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ADDENDUM NUMBER 01

Owner: Gwinnett County Board of Commissioners

Project: BL068-26, Drowning Creek Water and Sewer Project

Project No.: Project No. F01633.1

Addendum No. 01

Addendum Date: July 8, 2026

The following additions, deletions, modifications, or clarifications shall be made to the appropriate portions of the Contract Documents. Bidders must acknowledge receipt of this Addendum in the space provided on the Bid Form.

ARTICLE 1 – ADDENDUM

- 1.01 Amend the Contract Documents
- A. Make the additions, modifications, or deletions to the Contract Documents described in this Addendum.
- 1.02 Acknowledge Addenda
- A. Acknowledge receipt of this Addendum in the Bid Form submitted for this Project. Failure to acknowledge receipt of this addendum in the Bid Form may render the Bid as non-responsive and serve as the basis for rejecting the Bid.

ARTICLE 2 – BID REQUIREMENTS

- 2.01 No changes.

ARTICLE 3 – SPECIFICATIONS

- 3.01 Add the following Specification Sections:

Section	Section Title
33 05 23.71	Tunnel Lining
33 11 13.05	Ductile Iron Pipe (Water)
33 12 13	Water Service Connections
33 12 16	Water Utility Distribution Valves
33 12 19	Water Utility Distribution Fire Hydrants
33 12 19.81	Relocate and Reconnect Hydrants, Valves, and Meters
33 31 00	Sanitary Utility Sewerage Piping
34 41 16.10	Traffic Control
34 71 00	Roadway Construction

ARTICLE 4 – DRAWINGS

4.01 No changes.

ARTICLE 5 – APPENDICES

5.01 Add the following Appendices:

Appendix No.	Appendix Title
Appendix A	Geotech Reports
Appendix B	SUE A – Report of Subsurface Utility Engineering Services
Appendix C	SUE B – Subsurface Utility Engineering Quality Level “B” Survey

ARTICLE 6 – QUESTIONS

A. No changes.

END OF ADDENDUM NO. 01

SECTION 33 05 23.71

TUNNEL LINING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Overview
1.4	Work Included
1.5	Qualifications
1.6	Submittals
2.1	Manufacturers
2.2	Materials
3.1	Bulkheads
3.2	Construction Procedure
3.3	Excavation
3.4	Grouting
3.5	Liner Plates
3.6	Bypass Pumping
3.7	Safety Precautions

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Brick Masonry (04 21 13).
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00).
7. Bypass Pumping (33 01 30.74).
8. Traffic Control (34 41 16.10).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 OVERVIEW

- A. The method of construction for tunnel liner and manner of doing work shall be that selected by the Contractor but subject, at all times, to the prior approval by the Engineer and GCDWR. Unlined tunneling shall not be permitted.

1.4 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, labor, tools, and equipment necessary for the complete installation of a lined tunnel, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. The Work shall include, but is not limited to: excavation, liner plates, sheeting, grouting operation, brickwork, cradles, bases, fills, bolts, and other appurtenances; furnishing the services of qualified representatives of the liner plate manufacturer, and all labor, supervision, materials, tools, and accessories necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.5 QUALIFICATIONS

- A. Tunneling operations shall be performed by a qualified contractor who has constructed at least five (5) similar installations, which were constructed within (1) year of each other and have been in continuous successful operation for not less than five (5) years.

1.6 SUBMITTALS

- A. Submit to the Engineer, per the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, evidence of Tunnel Lining experience as specified in paragraph 1.5.A. of this specification.
- B. The Contractor shall submit to the Engineer, GCDWR, GCDOT, (and GDOT when work is within a state road right-of-way), all working drawings and schedules of procedure the proposed to be followed in the prosecution of the Work under this item.
- C. Working drawings shall show in detail the means and methods of tunneling operations together with all sheeting and shoring, materials of construction and installation, and all other structural details together with large scale plan and profile of the proposed tunneled pipe installation and affected structures.
- D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
- E. The Contractor shall not proceed with the Work until final approval has been given by the Engineer, GCDOT, and/or GDOT.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements, provide products by one (1) of the following: Warren, Contech, Commercial Pantex Sika Inc., or approved equal.

2.2 MATERIALS

A. TUNNEL LINER PLATES

1. Have the panels formed inward and made at least of No.8 gauge (.1644 inches) standard tunnel liner plates for Warren and Commercial liner plates and at least of No.10 gauge (.1345 inches) tunnel liner plates for Contech liner plates and be coated per GCDOT specification.
2. The plates shall be hot rolled, cold formed steel conforming to ASTM: A1011/A1011M with the following mechanical properties before cold forming:

Tensile strength =	49,000 psi
Yield strength =	30,000 psi
Elongation, 2 inches =	25%

PART 3 - EXECUTION

3.1 BULKHEADS

- A. The ends of the tunnel liner shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. All sheeting placed for the tunnel operations must be completely removed by the Contractor.

3.2 CONSTRUCTION PROCEDURE

- A. Unless otherwise specified or approved by the Engineer, follow the construction procedure outlined in paragraphs 3.3. Excavation, 3.4 Grouting, 3.5 Liner Plates, 3.6 Bypass Pumping, and 3.7 Safety Precautions, of this specification.

3.3 EXCAVATION

- A. Excavate and dispose of all materials whatever character encountered, including rock, within the external limits of the tunnel, in such a manner as to assure no settlement in the ground or structures over or near the tunnel. Conform to the outside of the tunnel section as nearly as possible.
- B. Fill voids formed outside of liner plates by the removal of rock by packing with cement mortar as directed by the Engineer or GCDWR.
- C. In the finished excavations, no deviation in excess of four (4) inches from the lines and grades given shall be tolerated. Remedy any excess deviation.
- D. Where tunneling is done with the use of a shield, Contractor shall have the shield designed by an experienced designer, subject to the approval of the Engineer. Make shield structurally sufficient to carry all loads that may be imposed upon it and equip it with steering devices and a sufficient number of jacks to propel the shield accurately to line and grade. Carry jack reactions into the liner plates and sufficient number of rings back of the shield to properly distribute the thrust. Use timber breastworks if necessary

to cause the angle of repose of the excavated material to fall within the limits of the shield.

- E. If poling plates are used in lieu of a shield, make of steel and of an interlocking design adequate for the Work.

3.4 GROUTING

- A. Grout the space between the plates and the excavation. As specified, as indicated on the Drawings, the carrier pipe shall be inserted into the space inside of the liner plates; placed upon approved skids or insulators (for mains with diameters of 6-inches or greater) previously set in the tunnel. The ends of the tunnel shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. Grouting shall be subject to the direction of the Engineer or GCDWR. All voids in the area outside the plates shall be pressure grouted every 10 feet, at the end of the work shift, or more frequently if soil conditions dictate. Before grouting any segment of tunnel liner, that segment shall be sealed sufficiently between the liner plates and the surrounding soil to retain the grouting pressure. These seals shall be located as follows:
 - At the entrance of the tunnel
 - Between grout intrusion nipples
 - Within one (1) foot of the end of the tunnel at the end of the work shift
- C. Perform grouting by a suitable machine, capable of forcing grout into all voids which it is desired to fill. A maximum pressure of 50 pounds per square inch at the grouting nipple may be required.
- D. Make grout of Portland Cement and water as specified, as indicated on the Drawings, or as directed by the Engineer. Where large voids are to be filled, fine sand in a proportion of not more than two (2) parts of sand to one (1) part of cement, may be used as directed by the Engineer.
- E. Take care to avoid causing grout to flow into pipes or conduits. If grout flows into pipe or conduits, remove it.

