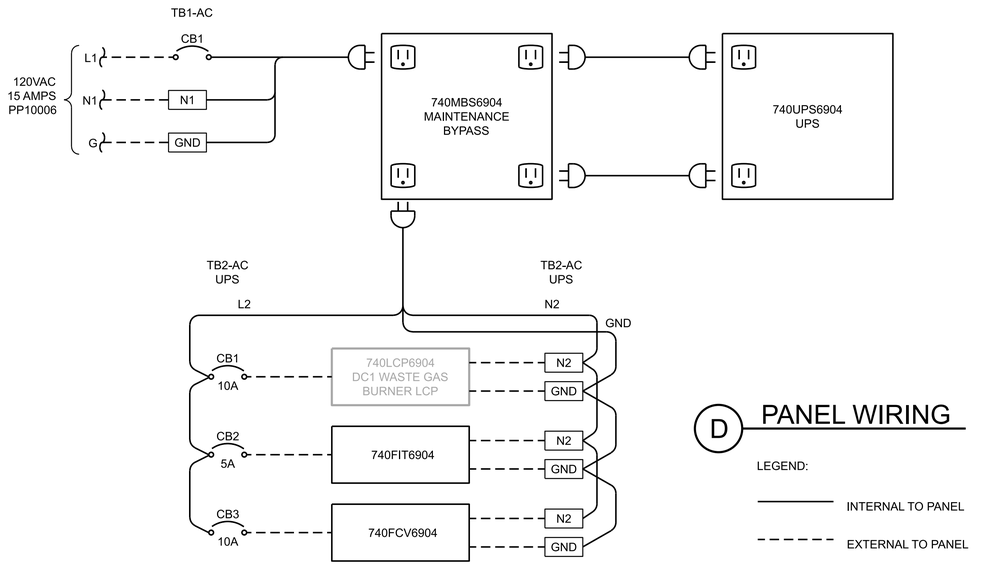
A INTERIOR VIEW



B EXTERIOR VIEW



C PANEL NAMEPLATE



D PANEL WIRING

LEGEND:

INTERNAL TO PANEL

EXTERNAL TO PANEL

DRN: AZ	ORIG DATE: OCTOBER 2025	0	10/25	AZ	NW	ADDENDUM 3
DSN: NW	DWG #: 008-I-708					
CHK: DD	CAD FILE #: 008-I-708_D3704507.dwg					
APPD: CM	SCALE: NTS	REV #	DATE	DRN	APPD	DESCRIPTION

THIS BAR IS ONE INCH WHEN DRAWING IS FULL SCALE.

Clean Water Services
2550 SW Hillsboro Hwy. Hillsboro, Oregon 97123-9379

PROJ NAME:
CLEAN WATER SERVICES
DURHAM WRRF
PHASE 6B DIGESTER

SHEET TITLE:
INSTRUMENTATION AND CONTROL
UPS PANEL DETAILS

SHEET: OF:
PLOT DATE: 2025-09-26
PLC #:
CWS PROJ #: 7203

Jacobs
DWG #: 008-I-708

REGISTERED PROFESSIONAL ENGINEER
72449PE
Digital Signature
OREGON
12/2025
NATHAN JOHN WAGNER
EXP. 6-30-2026
ENGR STAMP:

FINAL DESIGN

Recommended Spare Parts Information

Quantity	Part Number	Lubricant Type	Description	Price	Lead Time

Contact Information	
Company	
Name	
Phone #	
E-Mail	

Clean Water Services - Equipment Training Matrix
Facility Durham
Project Name Durham Phase 6B Digester
Project Number 7203

Spec Section	Equipment Type	# of Sessions	Hours	# of Sessions	Hours	# of Sessions	Hours
		Maintenance		Operator		E&I	
11383	Digester Gas Safety Equipment	1	4	1	2	1	4
11385	Digester Mixer	1	4	1	1	1	4
15202	Process Valves and Operators (Actuators)					1	4
15500	Heating Boilers	1	4	1	1	1	8
15720	Air Handling Units	1	4	1	1	1	4
15730	Unitary Air-Conditioning Equipment	1	4	1	1	1	4
15900	Instrumentation and Control Devices for HVAC	1	4	1	1	1	4
16262	Variable Frequency Drives					1	8
17208	Level Measurement: Radar			1	1	1	4
17305	Flow Measurement: Thermal Mass			1	1	1	4
17310	Flow Measurement: Ultrasonic Time of Flight					1	4
17311	Flow Measurement: Ultrasonic Doppler Flowmeters					1	4

MONTH-2025
Training Preference Day and Time

Operations	Wednesdays at 2pm
Maintenance	Tuesday, Wednesday 7am - 2pm
Electrical & Instrumentation	Tuesday, Wednesday 7am - 2pm

SECTION 02265
SECANT PILE EXCAVATION SUPPORT SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies the requirements for the installation of the Contractor designed secant pile excavation support systems for Digester 3 using temporarily cased hole drilling equipment.

B. Requirements for excavation support for trenches and facilities using excavation support systems not consisting of secant piles are provided in Section 02260, Shoring.

1.02 QUALITY ASSURANCE

A. Reference Standards: This section incorporates by reference the latest revision of the following documents. These references are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1. American Petroleum Institute (API): 13B: Field Testing Water-Based Drilling-Fluids.
2. ASTM International (ASTM):
   a. C39, Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens.
   b. C138-17a, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
   c. C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
   d. C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
   e. D3740: Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
   f. D5882: Low Strain Impact Integrity Testing of Deep Foundations.
3. International Association of Foundation Drilling (Association of Drilled Shaft Contractors) (ADSC): Drill Shaft Inspector’s Manual.