3.5 LINER PLATES

- A. Line tunnel excavation with rolled or pressed steel liner plates of the quality and type herein specified. Assemble liner plates in a true circle having an outside diameter in place as specified, as indicated on the Drawings.
- B. Provide at least one-sixth ($1/6^{\text{th}}$) of the plates with grout holes; tapped for 1- $1/2$ inch pipe and provide with cast iron screw plugs.
- C. Steel liner plates shall be installed as soon as possible, but no more than five feet (5') of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot (1') of tunnel shall be left unlined at the end of the day's operation.
- D. Liner plates shall be installed in accordance with the manufacturer's recommendations and shall be self-supporting.

- E. Punch all plates for $\frac{3}{4}$ inch bolts and use all bolt holes in installing. Upon completion of any ring of liner plates, retighten bolts in the two (2) rings previously completed.
- F. The use of steel liner plates shall not relieve the Contractor of full responsibility to properly shore, brace, and protect the tunnel excavation. Provide such temporary supports as may be necessary to properly support the face of headings and the roof and sides of the tunnel until the sewer pipe has been installed and the cradle and sand or grout fill has been placed.
- G. Completely excavate, place the steel lining, and grout each section of tunnel as specified, as indicated on the Drawings, or as directed by the Engineer for the entire distance between shafts or headings before pipe is placed.
- H. Damaged spelter coating shall be repaired in accordance with Georgia Department of Transportation Standard Specifications Section 645. Any plates having damaged spelter or bituminous coatings shall be repaired or replaced at the Contractor's expense.

3.6 BYPASS PUMPING

- A. Furnish and maintain adequate temporary bypass pumping equipment with proper standby units meeting requirements of Section 33 01 30.74 BYPASS PUMPING, to permit the concrete and pipe to be placed in the dry. Continue bypass pumping until all concrete and grout has received its' initial set.

3.7 SAFETY PRECAUTIONS

- A. The tunneling operation is to begin in a pit sheeted and shored as necessary, and begin at and proceed from one end. All of the applicable requirements of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Section 615, latest edition shall be observed. The Contractor shall conduct the operations in such a manner that all Work shall be performed below the level of the roadbed. The Contractor shall be responsible for coordinating and scheduling all of the Work with the Georgia Department of Transportation (GDOT), or Gwinnett County Department of Transportation (GCDOT), whoever has jurisdictional authority for the roadway being tunneled.
- B. All tunneling Work, at one particular location, shall be completed before Work is started at another location.
- C. If the tunnel installation Work is being conducted in a manner detrimental to the over passing roadway, or to the safety of the traveling public, all operations of tunneling shall cease until the necessary safety precautions have been made. In the event that distress occurs to the roadway due to the tunneling, the Contractor shall be required to submit to the Engineer, for approval by GDOT or GCDOT, a plan to repair the roadway as well as incur the costs of repair.
- D. A temporary bulkhead against the face of the excavation shall be provided and well braced during each cessation of work while the heading is within twenty feet (20') of railroad tracks or highway pavement.

- E. Furnish and maintain an adequate forced ventilation installation and comply with all the requirements and regulations of the State of Georgia and such other public bodies as have jurisdiction.
- F. Do not consider air from pneumatic tools and equipment as ventilating air. Make suitable provisions for abating dust during construction.
- G. Make first aid equipment appropriate to Work of this nature, available at all times.
- H. Furnish and maintain an adequate lighting system as required by the Work, or as directed by the Engineer.
- I. Provide and maintain all shoring and sheeting necessary for the safety of workers.

END OF SECTION 33 05 23.71

SECTION 33 11 13.05

DUCTILE IRON PIPE (WATER)

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Submittals
1.4	Quality Assurance
1.5	Delivery, Storage, and Handling
1.6	Warranty
2.1	Manufacturers
2.2	Materials
3.1	Thrust Restraint
3.2	Chlorination of Pipelines and Accessories
3.3	Connections to Existing Lines
3.4	Cutting Pipe
3.5	Inspection
3.6	Marking
3.7	Storing and Materials
3.8	Tapping
3.9	Testing
3.10	Unloading and Laying

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Erosion and Sedimentation Controls (31 25 00).
4. Turf and Grasses (32 92 00).
5. Precast Concrete Utility Structures (33 05 16.13).
6. Utility Pipe Jacking (33 05 23.16).
7. Water Service Connections (33 12 13).
8. Water Utility Distribution Valves (33 12 16).
9. Air Release and Vacuum Valves – Water (33 12 16.10).
10. Water Utility Distribution Fire Hydrants (33 12 19).
11. Relocate and Reconnect Hydrants, Valves, and Meters (33 12 19.81).
12. Traffic Control (34 41 16.10).
13. Roadway Construction (34 71 00).

1.2 REFERENCES

A. Reference Standards

1. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - a. ANSI/AWWA C104/A21.4: Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
 - b. ANSI/ AWWA C105/A21.5: Polyethylene Encasement for Ductile-Iron Pipe Systems
 - c. ANSI/ AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
 - d. ANSI/ AWWA C111/A21.11: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - e. ANSI/ AWWA C115/A21.15: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - f. ANSI/ AWWA C150/A21.50: Thickness Design of Ductile-Iron Pipe
 - g. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast for Water
 - h. ANSI/ AWWA C153/A21.53: Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
 - i. ANSI/ AWWA C600: Installation of Ductile-Iron Water Mains and their Appurtenances
 - j. ANSI/ AWWA C606: Grooved and Shouldered Joints
 - k. ANSI/ AWS D11.2: Guide for Welding Iron
2. Hereafter in this specification the specific referenced ANSI/AWWA standards are referred to either by their full description as in the first column of the above standards list, or only by their abbreviated AWWA "C" designation or abbreviated ANSI designation (e.g. AWWA C151 is meant to refer to ANSI/AWWA C151/A21.51, ANSI A21.51 is meant to refer to ANSI/AWWA C151/A21.51, etc.).

1.3 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the following:
 1. Product data:
 - a. Complete engineering data including, but not limited to, descriptive data, material specifications, and piping diagrams, as appropriate, to support the design of the piping.
 - b. Copies of the manufacturer's approved installation instructions for types of joints being used.

- c. Complete description of warranty to be provided.
- 2. Shop Drawings
 - a. Drawings showing plan and elevation, as required, of piping and all required fittings and appurtenances
 - b. Dimensional drawings of joints showing the manufacturer's allowable deflections.
- 3. Certificates
 - a. Upon request, furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers

- a. All pipes shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.
- b. During the manufacture of the pipe, give the Engineer access to all areas where manufacturing and testing is in process and permit the Engineer to make all inspections necessary to confirm compliance with the Specifications.
- c. Except as modified herein, test all materials used in the manufacture of the pipe in accordance with requirements as applicable.
- d. Perform said material tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Manufacturer, provided that the Manufacturer's and Contractor's schedule is not delayed for the convenience of the Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements

- 1. Inspect all pipe and fittings prior to unloading onto the site. Reject any damaged or defective materials and remove from site immediately.

B. Storage and Handling Requirements

- 1. Store ductile iron pipe and fittings in accordance with the manufacturer's requirements.

1.6 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from Final Completion, all water mains, appurtenances, trenches, roadway and other paved areas, landscaping, and other areas disturbed by the construction of the project, to be free

from defects, and to be installed in compliance with all laws, regulations, codes, specifications, plans, directions, and construction practices which govern said installations.

- B. The Contractor shall be responsible for repairs to any defective or leaking pipe, fittings, etc. Should trenches settle during the Warranty Period, Contractor shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any defects, leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement. No bell clamps or wrap around corsets are allowed as a means of repair on new pipelines.
- C. Within the Warranty Period, where no loss of customer service or property damage is involved, the Contractor shall begin work on requested repairs or corrective measures within twenty-four (24) hours following notification by GCDWR. If property damage or loss of customer service is involved, the Contractor shall begin work within four (4) hours of notification by GCDWR.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one (1) of the following manufacturers: American Cast Iron Pipe Company, U.S. Pipe, McWane Ductile, or approved equal.

2.2 MATERIALS

A. DUCTILE IRON PIPE

- 1. All ductile iron pipes shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Ductile iron pipe shall have cement mortar lining (standard thickness) in accordance with ANSI/AWWA C104/A21.4.
- 2. Ductile iron pipe shall be cast, cleaned, cement lined, coated, tested, and certified at a single manufacturing facility.
- 3. Ductile iron pipe shall be in nominal laying lengths of 18 or 20 feet of nominal diameters specified.
- 4. All ductile iron pipes shall be marked in accordance with AWWA C151 designations at intervals of five feet (5') or less on pipe barrel. As a minimum, pipe marking shall include manufacturer name or trademark, nominal pipe size, specification designation, and date of manufacture.

B. FITTINGS

- 1. All ductile iron fittings shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Fittings shall have cement mortar lining (double thickness) in accordance with AWWA C104.
- 2. All ductile iron fittings shall be marked in accordance with AWWA C110.

C. PUSH-ON PIPE AND FITTINGS

1. All Push-On ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51. Pipe shall be a minimum Pressure Class 350 for four inch (4") through twelve inch (12"), Pressure Class 250 for fourteen inch (14") through twenty inch (20"), and Pressure Class 200 for twenty-four inch (24") through sixty-four inch (64") diameter pipe. For locations where the system hydraulic pressure exceeds the rated pipe working pressure and/or depth of cover exceeds maximum depth of cover in accordance with AWWA C151, a licensed Professional Engineer shall specify the required pipe pressure class to be used.
2. Push-On Ductile Iron Fittings shall be manufactured with body thickness and radius of curvature conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
3. At a minimum, fittings four inch (4") through twenty inch (20") diameter shall be rated for 350 psi, and twenty-four inch (24") through sixty-four inch (64") diameter shall be rated for 250 psi.
4. Joint deflection shall be five degrees (5°) for four-inch (4") through twelve-inch (12"); four degrees (4°) for fourteen-inch (14"); three degrees (3°) for sixteen-inch (16") through twenty-four-inch (24"); and two and one-half degrees (2½°) for thirty-inch (30").

D. FLANGED PIPE AND FITTINGS

1. All Flanged Ductile Iron Pipe shall be manufactured in accordance with the latest requirements of AWWA C115.
2. Wall thickness of pipe shall be as required for pressure class in paragraph 2.2.C.1.
3. Flanged Ductile Iron Fittings shall be manufactured in accordance with the latest requirements of AWWA C110, rated for 250 psi. Design of flanged ductile iron fittings shall be as indicated on the Drawings, or as directed by the Engineer. In general, use flanged fittings with long radius elbows, except where space limitations prohibit use of same. Design of special flanged fittings, including wall castings, shall conform to dimensions and details as indicated on the Drawings, or as directed by the Engineer.
4. Flanged Ductile Iron Pipe twelve inches (12") or less in length (spool pieces), shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than twelve inches (12") in length shall be screw on type and attached to a threaded pipe section, and shall be factory fabricated. Pipe threads shall be of such length that, with flanges screwed home, the end of the pipe projects beyond the face of the flange. Flange and pipe to be faced to give a flush finish to the pipe and flange surface normal to the axis of the pipe. The flanges shall be of such design that flange neck completely covers the threaded portion of the pipe to protect same against corrosion. Flanges on ductile iron pipe and fittings are to be coated with coal tar pitch paint after machining.
5. Flanged ductile iron pipe and fittings to be faced and drilled in accordance with the latest requirements of AWWA C115/A21.15, Class 125, unless special

drilling is specified, or required. Where cap bolts or studs are required, flanges shall be drilled and tapped accordingly. Pipe with screw type flanges to be assembled at the point of manufacture unless otherwise specified, or directed by the Engineer.

6. Ductile iron blind and companion flanges shall be in accordance with the latest requirements of AWWA C110/A21.10. Regular or eccentric Ductile Iron Reducing Flanges shall be to the thickness of, and drilled to, the template of the regular companion flange of corresponding outside diameter.
7. Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

E. MECHANICAL JOINT PIPE AND FITTINGS

1. Mechanical Joint Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51.
2. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10 or /AWWA C153/A21.53 and joints in accordance with ANSI/AWWA Standard C111/A21.11.

F. RESTRAINED JOINT PIPE AND FITTINGS

1. Restrained Joint Push-On Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51, as manufactured by American Cast Iron Pipe Lok-Ring or Flex-Ring, U.S. Pipe TR-FLEX, or approved equal.
2. Restrained Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10, and joints in accordance with the latest requirements of AWWA C111/A21.11.

G. GASKETS

1. Push-On and Mechanical Joint:
 - a. Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on both the gasket and each spigot end of the pipe. Lubricant shall be NSF 61-approved and shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather, and shall adhere to either wet or dry pipe. **Only lubricant furnished with the pipe by the pipe manufacturer shall be used.**
 - b. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, and shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.

2. Flanged:

- a. Form flanged joints with through, stud, or cap bolts, as required, of the size and length specified by the manufacturer to thoroughly make up the joint. Use only full face type in all flanged joints; red rubber gaskets one-sixteenth inch (1/16") thick, as manufactured by the U.S. Rubber Company, or equal.
- b. Except as otherwise specified or noted, machine bolts, stud bolts, and cap bolts shall be made from alloy steel, complying with the requirements of ASTM A194-64, Grade 2 or 2H.
- c. For bolts, nuts, and threads, conform to the latest requirements of the following ANSI Standards and ASTM Designations:
 - i. Semi-finished, hexagonal bolt heads and nuts, meeting ANSI B18.2-60, heavy series dimensions.
 - ii. Bolt threads after plating, coarse thread series, Class 2A; and nut threads after plating, coarse thread series, Class 2B: ANSI B1.1-60.
 - iii. Galvanizing (if used): ASTM 153-61.
 - iv. Studs and nuts to be utilized underground or in contact with liquids – alloy steel, Grade B8: ASTM A193-64.

H. EXTERIOR COATING

1. Where corrosive soils, or where the pipe is located within ten feet (10') of a utility line that has cathodic protection that can cause a deleterious effect on the piping system, the exterior of ductile iron pipe shall be base-coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² (0.6554 oz/ft²) of pipe surface area. A finishing layer of asphaltic topcoat shall be applied to the zinc. The mean, dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "*Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer, Second Edition 2004-06-01.*"
2. When soils with electrical or stray currents are encountered, polywrap may be added to the zinc-coated pipe for additional corrosion protection. Polyethylene tube encasement shall be prefabricated, manufactured and supplied in accordance with ANSI/AWWA C105/A21.5, "*Polyethylene Encasement for Ductile Iron Pipe Systems.*" The wrap shall be overlapped one foot in each direction at joints, and secured in place around the pipe, and any wrap at tap locations shall be polyethylene taped tightly to prevent the entrance of foreign matter prior to tapping and inspected for any needed repairs following the tap.
3. Piping system buried underground or submerged, shall have a standard asphaltic outside coating as specified. Exposed pipe and fittings shall have an outside coating of universal primer.