B. Qualifications:

1. Secant Pile Contractor:
   a. Experienced in completing a minimum of three secant pile construction projects using the same pile drilling methods proposed for this Work, where the secant pile portion of the Work was performed and achieved Substantial Completion within the last 7 years. The secant pile contractor shall demonstrate experience of the firm with all three criteria items provided below:
      1) Construction of secant piles to a depth of 45 feet or greater.
      2) Excavation within secant pile supported shaft to a depth of 25 feet or greater.
      3) Construction of secant pile below groundwater.
      4) Using acoustical measuring device, or other proprietary pile installation monitoring system to measure verticality and the dimensional accuracy of the secant piles.
   b. Slurry Manufacturer's Onsite Technician: Trained by the slurry manufacturer with a minimum of 2 years' construction experience working with slurries.
   c. Pile Integrity Testing Consultant: Independent consultant with at least 2 years' experience in similar testing including performing testing and analyzing data. The testing shall be performed by a technician with at least 1 year experience in integrity testing. The interpretation of the records shall be performed by an engineer with at least 2 years' experience in integrity testing.

1.03 SUBMITTALS

A. Qualifications:

1. Provide detailed qualifications for:
   a. Secant Pile Contractor.
   b. Slurry Manufacturer's Onsite Technician.
   c. Independent Materials Testing Firm.
   d. Pile Integrity Testing Consultant.

B. Secant Pile Shaft Information and Narrative Plan (Plan):

1. At least 20 days prior to the start of secant pile construction, submit an Information and Narrative Plan that describes the proposed equipment and method of construction of secant pile shafts.

2. Remedial action plan(s) for repairing or replacing defective or otherwise nonconforming secant piles.
3. Groundwater Control Work Plan.

C. Project Records:

1. During secant pile wall construction, submit a daily drilled shaft record in a report format within 24 hours of completing each shaft installation. The daily record shall include the following information:
   a. Project Name.
   b. Name of Secant Pile Contractor, superintendent, and driller.
   c. Secant pile shaft name (Durham Digester 3).
   d. Secant pile identification number(s) consistent with the design document numbering.
   e. Ground surface elevation and top of secant pile elevation and coordinates.
   f. Secant pile length and diameter.
   g. Secant pile overlap.
   h. Theoretical volume of concrete required per drilled pile.
   i. Actual volume of concrete placed for each dilled pile.
   j. Records of obstructions encountered and resolution of obstruction removal or relocation of drilled pile.
   k. Unusual occurrences during drilling and backfill of pile.
   l. Record of re-drilling (if required).
   m. Concrete batch plant tickets.
   n. Slurry testing.
   o. Reinforcing placement.
   p. Concrete test results.
2. Record Drawings.

1.04 DEFINITIONS

A. Defect or Defective Pile:

1. The secant pile wall is an integral part of the completed work and its construction and integrity are paramount. The following will be considered defects and require satisfactory repair or replacement of defective piles:
   a. Exceeds specified vertical tolerances.
   b. Less than minimum wall thickness or interlock between piles.
   c. Less than specified minimum concrete strength.
   d. Cracks greater than 1/16 inch.
   e. Exceeds specified leakage.

f. Voids or cavities.
g. Concrete contamination or noncemented materials or soil intrusion.
h. Honeycombing.
i. Slurry debris and deposits in interlock preventing bonding of piles.
j. Interior surface protrusions or bulges if they negatively affect or impact construction of the digester or placement of fill between digester and secant system.
k. Inability to drill through existing piles to create interlock.
l. Failure of adjacent piles to interlock.
m. Interior diameter of secant pile shaft less than dimension indicated on the Drawings.

B. Digester 3 Excavation: Main excavation inside the secant pile wall.

C. Obstructions: A specific object (including boulders, logs, and manmade objects) encountered during secant pile construction which prevents or hinders the advance of the drill tooling, such that the advancement rate is significantly reduced relative to the rate of advance for the portion of the Work in the same geologic unit and same type of pile that does not contain the obstruction.

D. Primary Secant Pile: Primary secant piles are the alternating, unreinforced piles.

E. Secant Pile Shaft, Boring, Pile Hole: Secant pile's shaft, boring or hole.

F. Secant Pile Wall: Concrete wall that is formed with overlapping cast-in-place concrete piles. The concrete is placed using the tremie method, below existing grade in bored holes that are stabilized with drilling slurry and/or temporary casing.

G. Secondary Secant Pile: Secondary secant piles are the alternating piles, drilled between adjacent Primary Secant Piles.

H. Temporary Casing: Casing installed to facilitate secant pile construction that is removed during or shortly after concrete placement.

1.05 SECANT PILE SHAFT INFORMATION AND NARRATIVE PLAN

A. The Secant Pile Shaft Information and Narrative Plan (Plan) shall be prepared by the secant pile system Contractor and shall include the following calculations along with the layout drawings (Item 7) shall be prepared and stamped by a Professional Engineer licensed in the State of Oregon.

1. Data on all equipment necessary for the Work.
2. Background of the drilling equipment and its successful use on other projects with similar soil conditions and installation requirements.
3. Qualifications and experience of drilling equipment operator(s) and the drilling Contractor's onsite personnel.
4. Information that shows that the drilling equipment has sufficient capacity to drill in the Project's soil conditions and through previously installed secant piles to create the interlocking overlap.
5. An overall sequence of construction of the secant piles, ring beam, groundwater control, excavation, interior cast-in-place concrete structure, and backfilling.
6. Sequence of the installation of various secant piles forming the shaft wall including maximum time limits for drilling overlapping pile holes.
7. Layout drawing(s) and calculations including:
    a. Pile layout plan.
    b. Diameter of piles.
    c. Sequence of pipe installation using numbers indicated on the Contractor's approved submittal.
    d. Guide wall and ring beam details, if either is used. Guide walls and/or ring beam shall be designed to accommodate the existing electrical duct bank located east of Digester 3. The duct bank cannot be moved and the electrical system cannot be de-energized. Remove the upper portion of the secant system including the guide wall and ring beam in accordance with requirements provided on the Drawings.
    e. Wall penetration details.
    f. Reinforcement details, including requirements for reinforcing splices if applicable.
    g. Required minimum 28-day unconfined compressive strength of concrete.
    h. Calculations demonstrating the adequacy of the secant system to withstand anticipated earth and surcharge loading.