PART 3 - EXECUTION

3.1 THRUST RESTRAINT

A. Location

1. Buried Piping: Where shown and where required to restrain force developed at pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist because of hydrostatic testing and normal operating pressure.
2. Exposed Piping: At all joints in piping.

B. Where specified, or as directed by the Engineer or GCDWR, plugs, caps, tees, and bends deflecting 22½ degrees or more shall be restrained. Restraint joint pipe and fittings shall be restrained to the minimum restraint lengths specified in the Contract Documents with one (1) of the following methods:

1. Method 'A': Restrained joint pipe and fittings.
2. Method 'B': One (1) of the following dual (2) independent restraints:
 - a. Mechanical joint restraint Mega-Lug, or equal, plus Thrust Blocking
 - b. Mechanical joint restraint Mega-Lug, or equal, plus Rodding.

C. Where indicated on the Drawings, or specified in the Contract Documents, 11¼ degree bends or less may be restrained with only one (1) method of restraint.

D. Thrust Ties

1. Steel Pipe: Attach with lugs fabricated in accordance with details shown on Drawings.
2. Ductile Iron Pipe: Attach with socket clamps anchored against a grooved joint coupling or flange.
3. Flanged Coupling Adapter: For exposed installations, install manufacturer's anchor studs through the coupling or sleeve or use dismantling joints.

E. Mechanical Joint Valve Restraint in Proprietary Restrained Joint Piping

1. Install pipe joint manufacturer's adapter gland follower and pipe end retainer, or mechanical joint anchor gland follower.

F. Thrust Blocking

1. Place between undisturbed ground and fitting to be anchored.
2. Quantity of Concrete: Sufficient to cover bearing area on pipe and provide required soil bearing area as shown.
3. Place blocking so that pipe and fitting joints will be accessible for repairs.
4. Place concrete in accordance with Section 03 30 00 – Cast-in-Place Concrete.

3.2 CHLORINATION OF PIPELINES AND ACCESSORIES

- A. Before being placed in service, all new water main pipelines and accessories shall be disinfected by chlorination. All chlorinating equipment, materials, labor, and supplies shall be furnished by the Contractor.
- B. Prior to chlorination, all mud, dirt, debris and other foreign matter shall be removed from the pipeline by a thorough flushing through fire hydrants or by other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be performed prior to the pressure test to ensure removal of any trapped air within the pipe.
- C. Unless directed otherwise by GCDWR, cuts made in existing lines for the insertion of valves or fittings, for repairs or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valves, fittings, etc., by spraying with a one percent (1%) hypochlorite solution.
- D. The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a tapping saddle. Use of fire hydrants for insertion of the chlorinating agent is specifically prohibited.
- E. FIRE HYDRANTS SHALL NOT BE USED AS SAMPLING POINTS. A SAMPLING TAP MUST BE INSTALLED AT ALL TEST POINTS.
- F. Back pressure, causing a reversal of flow or negative pressure in the pipe being treated, shall be prevented.
- G. During the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.
- H. Disinfection of water mains shall be performed in strict accordance with the latest requirements of AWWA C651, and the latest requirements of Georgia Environmental Protection Division's *Minimum Standards for Public Water Systems*. Should the initial chlorination treatment prove ineffective, the chlorination procedure shall be repeated until confirmed test results show that water sampled from the newly laid pipe conforms to the requirements as specified above. The highly chlorinated water shall be retained in the pipe, as specified above, to destroy all non-spore-forming bacteria. After the chlorine treated water has been retained for the required time, the water shall be tested for residual chlorine in the extremities.
- I. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the entire length of the newly laid main shall test, both chemically and bacteriologically, to be the same water quality as the water being served to the public through the existing pipelines.
- J. When water main is in close proximity to creeks, streams, ponds, or other bodies of water, Contractor may be directed by GCDWR to de-chlorinate any water flushed from the main and discharged to the body of water to prevent damage to aquatic organisms, plants, fish, etc. Method and system of de-chlorination must be pre-approved by GCDWR.

- K. After flushing, GCDWR shall notify the GCDWR Environmental Laboratory that the main is ready for a bacteriological sample to be processed. Bacteriological test sites should be installed as indicated on the Drawings, or as directed by GCDWR. Two (2) consecutive sets of acceptable samples, taken at least twenty-four (24) hours apart, shall be collected from the new main. At least one (1) set of samples shall be collected from every twelve hundred feet (1,200') of new water main; plus one (1) set from the end of the line (dead end or cul-de-sac), and at least one (1) set from each branch. Both sets of samples must receive two (2) acceptable ("passed") test results in order for the line to receive a "Passed" certification and be placed into service.
- L. NOTE: WHEN THE ENVIRONMENTAL LABORATORY REPRESENTATIVE ATTEMPTS TO OBTAIN AN ACCEPTABLE SAMPLE, IF THEY OBSERVE AIR, DISCOLORED WATER, TRASH, DEBRIS, TOO HIGH CHLORINE RESIDUAL, OR NO CHLORINE RESIDUAL, IN THE WATER, NO SAMPLE WILL BE TAKEN UNTIL THE MAIN IS RE-FLUSHED.

3.3 CONNECTIONS TO EXISTING LINES

- A. Connections to existing pipelines shall, in general, be made by the use of tapping sleeves and valves, except as specifically indicated on the Drawings to be otherwise, or directed by the Engineer. In certain instances, it may be specified or directed by the Engineer or GCDWR to tap a dry line. In this circumstance, a tapping sleeve and valve is required and the tap accomplished utilizing a standard tapping machine. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE PERMITTED TO BURN A HOLE IN THE MAIN USING OXYACETYLENE TOOLS.
- B. The closing of any existing mainline valve or valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction *and* presence of GCDWR. All such shutdowns must be approved in advance by GCDWR. The Contractor shall provide all labor and equipment sufficient to find and uncover valves, and cleanout valve boxes for access to existing valves required to complete or repair any work installed under this Contract. GCDWR will provide all records and information available to assist in the locating of covered valves. This assistance shall not relieve the Contractor of responsibility to locate any necessary valve to accomplish the Work.
- C. The Contractor will be responsible for notifying, with the assistance of GCDWR, all customers who will be affected by the interruption of water service, a minimum of twenty-four (24) hours in advance of the planned shutdown. No service may be interrupted without GCDWR prior approval. No extra payment will be allowed for a connection to a valved "stub-out" line or to a line where no customers will be affected by the tie-on or cut-in.

3.4 CUTTING PIPE

- A. Wherever the pipe requires cutting to fit into the line, or to fabricate joints, the Work shall be performed in such a manner as to leave a smooth end at right angles to the axis of the pipe. Any breakage will be at the Contractor's expense. When a piece of pipe is cut to fit into the line, lead joints on existing piping will be removed. Lead joints are to be disposed of at an approved offsite facility.

- B. Use a cutting saw for all cutting of ductile iron pipe. Remove all burrs from inside and outside edges of all cut pipes.

3.5 INSPECTION

- A. Submit under the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, copies of the Manufacturer's Sworn Certificate of Inspection and Testing of all ductile iron pipe and ductile iron fittings provided for the Work. All ductile iron pipe and fittings will be subject to inspection and approval by GCDWR after delivery of material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged ductile iron pipe or fittings are not permitted to be used in the Work.
- B. Such inspection by GCDWR does not relieve the Contractor of full responsibility for the material installed. FAILURE BY GCDWR TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

3.6 MARKING

- A. All ductile iron pipes shall be marked in accordance with the latest requirements of AWWA C151/A21.51. Additional pipe markings shall include the manufacturer's initials, pressure or class designation, and size conspicuously on each pipe.
- B. All ductile iron fittings shall be marked in accordance with the latest requirements of AWWA C110/A21.10.
- C. Ductile iron pipes and fittings received shall be furnished by the Contractor with a manufacturer's list, in duplicate, of all pieces of pipe and fittings received on the project, including copies of shipping documents from the manufacturer and/or supplier. Said lists shall, at a minimum, indicate the manufacturer's name, serial or mark number, weight, class or pressure designation, length, size, and description of each typical piece received.

3.7 STORING OF MATERIALS

- A. All tools, materials, machinery, and equipment required in the Work may be stored in compact, neat, stockpiled manner adjacent to the worksite, in a suitable location, and in such a manner as to cause the least inconvenience to the affected property owners, ensure traffic safety, and so as not to endanger the general public in any way. All active, existing fire hydrants, water and gas shut-off boxes, must at all times, be kept unobstructed and accessible at all times. All water and gas valves, underground power, and telephone line manholes must be left uncovered and unobstructed by such storing of materials.

3.8 TAPPING

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, piping shall be tapped to receive piping. Taps shall be installed utilizing tapping sleeves or saddles as specified.

1. Direct taps where threads are cut into the pipe barrel shall not be permitted. Holes shall be drilled accurately, and at right angles to the axis of the pipe or fittings. Where plugs are drilled, holes shall be at right angles to the face of the plug.
2. The cutting of tap holes with oxyacetylene is specifically prohibited. On sixteen inch (16") and larger mains, the Contractor will be required to demonstrate to the satisfaction of GCDWR that they are qualified to perform the Work.

3.9 TESTING

- A. Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section of water main, as may be determined or defined by GCDWR, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI, as measured at the lowest elevation of the test section. Where static pressure of the existing water supply exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section, shall be equal to the static pressure plus 50 PSI. If elevation differentials, within a test section, vary by more than forty-five (45) vertical feet, then the test section shall be broken into shorter lengths by the insertion of additional valves.
- B. All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the "closed" position.
- C. ALL TESTING OF WATER MAINS, FITTINGS, AND APPURTENANCES SHALL BE CONDUCTED IN THE PRESENCE OF, AND UNDER THE DIRECTION OF GCDWR. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the pressure on the water main; 2) a corporation cock in the main to attached gauge or pump connection; 3) plugs to seal taps after use in testing; 4) a suitable pump, piping, appliances, labor, fuel, and other appurtenances necessary to conduct the pressure tests; 5) a valve wrench and labor to accompany GCDWR to verify that all valves, including fire hydrant branch valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure, as noted above, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. GCDWR will make water available necessary for flushing and testing of water mains. The Contractor shall provide whatever means necessary for transporting or conveying the water from a designated source to the test section of main.
- D. NOTE: THE USE OF FIRE HYDRANTS AS A CONNECTION FOR EITHER HYDROSTATIC TESTING OR INJECTION OF CHLORINE SOLUTIONS FOR DISINFECTION IS EXPRESSLY PROHIBITED.
- E. Before applying the specified test pressure, all air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor to install additional ¾" service taps at the highest elevation, including any intermediate points of the pipe section to be tested, or at locations directed by GCDWR. Any such taps installed must be removed by the Contractor prior to Final Completion of the main.

- F. The test pressure shall be maintained for a minimum of two (2) hours to allow for thorough examination for leakage, and permit GCDWR to confirm that all the air has been removed, and that all valves within the test section of pipe are fully open. The pipeline shall be made watertight under the test pressure.
- G. A Testing Allowance in compliance with the latest requirements of AWWA C600, Section 5.2 and Table 6 shall be applied. The Testing Allowance shall be defined as the quantity of makeup water that must be supplied to the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. No pipe installation will be accepted if the amount of makeup water is greater than that allowed by AWWA C600.
- H. Any exceeding of the testing allowance or leakage developed during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the testing requirements specified herein.
- I. No separate payment will be made for testing.
- J. After the section of main has been completely tested, chlorinated, and successfully passed the required bacteriological tests, it shall be placed in service immediately upon direction from GCDWR. The Contractor shall supply all labor and equipment necessary to place the main and all appurtenances in service.

3.10 UNLOADING AND LAYING

- A. Ductile iron pipe shall be loaded, transported, and unloaded in accordance with latest requirements of AWWA C600. Do NOT skid or roll pipe handled on skid ways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately set aside, and thoroughly inspected by GCDWR before any decision is made regarding its acceptability. Do not damage casting and linings. If damage occurs to the lining, make repairs or replacement as directed by GCDWR. If there is any question regarding acceptability of said suspect materials by GCDWR, the Contractor shall remove and replace the questionable materials.
- B. Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take care to prevent the pipe coating from being damaged, particularly on the inside of the pipe and fittings.
- C. Pipe may not be "strung" along the project jobsite within highway rights-of-way, unless specifically directed to do so by GCDWR, and then only after receiving permission from the road authority which has jurisdiction.
- D. The Contractor shall carefully examine all pipe and fittings for defects just before laying, and lay no pipe or fitting which is known to be defective. In the event that defective pipe or fittings is discovered after having been laid, the Contractor shall

remove and replace with sound pipe or fittings in a satisfactory manner at Contractor's expense.

- E. Standard depth of cover is four feet (4') below the final grade elevation of the edge of pavement of existing or proposed roadway surface. In the event the road shoulder final grade is below the final grade elevation of the edge of pavement of the roadway surface, then a minimum of four feet (4') of earth cover shall be maintained at all times, measured on the down-slope side of the pipe trench. In the event the road shoulder final grade is above the final grade elevation of the edge of pavement of the roadway surface, then the pipe shall be placed at an elevation of four feet (4') below the final grade elevation of the edge of pavement of the roadway surface and covered with compacted earth. In no case shall depth of cover exceed twelve feet (12') without prior written authorization from GCDWR.
- F. Pressurized flow Ductile Iron Pipe shall be laid using a minimum of Class 'D' bedding. If laying in rock trench, the trench bottom shall be undercut to allow a minimum of six inches (6") of bedding material to be placed and compacted to establish the required elevation indicated on the Drawings.
- G. It is the Contractor's responsibility to maintain a clean worksite and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on the site, and shall be thoroughly cleaned before being laid. During any breaks in the laying of the pipe, and when ending the construction for the day, the Contractor shall install a mechanical or fitted plug to the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out, and inspected by GCDWR, before new or further pipe installation may commence.

END OF SECTION 33 11 13.05

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Work Included
1.5	Submittals
2.1	Materials
3.1	House Service Connections
3.2	Relocate, Replace, or Lower Existing Services
3.3	Abandon Existing Services
3.4	Extra Long Service Line Installation
3.5	New Meter Installation
3.6	Existing Meter Change Out
3.7	Salvage Existing Meter
3.8	Relocate Large Meters/ Check Valves

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Sidewalks, Curbs, and Gutters (32 16 13).
3. Turf and Grasses (32 92 00).
4. Utility Pipe Jacking (33 05 23.16).
5. Ductile Iron Pipe (33 11 13.05).
6. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 DEFINITIONS

- A. House Service Connection is defined as the water line between the water main and the water meter.