8. Demonstrate coordination with other systems including pipeline penetrations, existing structures, new and previously constructed structures, dewatering systems, landscaping, drain lines, etc.
9. Methods of excavation of the pile holes, including methods and procedures to assure the alignment, stability of pile holes, and clean bottom of pile holes.
10. Method and locations of slurry preparation, site distribution, reclamation, and disposal.
11. Qualifications of slurry designer and slurry manufacturer's onsite technician.
12. Slurry designs, including mix composition, tests to be performed, test methods and frequency of monitoring and testing to comply with requirements specified herein and manufacturer's recommendations.
13. Method of monitoring deviation from vertical of pile holes during excavation, and details of proposed corrective measures to be implemented if necessary.
14. Method(s) for cleaning pile holes, slurry deposit filled gaps, and equipment and method for checking and proving the cleanliness of excavated pile hole bottoms and soundness of foundation material, prior to placing concrete.
15. Method of installing and securing reinforcing.
16. Method of placing concrete and handling displaced slurry.
17. Method(s) for handling and stopping all flowing leaks in the secant pile wall prior to construction of Digester 3.
18. Concrete mix design including strength at 3-day, 8-day, and 28-day ages (include 56-day strength for Primary Secant Piles). Trial mix test results shall indicate slump immediately after mixing.
19. Manufactures data for automated pile monitoring and recording equipment and example report. Provide calibration data and manufacture data for each component of the monitoring system, including digital display unit, depth sensor, magnetic flow meter, field printer, grout pressure sensor, and torque pressure sensor.
20. Methods for conducting the verticality measurements.
21. Pile construction data log.
22. Contingency and emergency plans and procedures, such as: removal of obstructions, remedial repairs.

1.06 GROUNDWATER CONTROL WORK PLAN

A. Develop a work plan to address methods to be used to monitor and control bottom stability of the borings.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA

A. Subsurface Conditions: Refer to Geotechnical Data Report (GDR).

B. Secant Piles:

1. Construct the secant piles to the following tolerances and requirements:
   a. Center of Pile: Within plus or minus 1 inch of the locations indicated on the Contractor's approved design Drawings and Secant Pile Plan.
   b. Top Elevation of Pile: Within plus or minus 4 inches of the layout provided on the Contractor's approved Secant Pile Plan submittal and no lower than elevation 158 feet.
   c. Pile Tip Elevation: At or below the elevation indicated on the Contractor's design Drawings.
   d. Verticality: Construct individual piles within a tolerance of 1:200, or 0.5 percent, from vertical at any level over the upper 55 feet of each pile. Verticality of the piles below a depth of 55 feet shall be within a tolerance of 1:100 or 1.0 percent from vertical.
   e. Pile Diameter: Plus 1-inch or minus 0 inch of the diameter indicated on the Contractor's approved design Drawings and submitted Secant Pile Plan.
   f. Partial Depth Secant Piles: Contractor shall determine required minimum depth to maintain shaft stability. Install secant piles to at least elevation 132 feet.
   g. Leakage: Completed secant piles shall be cleaned to bare concrete by pressure washing. After cleaning, the exposed secant pile wall shall be free of all flowing water. Seal all flowing leaks in the secant pile wall. Flowing leaks shall be defined as a leak from which the water moves under the effects of wind or gravity. Moist patches that are not flowing are acceptable.
   h. Shaft Dimension at Inside Face of Secant Piles: Minimum radius indicated on the Drawings.
   i. Number of Piles: Equal to or greater than the indicated on Contractor's approved design Drawings.
   j. Refer to Drawings for all locations of utilities that will require penetrations through the secant pile excavation support system.
   k. Responsible for the design coordination of pile excavation support system with all disciplines including mechanical and electrical penetrations, landscaping, adjacent new structures, drain lines, etc.

2.02 TEMPORARY CASING

A. Temporary Casing: Capable of being installed and removed without disturbing the surrounding soil or damaging the pile shaft or adjacent piles. The outside diameter of the casing shall not be less than the pile diameter.

2.03 REINFORCING STEEL

A. As required per the Contractor's secant pile design.

B. Splices in reinforcing steel, if applicable shall be as required by the Contractor's design.

2.04 CONCRETE

A. Minimum concrete compressive strength as specified by the secant pile system designer in accordance with Article Secant Pile Shaft Information and Narrative Plan.

2.05 SLURRY

A. Nontoxic, easily degradable synthetic slurry or water slurry. Mineral slurries are not allowed.

1. Synthetic Slurry:
   a. Acceptable Manufacturers:
      1) Shore Pac GCV, CETCO.
      2) SlurryPro CDP, KB International.
      3) Super Mud, PDS Company.
      4) "Or-equal."
2. In conformance with the manufacturer's recommendations.
3. Mix Design:
   a. Appropriate for project requirements and conditions.
   b. Slurry manufacturer's onsite technician shall provide technical assistance and oversee the slurry preparation and use, recommend adjustments if necessary, and confirm the adequacy of the slurry for the site specific conditions.
4. Water: Clean, potable, and free of impurities detrimental to slurry, and compatible with the slurry mix design.
5. Performance Criteria:
   a. Hydrostatic Head Produced: Sufficient to provide hole stability and to prevent water and soil inflow to the drill-hole.
   b. Viscosity or Rheology: Sufficient to seal weak and open soil formations.

c. Stability and Flow: Ensure that the slurry will remain stable and fluid during excavation and until concreting is completed, and flows without gelling under displacement by concrete.
d. Sand Content: Maximum of 0.5 percent by volume measured two feet from the bottom of the pile, just prior to concreting, in accordance with API 13B-1.
e. Other Slurry Properties or Additives: As deemed appropriate or necessary to provide hole stability.

6. Water: Water without site soils or slurry additive may be used to control bottom heave within secant pile excavation when casing is used for the entire length of the boring. Use of water without full length casing may only be used with the approval of the Project Representative.

PART 3 EXECUTION

3.01 GENERAL

A. A preconstruction conference for the secant pile excavation support system shall be held at least 5 days prior to beginning any pile construction to discuss construction procedures, personnel, equipment, and other aspects of the construction. This conference will not be held until the requisite submittals have been reviewed and been approved or accepted. The Contractor's superintendent, slurry manufacturer's onsite technician, and drilling Contractor's project manager and supervisor(s) shall attend this conference.

A. The slurry manufacturer's onsite technician shall be onsite as necessary to provide technical assistance and oversee the slurry preparation and use, recommend adjustments if necessary, and confirm the adequacy of the slurry for the site specific conditions. Both natural and synthetic slurry shall be disposed of offsite in accordance with local, state, and federal requirements.

B. Preparation:

1. Construct guide walls, level construction pad, and layout the secant piles as indicated on the Drawings and tolerances indicated herein.
2. Proper guide walls shall be constructed to help achieve the necessary position and vertical alignment of the secant piles within the required tolerances.
3. Guide walls shall be fully constructed prior to construction of secant piles.

C. Conduct work so as not to damage facilities or improvements that are to remain in place. Employ construction methods that prevent the spillage of

excavated materials, drilling slurry, or concrete offsite onto streets, sidewalks, or other facilities.

3.02 DEMONSTRATION TESTING

A. Demonstration testing shall be conducted on three overlapping piles that are part of the secant pile wall.

B. Provide pile drilling and construction monitoring and recording measurements and analysis on the demonstration piles.

C. The Contractor will make a determination on the acceptability of the demonstration piles, based on the construction reports and construction monitoring test results and analyses.

D. For each demonstration pile, pile integrity testing shall be performed in accordance with ASCE D5882 by the approved Pile Integrity Testing consultant.

1. The integrity testing shall not be performed until the concrete has cured for a minimum of 7 days, unless otherwise approved by the Engineer.

E. For each demonstration pile perform the following testing:

1. Slurry, if used to maintain hole stability:
   a. Test results shall be within the particular manufacturer's acceptable range. Provide testing for:
      1) Density.
      2) Viscosity.
      3) pH.
      4) Sand content testing prior to placing concrete.
2. Concrete used for secant piles. Test concrete in each demonstration pile for:
   a. Unit weight and air content in accordance with ASTM C138.
   b. Slump in accordance with ASTM C143.
   c. Temperature in accordance with ASTM C1064.
   d. Strength testing of 6-inch by 12-inch cylinders. Prepare and cure a minimum of eight 6-inch by 12-inch cylinders for each of the demonstration piles in accordance with ASTM C31. Complete strength testing following ASTM C39. Two cylinders shall be tested at 3 days, two at 7 days, and two at 28 days with two cylinders provided for reserve testing at cure times determined by the Engineer.

F. For each demonstration pile demonstrate the following procedures are completed in accordance with specification requirements:

1. Secant pile drilling and verticality control.
2. Concrete tremie placement.
3. Placement of reinforcing steel, if required by the Contractor's design.

G. If the adequacy to demonstrate of the proposed means and methods fails, or subsequently, materially changes the means and methods, additional demonstration testing as described herein will be required.

3.03 BORINGS FOR SECANT PILES

A. Install temporary casing as necessary to maintain the hole until concrete is placed. Casing shall be installed by either rotating or oscillating the casing. Installing the casing by vibratory means will not be allowed. Sufficient quantity of temporary casing shall be onsite at all times to maintain productivity.

B. Excavate in a manner such that the soil outside the pile diameter is not adversely affected and without excavating below the bottom of temporary casing. Use pile boring methods that will minimize over-excavation and loosening and caving of material outside the pile diameter. Anticipate that obstructions may be encountered and be prepared to implement appropriate procedures and equipment for their removal. Advise Project Representative immediately upon encountering obstructions. Fragments of any obstructions encountered shall be retained and provided to the Project Representative.

C. Perform borings continuously from ground surface to the required depth. If the pile shaft excavation cannot be completed in a single continuous operation, the pile shaft shall be backfilled to a minimum depth of 5 feet above the bottom of the casing and drilling slurry shall be maintained at such an elevation as necessary to prevent caving and bottom-of-hole instability. Similarly, do not leave a completed drilled shaft excavation open overnight. Either complete the shaft by placing concrete or temporarily complete as described.

D. Provide suitable equipment for checking plumb, alignment and dimensions of each pile hole excavation. Plumb, alignment, and dimensions shall be checked frequently, but at not less than at 15-foot intervals.

E. Maintain excavated soil within cased pile hole or fill each pile hole with slurry or water as necessary to maintain a stable hole. The process of advancing the borehole and the temporary casing shall be such that the soil is not drawn into

the bore from outside the area of the pile and cavities are not created outside the temporary casing.

1. For drill systems where soil is incrementally removed from the cased pile hole, add water or slurry to the hole as necessary to prevent base heave or caving. Maintain a minimum excess pressure head of 10 feet at the base of the pile hole.
2. For cased auger or dual-rotary drill systems maintain base stability using continuous flight hollow shaft auger and creating a head of cement grout at least 10 feet above the point of injection as the auger is withdrawn through the bottom 30 feet of the pile. A head of cement grout shall be maintained at all times during the pumping and extraction process so that the grout has a displacing action removing any loose material.