1.4 WORK INCLUDED

- A. The Contractor, under this item, shall furnish all materials, labor, tools, and equipment to properly install, relocate, or replace all water house service connections, service lines, meters, and meter boxes, as indicated on the Drawings. If in the process of conducting the Work, Contractor discovers previously unknown services, additional services, or connections affected by construction of the new main, Contractor shall immediately notify GCDWR for direction concerning the services. New service connections to water mains shall be made in accordance with the Drawings, or as directed by GCDWR. New service connection taps shall be made as pipe is installed and shall be directly in line with the meter. The Contractor shall make all reconnections of house water services (presently connected to existing water mains), to water mains constructed under this Contract. Contractor shall remove from service the portion of the house water service connected to the existing water main by closing the corporation stop on the house water service at the existing main. All house service connections shall be installed using copper service lines, compression fittings, and shall meet current GCDWR Meter Installation Standards.
- B. Contractor shall make all pavement, curb, and sidewalk cuts, excavation, sheeting, shoring, boring, backfilling, and landscaping or sodding/seeding repairs required for the house service connections; this includes any disturbed areas associated with long side services on both sides of the roadway. Trenches shall be backfilled and pavement courses installed as specified under Sections 31 23 00 EXCAVATION AND FILL, 32 12 16 ASPHALT PAVING, and 34 71 00 ROADWAY CONSTRUCTION.
- C. Contractor shall make all relocations of existing house services from existing main to new water main as indicated on the Drawings, or as directed by GCDWR, whether or not the existing main is to be abandoned as part of this Contract. When existing main is to remain in service, or when directed by GCDWR, Contractor shall abandon all portions of the existing service by excavating the service connection at the existing main and closing the corporation stop for each service to be abandoned.
- D. All temporary relocations or replacements of house service connections necessary to perform the Work, shall be made at Contractor's expense. Any replacements made necessary due to the negligent or careless operations by the Contractor shall be accomplished immediately, if customer service is affected. The Work shall be of first class workmanship, and shall be completed using only approved materials as specified, as indicated on the Drawings, or as directed by the Engineer.
- E. NOTE: House water service connections shall not be reconnected to new mains until the new mains have been disinfected, tested, and passed for placing into service, as provided in Section 33 11 13.05 DUCTILE IRON PIPE (WATER), paragraph 3.2. Chlorination of Pipelines and Accessories.

1.5 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all water service connections and accessories to be used in construction, along with product data sheets for all piping/tubing, valves, meter boxes, and accessories to be used for house service connections.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Service lines shall consist of copper, galvanized steel, or Municplex (or approved equal) pipe with fittings and appurtenances in accordance with the following:
 - 1. Copper Pipe (Tubing): Shall be manufactured and furnished in accordance with ASTM Specifications B88, Type 'K'. Fittings shall be of the compression "pack-joint" coupling type.
 - 2. Galvanized Steel Pipe: shall be standard weight galvanized steel pipe with screw joints conforming to ASTM A53 REV A 1988. Fittings shall be galvanized, except that the nipples and couplings shall be of the same materials as the pipe.
 - 3. Municplex (or approved equal): shall be furnished in SDR 9 copper tube sizes (CTS) in accordance with ASTM F876 and AWWA C800. AWWA C904 compression joint brass valves and fittings (with stainless steel inserts) are for 1-1/2" and 2" services only, and shall be compatible with AWWA C800 tubing.
 - 4. Appurtenances such as corporation stops, curb stops, adaptors for copper and galvanized steel and service lines shall meet the requirements of ASTM B-62 bronze construction, and AWWA C800 for threads. Adaptors shall be furnished as required for connecting copper and galvanized steel pipe. Corporation stops, curbs stops, and adaptors shall be as manufactured by AYMcdonald, Ford, Mueller, or equal. Double strap saddles for tapping the main shall be Dresser Style No. 91, Smith-Blair Style No. 313, or equal; and shall be tapped for mueller threads. Where saddles required, no extra payment shall be allowed.
 - 5. NOTE: The use of soldered joints or flare joints on copper pipe and fittings is expressly prohibited.

PART 3 - EXECUTION

3.1 HOUSE SERVICE CONNECTIONS

- A. When new or replacement water mains are installed, all existing service connections shall be switched to the new water main. The Contractor shall perform all work required for reconnecting the existing meter to the new water

main including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified above.

- B. Long side service connections shall be installed via boring under the paved road in accordance with Section 33 05 23.16 UTILITY PIPE JACKING.

3.2 RELOCATE, REPLACE, OR LOWER EXISTING SERVICES

- A. As indicated on the Drawings, or as directed by GCDWR, to connect, relocate, or replace an existing water service the following is required:
 - 1. If existing service line is one inch (1") or less, and either galvanized or polybutylene or other pipe material, the entire service line from the main to the meter shall be copper, as specified above in paragraph 2.1.A.1.
 - 2. If existing service line is one and one-half inch (1-1/2") or two inch (2"), and is galvanized pipe which is greater than 10-years-old and shows evidence of significant corrosion internally or externally, or is PVC, then the entire service line from the main to the meter shall be replaced with Galvanized Steel Pipe or Municipex (or approved equal), as specified above in paragraph 2.1.A.2. and 2.1.A.3.
 - 3. Shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified. Long side services shall include the related boring necessary to complete the installation. Service line connections, coupled to existing copper service lines to avoid additional service bores, shall be considered short-sided connections. Relocating existing meters and lowering existing service shall include all materials, tools, equipment, and labor to properly relocate services to a depth and location as directed by GCDWR.

3.3 ABANDON EXISTING SERVICES

- A. The Contractor shall abandon existing service connections as indicated on the Drawings, or as directed by the Engineer. Service connections shall be abandoned by removing the existing meter, meter box, curb stop, and service piping. For services connected to ductile iron pipe, the tap in the main shall be sealed with a brass plug. For services connected to PVC pipe, the tap on the main shall be sealed with a repair sleeve. In either case, the plug or sleeve shall be checked for leaks at normal operating pressures prior to backfilling the excavated area.

3.4 EXTRA LONG SERVICE LINE INSTALLATION

- A. When a new service line is to be installed across a road with more than five (5) lanes, it shall be considered an extra long service installation. For these conditions, the Contractor shall install a new copper or galvanized pipe service line, depending on the size of the service, via boring under the road with a minimum of four feet of cover over the new service pipe.

3.5 NEW METER INSTALLATION

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, the Contractor shall install new meter connections to existing or new water mains. The Contractor shall perform all work required for installing the new meter including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the meter installation using copper or galvanized steel pipe, depending on the size of the service, tapping saddles, corporation stops, curb stops, and valve boxes. The meter shall be provided by GCDWR and installed by the Contractor.

3.6 EXISTING METER CHANGE OUT

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall change out existing water meters. The Contractor shall provide all labor and equipment required for the meter change out. GCDWR shall provide the new meters for installation by the Contractor.

3.7 SALVAGE EXISTING METER

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall salvage existing water meters. The Contractor shall provide all labor and equipment required for removal of the meter and transporting and delivering such meters for salvage to GCDWR Central Facility, 684 Winder Highway, Lawrenceville, GA 30045. Work shall include placing a plug or cap on the ends of the piping from where the meter was removed.

3.8 RELOCATE LARGE METERS/CHECK VALVES

- A. Where indicated on the Drawings, or directed by the Engineer, the Contractor shall relocate large meters and check valves. The Contractor shall provide all labor and equipment required for removal of the meter/check valve and its associated vault and piping, transporting and delivering such meters and check valves to the new location, and install the new meter/check valve including all excavation, bedding, piping connections, vaults, isolation valves, and related appurtenances for a complete installation. Work shall include placing a plug in or connecting the ends of the piping from where the meter/check valve was removed.

END OF SECTION 33 12 13

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessory Equipment
2.2	Butterfly Valves
2.3	Gate Valves
2.4	Tapping Sleeves and Valves
2.5	Line Stop Type Valves
2.6	Insertion Type Valves
2.7	Valve Markers
3.1	Painting
3.2	Placing
3.3	Tapping Sleeves and Valves
3.4	Testing
3.5	Wet Cut-Ins

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Turf and Grasses (32 92 00).
3. Ductile Iron Pipe (33 11 13.05).
4. Roadway Construction (34 71 00).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor, under this item, shall furnish all the materials, labor, and equipment to properly set in place, at the locations indicated on the Drawings, or as directed by the Engineer, all gate valves and butterfly valves, tapping sleeves and valves, and other valve-type assemblies of the size and types specified, which are necessary for the proper completion of the Work; including all excavation required for their installation.

1.4 SUBMITTALS

- A. Before any valves or operating devices are manufactured, the Contractor shall submit, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and receive approval of the Engineer, detailed drawings and product data for each size and type of valve to be provided, including detail of the size and location of all valves and accessories, as specified, as indicated on the Drawings, or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 ACCESSORY EQUIPMENT

- A. All valves, which are to be buried in the ground, shall be provided with a valve box and cover. One (1) adjustable (4'6" to 7'0") gate valve operating key for 2" square operating nuts shall be provided for each 10 valves (or fraction thereof) installed on each project. Key shall be Pollard No. 54801, or equal. Final payment shall be withheld until all accessories are provided to GCDWR. Where the depth of cover is more than five feet (5'), Contractor shall provide suitable, permanently installed valve stem extension and guide at no extra cost to GCDWR. In no case shall depth of cover exceed twelve feet (12') without written authorization from GCDWR.

2.2 BUTTERFLY VALVES

- A. Provide butterfly valves meeting the latest requirements of AWWA C504, and shall be as manufactured by Mueller, Kennedy, Pratt, or approved equal.
- B. Provide butterfly valves that shall be hand-operated, with bodies of cast or ductile iron with integrally cast hubs for shaft bearing housing, and adapted for joints as indicated on the Drawings, or as directed by the Engineer. Except as modified herein, furnish valves of the short body laying length with operators sized on the basis of actual line pressure and velocity. Butterfly valves shall be a minimum Class 150 or as indicated on the Drawings, or directed by the Engineer.
- C. Furnish valves having Type 304 stainless steel valve shaft, keyed for operator connection and connected to the disc with Type 304 stainless steel pins secured in place. Orient shaft as indicated. Furnish two-way thrust bearings, preset at the factory and permanently grease lubricated. Provide resilient valve seat of natural rubber per ASTM D2000, or Buna N type per ASTM D2000 providing uninterrupted 360 degree seating completely adjustable around circumference. Furnish mating seat of Type 304 or 316 Stainless Steel. Apply the resilient seat to the body, recessed in a groove, or to the disc per ANSI/AWWA C504, Sec. 9.5.
- D. Furnish valve discs, seating at 90 degrees to the pipe axis, of ductile iron per ASTM Des. A536, Grade 65-45-12, cast iron per ASTM Des. A48, Class 40, or fabricated steel per ASTM Des. A36.
- E. All butterfly valves shall open by turning the operating nut to the left (counter-clockwise).
- F. Butterfly valves shall only be used on sizes twelve inches (12") and larger.

- G. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.

2.3 GATE VALVES

- A. Gate valves shall conform to the latest requirements of AWWA C509 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, M&H, or approved equal.
- B. Gate valves shall be hand operated, non-rising stem, and bronze mounted of the resilient seat type with cast or ductile iron bodies, and adapted for joints as indicated on the Drawings, or as directed by the Engineer.
- C. All gate valves shall open by turning the operating nut to the left (counter-clockwise).
- D. Valve stems shall be manganese bronze with the collar cast solid with the stem. The threads of stems and stem nuts shall be of the square or Acme type. The ultimate tensile strength shall not be less than 65,000 pounds per square inch and an elastic limit of not less than one-half ($\frac{1}{2}$) of the ultimate tensile strength.
- E. Valves shall be provided with 'O' ring seals. Ring seal plate shall be fitted with two (2) 'O' rings: the upper ring serving as a dirt seat, the lower ring as a pressure seal. Design shall permit replacement of 'O' rings while the valve is under pressure in the fully opened position. 'O' rings shall be Precision Rubber Products Corporation, Quality Compound No. 122-70, or approved equal.
- F. Gate valves shall only be used in sizes two inch (2") through twelve inch (12"), of the resilient-seated type.

2.4 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves for size on size taps 16" x 16" and larger shall be ductile iron with mechanical joint ends, such as manufactured by American Valve and Hydrant, Mueller Company, or equal. Split Steel prefabricated tapping sleeves as manufactured by JCM, Smith-Blair, or equal, may be used for size on size taps 12" x 12" and smaller, and for all taps smaller than "size on size". Outlets shall be sized to permit a tap to be made using a full size shell cutter. The existing pipe shall be thoroughly cleaned prior to the installation of the sleeve. The use of strap saddles for taps larger than two inch (2") is not permitted. Shop drawings for split steel sleeves must be approved by the Engineer prior to use.
- B. For asbestos-concrete pipe and Class 200 PVC pipe, the Contractor must use "Ford" stainless steel full circle tapping sleeve or approved equal, which contains a full gasketed surface within the sleeve body to allow for the variances in the manufactured O.D. of the asbestos-concrete pipe.
- C. Tapping valves shall conform to the requirements for gate valves herein before stipulated, except for modifications necessary to permit the use of full size shell cutter.

2.5 LINE STOP TYPE VALVES

- A. Line stop valves shall provide a means to install a temporary blockage of flow in an existing pressurized water main without removing the main from service. The line stop valve shall be installed through a single circular hole cut into the top of the pipe. Line stop valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The line stop valve shall consist of three sub-assemblies: the valve body, which shall be mounted pressure tight around the main; the valve cartridge, which shall be inserted into the valve body; and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. At the completion of the line stoppage, the line stop valve shall be removed, and the valve body shall remain on the main. A blind flange shall be installed on the valve body to seal against leaks.

2.6 INSERTION TYPE VALVES

- A. Insertion type valves shall provide a means to install a permanent block (open-close) valve into an existing pressurized water main without interruption of flow through the pipe and no reduction of line pressure. The insertion valve shall be installed through a single circular hole cut into the top of the pipe. Insertion valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The insertion-type valve shall consist of three subassemblies; the valve body, which shall be mounted pressure tight around the main, the valve cartridge, which shall be inserted into the valve body, and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. The maximum operating pressure of the insertion type valve shall be 150 psi, with a maximum test pressure of 200 psi.

2.7 VALVE MARKERS

- A. Valve markers shall be furnished and installed with each valve installed with exception of fire hydrant valves. The markers shall be of Class 'A' Concrete, as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, four inch (4") square by five feet (5') long, and shall be of the same construction as that of highway right-of-way markers. The words, "Water Valve" shall be cast vertically into the marker beginning two inches (2") below the top of the marker. There shall be a one and one-quarter inch (1¼") brass plug cast into the marker one inch (1") below the letter 'E' of the word "Valve", which shall be stamped in the field by the Contractor, after installation, with the distance, in feet, from the valve marker to the valve box. The markers shall be installed as close to the right-of-way line opposite the valve as is possible, with the brass plug facing the valve. The marker shall be located so as to avoid damage by traffic. The top of the marker shall generally be set twenty-four inches (24") above finished grade. The markers may be set somewhat lower in areas where it may be considered obtrusive, such as lawns; however, at no time shall the marker be installed at less than eighteen inches (18") above finished grade.