F. Slurry:

1. Slurry, where used, shall be mixed, thoroughly hydrated, and tested for conformance with the design material properties before being placed in the drill hole.
2. The date, time, name of person sampling and testing and results shall be recorded and provided to the Project Representative.
3. Samples of slurry from the mid height and within 2 feet of the bottom of the drill hole shall be taken and tested at least once every 4 hours to verify the control of the slurry properties.
4. Sampling and testing shall be taken at least every 2 hours if the slurry is not re-circulated in the drill hole or if the previous sample did not have consistent design properties.
5. All slurry shall be re-circulated or agitated with the drilling equipment when tests show that the samples do not have consistent specified properties.
6. Slurry samples shall be taken and tested prior to final cleaning of the bottom of the hole and again prior to placing concrete.
7. Cleaning of the bottom of the hole and placement of concrete shall not start until tests show that samples taken at mid-height and within 2 feet of the bottom of the hole have consistent specified properties.
8. Clean, re-circulate, de-sand, or replace the slurry to maintain the required slurry properties.

G. Perform borings near utilities and duct banks that are to remain in place without causing damage to, or movement of, these facilities, including damage to completed piles.

H. Dispose of all excavated materials in accordance with applicable permits and regulatory requirements.

I. Do not advance adjacent primary pile borings within 24 hours of each other.

J. Do not advance secondary pile borings if adjacent primary piles contain unset concrete and concrete in adjacent primary piles has not been in place a minimum of 24 hours.

3.04 SECANT PILE INSTALLATION

A. Utilize temporary shoring and maintain slurry or water in the pile hole or utilize continuous flight augers with combination of soil and head of cement grout as necessary to prevent heaving and bottom-of-hole instability.

B. In the event that the results of the pile monitoring and associated measurements indicate the potential that the secant pile installation is out of compliance with the requirements for pile diameter, cross sectional shape, location or verticality, verbally communicate the potential to the Project Representative prior to placing reinforcing and/or concrete in the hole. The Project Representative may direct the Contractor to fill the hole with Controlled Density Fill to allow it to be redrilled in accordance with the specified tolerances.

C. Prior to placing reinforcing and/or concrete in the pile hole, clean the bottom of the hole of all loose material. No more than 6 inches of loose or disturbed material shall remain. Reinforcing shall be braced/supported such that it is properly situated and aligned within the pile (horizontally and vertically) and maintained during concrete placement.

D. Provide minimum of 2 inches of concrete cover over reinforcing steel.

E. Place concrete as soon as possible after completion of pile hole drilling, inspection of the hole, and placement of the reinforcing. Holes shall not be left open longer than 4 hours after drilling is completed at any stage of excavation. If for some reason this cannot be accomplished in certain instances, comply with the requirements of this section.

F. Place concrete by tremie method, in such a manner that the concrete displaces the slurry or excavated soil progressing from the bottom and rising uniformly level to the required top elevation. Concrete placement shall continue in one operation to the top of the pile hole and the elapsed time from the beginning of concrete placement in the pile hole to the completion of the placement shall not exceed 2 hours. Admixtures in the concrete mix shall be adjusted for the

conditions encountered on the Job so that concrete remains in a workable plastic state throughout the 2-hour placement. Before concrete placement, test remains in a plastic state throughout the 2-hour placement. Before concrete placement, presubmit test results of both a trial mix and a slump loss test using methods to demonstrate the concrete meets the 2-hour requirement. The tests shall be conducted using concrete and ambient temperatures appropriate for site conditions. At the discretion of the Project Representative, a placement time in excess of 2 hours may be granted if the Contractor has previously requested an extended period of placement by documented procedures that can be used to maintain concrete in a workable state and can demonstrate that the concrete has remained workable for the specific secant pile where the extended placement period is requested.

G. The discharge end of the tremie pipe shall include a device to seal out water while the tube is first filled with concrete. The tremie shall be initially positioned at the bottom of the hole prior to placing concrete. Throughout the concrete placement operation, the discharge end of the tube shall remain submerged in the concrete at least 5 feet and always contain enough concrete to prevent water from entering.

H. If concrete placement is halted for any reason in a manner that could lead to defective concrete, the top surface of the tremie concrete shall be cut back to sound concrete and cleaned of all laitance and weak concrete. The remainder of the pile shall either be cast by tremie or in the dry. Where concrete is placed in the dry, the concrete shall be placed by tremie and the free fall of the concrete from the bottom of the tube shall not exceed 1.5 times the diameter of the pile. Temporary casing shall be extracted while the concrete within remains sufficiently workable to ensure that the concrete is not lifted. When the casing is withdrawn as concreting proceeds, a sufficient head of concrete shall be maintained to prevent the entry of groundwater that may cause reduction of cross-section of the pile.

3.05 SECANT PILE INSPECTION

A. Perform the pile installation monitoring continuously during pile drilling, tool extraction, and backfilling. The monitoring shall assure a minimum grout volume is pumped per unit depth increment.

B. Immediately inform the Project Representative of over-excavation, obstructions, or boring that is out of tolerance.

C. Use appropriate inspection devices before tremie concreting, to demonstrate that the pile hole bottom has been properly cleaned and excavated to the

specified diameter, depth, verticality, and that the requisite overlap of piles will be attained.

D. Check concrete properties as required prior to placing. Closely monitor concrete placement and chart actual volume of concrete placed versus theoretical volume required.

E. Maintain pile construction log.

3.06 PILE MONITORING AND ANALYSIS

A. For all piles provide continuous monitoring during drilling, tool extraction, and backfilling of each pile. Monitor for:

1. Pile alignment.
2. Pile profile.
3. Extraction rate with pumped grout volume.
4. Concrete grout pressure.

B. Record preliminary results and findings of monitoring for each secant pile installed. Submit draft records within 4 hours after testing for the demonstration piles and within 24 hours after testing for production piles. Submit the final results, analyses and interpretations in accordance with ASTM D5882 and in reporting format. Submit test results within 3 days after testing. A final compilation report containing all of the secant pile installation records shall be prepared, stamped, dated, and signed by the testing firm's or secant pile installation Contractor's Professional Engineer. The report should document the secant pile construction activities, provide figures showing the layout and identification number of the secant piles, summarize the installation and monitoring activities performed, summarize nonconforming piles and methods used to correct or replace nonconforming piles.

C. Should the test results indicate that the secant pile is out of tolerance, or the test results appear suspect by either the testing firm's Professional Engineer or Project Representative, immediate notify the Project Representative. Retesting may be directed by the Project Representative.

3.07 SPOIL HANDLING AND DISPOSAL

A. Excess materials, waste and spoil shall be removed by the Contractor from the construction area and disposed of offsite in according to local code.

B. Continuously remove drilled spoil during shaft placement.

3.08 CORRECTION OF DEFECTIVE PILES/REMEDIAL REPAIRS

A. For those drilled pile shafts determined to be defective, the drilled hole shall be filled with Controlled Density Fill in order to permit the secant pile to be redrilled.

B. For those piles determined to be defective, submit a remedial action plan for review.

C. Remedial action plans shall demonstrate the suitability for the intended replacement of the out of tolerance pile. Remedial work shall not begin until the information submitted has been reviewed and the remedial action plan accepted. Allow 3 days for the Project Representative's review.

D. Remedial repairs and subsequent verification testing.

3.09 RECORD DRAWINGS

A. Maintain as-built records of the Work in accordance with the guidance provided in the ADSC Drill Shaft Inspector's Manual, including:

1. Pile identification.
2. Excavation depth and elevations of top and bottom of finished piles.
3. Summary of dates and times of construction of all pile borings, excavation, reinforcing and concrete placement.
4. Summary description of soils encountered on all pile borings, obstructions, and problems with excavation or concrete placement, if any.
5. Deviation of all piles from vertical, if any.

3.10 SHAFT EXCAVATION

A. Following completion of the secant pile wall excavate the interior of the shafts in accordance with Section 02315, Excavation.

B. Excavation shall not commence until the concrete in all of the piles has reached the minimum specified design strength.

C. Maintain the depth of excavation within 6 feet of level across the shaft during excavation.

D. Remove any protrusions or bulges interfering with construction or backfill of the Digester. Properly repair or grout any cavity that interferes with the

installation of subsequent materials, or construction, or compromises the integrity of the wall (strength, leakage).

E. Repair leaks in the secant piles so that the leakage does not result in loss of ground outside the secant pile shoring system. Stop leakage using proven methods appropriate for the situation. Such repairs and repair materials will be subject to review by the Project Representative.

3.11 FINISHING

A. Clean the interior wall face to remove soil and loose concrete.

B. Repair all leaks such that the completed secant piles and excavated shaft to prevent the loss of ground outside of the shoring system.

C. Remove the top of the secant piles after construction of Digester 3 and placement of backfill around the digester as noted on the Drawings.

3.12 GEOTECHNICAL INSTRUMENTATION MONITORING

A. Install geotechnical instrumentation and monitor in accordance with Section 02205, Instrumentation and Monitoring.

3.13 FIELD QUALITY CONTROL

A. Control Testing of Synthetic Slurry: If synthetic slurry is utilized, use suitable means and methods to test and properly control quality of synthetic slurry.

B. Test Equipment and Methods: Provide test equipment and methods that conform to the requirements of API 13B-1.

C. As a minimum, take samples and perform tests specified below in accordance with referenced standards to verify that properties of slurry inside pile holes are within the specified limits during drilling, including sand content, prior to final cleaning and just prior to placing concrete. Comply with slurry manufacturer’s technical representative’s recommendations or requirements. Test results shall be within the particular manufacturer’s acceptable range. Sand content prior to placing concrete shall be as specified in this section.

1. Density.
2. Viscosity.
3. pH.
4. Sand content.

D. Concrete used for secant piles for:

1. Unit weight and air content in accordance with ASTM C138.
2. Slump in accordance with ASTM C143.
3. Temperature in accordance with ASTM C1064.
4. The concrete mix shall be sampled using 6-inch by 12-inch cylinders. One set of concrete cylinders shall be collected for each day during which secant piles are constructed and six cylinder samples shall be collected for each 50 cubic yards of concrete placed. Cylinders shall be cured and tested in accordance with ASTM C31.
5. Strength Testing:
   a. During the progress of the Job standard compression testing shall be completed in accordance with ASTM C39 by the approved material testing laboratory.
   b. From each set of six cylinders, two shall be tested at 3 days, two at 7 days, and two at 28 days, unless specified strength has already been obtained.
6. Other testing and methods in accordance with Section 03300, Cast-in-Place Concrete.

E. Inspect concrete used in secant piles to the requirements stated herein.

3.14 CONSTRUCTION IN VICINITY

A. Do not excavate or drive piling outside of the secant pile wall which will expose the exterior face of the secant piles prior to the secant pile concrete reaching design strength.

END OF SECTION

SECTION 16611
UNINTERRUPTIBLE POWER SUPPLY

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies an on-line, double conversion single-phase uninterruptible power supply (UPS) system to provide backup power for the Digester Complex 1 (DC1) waste gas burner system at the Durham Wastewater Treatment Facility.

B. The UPS equipment includes a UPS comprising a rectifier/charger; pulse-width-modulation inverter; displays and controls; discrete relay outputs; make-before-break, wrap-around maintenance bypass switch; DIN rail mounted circuit breakers and terminals for load outputs; wall-mounted enclosure; and appurtenances.

C. The UPS integration services include installation, configuration, commissioning, and training for a completely operational UPS system.

1.02 RELATED SECTIONS

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.

C. The following sections are related to the Work described in this section. This list of related sections is provided for convenience only and is not intended to excuse or otherwise diminish the duty of the Contractor to see that the completed Work complies accurately with the Contract Documents.

D. Section 01330, Submittal Procedures.

E. Section 01612, Anchorage and Bracing.

F. Section 16050, Common Work Results for Electrical.

G. Section 16075, Electrical Identification.

1.03 QUALITY ASSURANCE

A. Referenced Standards: This section incorporates by reference the latest revisions of the following documents. In case of conflict between the requirements of this section and the listed documents, the requirements of the Contract Specifications shall prevail.

Reference	Title
IEEE 485	Recommended Practice for Sizing Lead – Acid Batteries for Stationary Applications
NFPA 70 UL1778	National Electrical Code (NEC) Uninterruptible Power Supply Equipment

B. Label: UPS equipment shall bear a UL or other label acceptable to the inspection authority having jurisdiction for the specific application and be UL1778 listed.

C. Manufacturer shall have a minimum of 5 years in the design, manufacture, and testing of solid-state UPS systems.

D. Prior to shipment, the manufacturer shall fully and completely test the system to assure compliance with these specifications and shall include as a minimum: Operational discharge and recharge tests to guarantee rated performance.

1.04 SUBMITTALS

A. Procedure: Section 01330, Submittal Procedures.

B. Catalog cuts showing general features of the UPS and batteries.

C. Battery discharge/recharge calculations showing a minimum of 20 minutes backup time for the specified downstream loads including: 120V ac/2A waste gas burner control panel; 120V ac/1A valve actuator; 120V ac/0.2A flow transmitter.

D. Dimensions and weights of components including working clearances.

E. Block diagram depicting functional operation of UPS.

F. Configuration instructions for dry contact relay outputs.

G. Installation instructions and drawings.

H. Cabling and termination requirements.

I. Maximum input and output current.

J. Wiring diagrams, internal and external.

K. User's manual.

1.05 PERFORMANCE REQUIREMENTS

A. Equipment AC Input Characteristics:

1. Normal Source: 120V ac, single-phase, 3-wire.
2. Operating Voltage Range: Plus 10 percent to minus 15 percent (minus 20 percent without battery discharge).
3. Frequency Range: 40 Hz to 70 Hz.
4. Input Current Distortion: 5 percent total harmonic distortion maximum at full load.
5. Input Power Factor: 0.98 lagging at full load.
6. Surge Protection: Sustains input surges without damage per IEEE C62.41, Category B.

B. Equipment ac Output Characteristics:

1. Voltage: 120V ac, single-phase, 3-wire.
2. Voltage Regulation: Plus or minus 3 percent nominal for no load to full load.
3. Frequency Regulation: 60 Hz plus or minus 5 percent.
4. Frequency Synchronized to Power Source: Automatic disconnect at plus or minus 0.5 Hz.
5. Output Power Rating: 1,500VA at 0 degrees C to 40 degrees C ambient.
6. Voltage Transient Response: Plus or minus 7 percent maximum upon application or removal of 50 percent to 100 percent load step; recovery to plus or minus 1 percent of steady state within 100 mS.
7. Overload Capability: 150 percent for 2 seconds.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Ambient temperature ranges from 50 degrees F to 95 degrees F.

B. Elevation above sea level is 0 feet to 500 feet.

C. Relative humidity 5 percent to 95 percent, non-condensing.

1.07 SEISMIC ANCHORAGE AND STRUCTURAL DATA

A. Mechanical, instrumentation and control, electrical, nonstructural systems, components, and elements permanently attached to the structure shall be anchored and braced to resist seismic forces. Contractor shall design the structural components, seismic attachment, braces, and anchors to the structure.

1.08 EXTENDED WARRANTY

A. In addition to the manufacturer's standard warranty, the Contractor shall repair or replace without charge to the District, any equipment or part thereof, that the Contractor supplies that fails in operation during normal use within two years from the date of acceptance of the UPS system.

PART 2 PRODUCTS

2.01 CANDIDATE MANUFACTURERS/PRODUCTS

A. The UPS system shall be capable of providing 1,500VA. Acceptable manufacturer includes the following:

1. Eaton 9SX 1500VA UPS with Industrial Relay Card.
2. "Or-equal."

2.02 GENERAL

A. All materials and components shall be new and currently manufactured.

B. UPS shall be a true on-line system designed to operate in the following modes:

1. Normal: Load is powered by the UPS inverter, which obtains power from upstream normal power.
2. Back-Up: Load is powered by the UPS inverter, which obtains power from the battery automatically without interruption, and returns to upstream normal power without interruption.
3. Recharge: Upon restoration of upstream normal power, the input converter shall automatically restart and resume supplying power. The battery charger shall then recharge the batteries.
4. Automatic Restart: Upon restoration of upstream normal power after a power failure that resulted in complete battery discharge, the UPS shall automatically restart and resume supplying power to the load and the battery charger shall automatically recharge the batteries, unless disabled or delayed by the user.

5. Automatic Bypass: UPS failure shall automatically cause the load to transfer from the inverter to the bypass.
6. Manual Bypass: Shall cause an immediate transfer of load from the inverter to the bypass source without disruption to input converter, inverter, and battery charger functions.

2.03 CONVERTER/INVERTER

A. Converter:

1. Input converter changes incoming ac power to a regulated dc output to the inverter and provides input power factor and input current distortion correction. The input converter shall be provided with:
   a. Undervoltage protection (including low-energy surges introduced on the primary source and bypass source).
   b. Overvoltage protection.
   c. Capability to sustain input surges without damage per IEEE C62.41, Categories A and B.

B. Inverter:

1. Output inverter converts dc power from the input converter or batteries into precise regulated ac power sine waves. The inverter shall be:
   a. Capable of supplying current and voltage for overloads up to 150 percent of full load current for up to 10 seconds.
   b. For currents greater than 150 percent or longer time durations, the inverter electronic current-limiting protection shall protect the inverter regardless of the magnitude of connected output overload.
   c. Capable of providing control logic to sense overload and disconnect from critical load without needing to clear protective fuses, and to shutdown voltage set point to prevent battery damage from discharging.
   d. Automatically transfer to bypass when any of the above conditions are exceeded.

2.04 BATTERY

A. Provide the required number of battery modules to meet a reserve time of 20 minutes at loads specified.

B. Batteries shall be sealed maintenance-free, lead acid type with a three-year to five-year life expectancy.

2.05 UPS MONITORING AND CONTROLS

A. UPS Local Display and Alarms:

1. Front panel LEDs and LCD display shall indicate and alarm the following:
   a. Indicate Only:
      1) AC Input Failure.
      2) On Battery Power.
      3) Load On/Off.
      4) On Inverter.
   b. Indicate and audibly alarm:
      1) Replace Battery Module.
      2) Replace Power Module.
      3) Replace Control Module.
      4) On Bypass.
      5) Low Battery.
      6) Over Temp Warning.
      7) UPS Shutdown.
      8) Output Undervoltage.
      9) Output Overvoltage.
      10) DC bus Overvoltage.
   c. Upon fault condition, the UPS shall attempt to maintain load or transfer load to bypass.
   d. UPS shall be provided with an audible alarm silence button.

B. The UPS shall be provided with 125V ac/5A, form C, relay contacts for the following:

1. AC Input Failure.
2. On Battery.
3. Low Battery.
4. On Bypass.
5. UPS Fault.

C. UPS Control:

1. Initiate automatic battery test either on a user defined periodic schedule or user defined date and time.
2. Automatic UPS bypass circuit shall transfer the load to the bypass source based on:
   a. Inverter overload capacity exceeded.
   b. Inverter over temp.
   c. UPS fault condition.

3. Automatic UPS bypass circuit shall transfer the load, without exceeding transient limits, when an overload or malfunction occurs within the UPS. The bypass shall have an overload rating of 200 percent rated full load for 10 cycles. Automatic bypass shall be inhibited if one of the following conditions exist:
   a. Inverter/bypass voltage difference exceeds preset limits (plus or minus 15 percent of nominal).
   b. Bypass frequency is out of preset limits (plus or minus 5 percent of nominal frequency).
4. Automatic retransfer of the load back to the UPS shall occur unless:
   a. It is inhibited by manual control.
   b. Bypass is out-of-synchronization range with inverter output.
   c. Overload condition exists in excess of the inverter full load rating.
   d. There is a UPS fault condition present.
5. Manual internal UPS bypass circuit shall allow power to bypass the rectifier, battery charger, inverter, and battery.

2.06 MAINTENANCE BYPASS SWITCH POWER DISTRIBUTION UNIT

A. Mounted in common enclosure with UPS.

B. Provides complete “wrap-around” protection to allow the UPS to be pulled from service. The “wrap-around” allows the electrical load to be connected to the upstream normal power during UPS and battery maintenance. Provide a make-before-break bypass for the UPS and battery without shutting down the load.

C. Acceptable product is the rack-mountable Eaton HotSwap MBP Catalog No. EHBPL1500R-PDU1U “or-equal.”

2.07 DIN RAIL, OUTPUT CIRCUIT BREAKER AND TERMINALS ASSEMBLY

A. Provide a rack-mounted 35 mm DIN rail assembly complete with output circuit breakers, terminals and internal wiring as shown on the Drawings.

2.08 RACK ENCLOSURE

A. Enclosure:

1. UPS, maintenance bypass switch PDU, and DIN rail assembly shall be housed in a wall-mounted, NEMA 1, 15 bay (15U) rack enclosure.
2. Acceptable product is NavePoint 00406210 “or-equal.”

B. Enclosure Sliding Shelf:

1. Include slide shelving for UPS for ease of maintenance.
2. Shelf: 1-bay (1U) vented sliding 4-post adjustable shelf with weight capacity to handle equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Equipment Mounting:

1. Install uninterruptible power supply, maintenance bypass PDU and DIN rail for output load interconnection in the wall-mounted 15U rack enclosure as shown on the Drawings. Installation per the manufacturer's installation instruction.
2. Wall mount the UPS panel at the approximate location shown on the Drawings. Coordinate final location with the Owner. Provide seismic anchorage and bracing.
3. Mount equipment near front of enclosure.

3.02 FIELD TESTING

A. In addition to any testing herein, perform all testing for this product or system consistent with the requirements of applicable codes, and the manufacturer's current quality assurance program.

B. Test prior to operational use.

C. Load Test:

1. Use 0.8 power factor load bank.
2. Disconnect ac input and operate UPS at rated load.
3. Record operating time and battery voltage.
4. Continue operation at rated load battery cutoff.
5. Monitor battery voltage and record value just prior to cutoff.

D. Battery Recharge Test: Connect ac power to each battery module in low batter state and record battery specific gravity. Allow battery module to be charged and record battery specific gravity at end of specified recharge duration.

E. Relay Output Test: Verify relay outputs are correctly configured. Verify that "UPS Fail" contacts are wired to and correctly monitored by 120V ac digital input at PLC panel. Verify that "AC Input Fail" contacts are wired to and correctly monitored by "Full Open Override" input at actuator for flow valve.

END OF SECTION