PART 3 - EXECUTION

3.1 PAINTING

- A. All valves where not constructed of brass, bronze, or of finished steel shall be painted at the point of manufacture in accordance with AWWA Specifications for Painting, Ductile, Cast Iron Water Pipes, and Fittings, except machined surfaces, which shall be given a suitable coating of grease or other protective material.

3.2 PLACING

- A. All valves shall be set accurately and carefully to the lines and grades indicated on the Drawings, or as directed by the Engineer, and shall be joined to the pipe utilizing such approved joints as herein specified for ductile iron water mains.
- B. Tapping sleeves and valves, and insert valves, shall be installed in accordance with the manufacturer's recommendation.
- C. Valve boxes shall be centered plumb over the operating nut of the valve with the cover flush with the surface of the finished pavement, finished grade after landscaping, or as directed by GCDWR. The valve box shall not be in direct contact with the bonnet of the valve, and shall be supported in such a manner as not to transmit shock, stress, or load directly to the valve. A formed or pre-cast concrete collar shall be placed around the valve box top as indicated on the Drawings. Valve shall be provided with thrust blocking as indicated on the Drawings, or as directed by the Engineer. VALVE BOXES ARE TO BE OF THE ADJUSTABLE SLIP-TYPE. SCREW ADJUSTING VALVE BOXES ARE NOT PERMITTED.
- D. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.
- E. On GCDOT road projects where final grade shall not be obtained until after the waterline construction is completed, the Contractor may install six inch (6") SDR 35 PVC pipe to a grade directed by GCDWR, until final grade is reached. After final grade is completed, the Contractor may install valve boxes, valve markers, and pads as required.

3.3 TAPPING SLEEVES AND VALVES

- A. The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing water mains at locations indicated on the Drawings, or as directed by the Engineer. The Contractor shall provide the tapping machine and competent supervision for the making of taps. It is the Contractor's responsibility to verify the type, size, O.D., and class of the existing pipe before ordering the tapping sleeve and valve.
- B. Prior to making the tap, the Contractor, in the presence of GCDWR, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 200 PSI (PNEUMATIC, or AIR-PRESSURE TESTING IS PROHIBITED). The Contractor shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials, which will not permit the tapping

valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.

- C. Back taps shall not be permitted unless specifically authorized by GCDWR. Any said authorized backtaps shall be constructed using mechanical joint fittings and mechanical joint retainer glands, Mega-Lug or equal, and single joints of pipe. Threaded rod shall only be permitted from the steel casing to the first fitting. Welding eye bolts directly to the casing for the purpose of installing threaded rod is NOT permitted.
- D. All valves, which are buried in the ground, shall be provided with a valve box and cover. Where the depth of cover is more than five feet (5'), the Contractor shall provide suitable, permanently installed valve stem extensions and guides, which have been approved by GCDWR prior to fabrication and placement.

3.4 TESTING

- A. All valves shall be tested at the point of manufacture in accordance with the specific AWWA Standard for that size and type of valve and made drop-tight when tested under the hydrostatic head specified herein. After the valves have been set in place, and are ready to operate, the Contractor shall hydrostatically field-test each valve as part of the hydrostatic test of the main. Any valve not proved to be "bubble-tight", shall either be repaired to make it so, or be removed from the line and replaced. Valves repaired or replaced shall be re-tested for leakage prior to acceptance by GCDWR.

3.5 WET CUT-INS

- A. The Contractor shall, under this item, provide all labor and equipment necessary to make a cut-in to an existing water main for the purpose of making a connection, installing a valve, fire hydrant assembly, or other fittings and appurtenances. A "wet cut-in" is defined to be the physical cutting into any existing water main, which will result in the interruption of service to an existing customer, or which shall necessitate the removal of water contained within the existing main from the excavation, which is caused by cutting into the pipe. Wet cut-ins shall not be allowed to be performed on Fridays.

END OF SECTION 33 12 16

SECTION 33 12 19

WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessories
2.2	Hydrants
2.3	Automatic Flushing Device
3.1	Painting, Coating, and Lubricating
3.2	Setting Hydrants

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Water Utility Distribution Valves (33 12 16).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish and install at the locations indicated on the Drawings or as directed all fire hydrants necessary or required for the proper completion of the Work under this Contract.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the size of all fire hydrants and accessories to be used in construction, including product data, materials of construction, and operation and maintenance data.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. The Contractor shall furnish one (1) adjustable hydrant wrench for each ten (10) hydrants installed, or fraction thereof. Wrench to be Pollard No. P-665-1, or equal. Final payment shall be withheld until all accessories are provided to GCDWR.

2.2 HYDRANTS

- A. Fire hydrants shall be manufactured in full compliance with the American Water Works Association Standard for Dry - Barrel Fire Hydrants, C502-80, and as herein amended. Hydrants approved for use are American Flow Control B-62-B, M&H 129, Mueller IMP-PRT2, Clow Medallion, U.S. Metropolitan 250 M-94, or EJ 5CD250, or equal.
- B. Type - Three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
- C. Size - Internal main valve diameter shall be a minimum of 5- $\frac{1}{4}$ ".
- D. Identification - Each hydrant shall have the name of the manufacturer, the year when made, and the nominal valve size in legible, raised letters cast on the barrel or bonnet.
- E. Dry Top Bonnet - Each hydrant shall be constructed with a moisture-proof lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be comprised of a top "O" ring serving as a dirt and moisture barrier and lower "O" ring which shall serve as a pressure seal.
- F. Operating Nut - The operating nut shall be of regular pentagon shape measuring 1- $\frac{1}{2}$ " point to flat; i.e., National Standard, and shall open by turning counter-clockwise (left). Nozzle caps shall have the same cross-section as the operating nut and shall come with heavy duty, non-kinking chains. Chains shall be securely affixed to the hydrant upper barrel and permit free turning of the caps.
- G. Traffic Design - The hydrant barrel sections shall be connected at the ground line in a manner that shall prevent damage to the hydrant when struck by a vehicle. The main valve rod sections shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.
- H. Main Valve - The main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.
- I. Main Valve Seat - The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement. Two (2) "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained without the employment to torque compressed gaskets. The hydrants shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.

- J. Drain - The drain mechanism shall be designed to operate automatically with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in the main valve assembly to drain the hydrant barrel.
- K. Inlet Connection - Cast iron inlet elbow shall have a 6 inch mechanical joint connection complete with accessories.
- L. Extensions - Barrel extension sections shall be available in 6 inch increments complete with rod, extension coupling, and the necessary flanges, gaskets, and bolts so that extending the hydrant can be accomplished without excavating.
- M. Nozzles - No lead shall be allowed in nozzle installation.
- N. Testing - All fire hydrants shall be tested in strict accordance with ANSI/AWWA-C502 at the supplier's expense. Certificate of Compliance shall be furnished to GCDWR upon their request.

2.3 AUTOMATIC FLUSHING DEVICE

- A. Automatic flushing device shall have a 1" brass FIP inlet, leading vertically into a 1" automatic solenoid valve. Automatic solenoid valve shall have an internal, self-cleaning debris screen, and have a 220 psi rating. Each unit shall be furnished with a stand-alone valve controller. Valve controller shall not require a second hand-held device for programming. Controller shall have a minimum of 9 possible flushing cycles per day, shall be submersible to 12 feet, operate with 9 volt battery and have resin-sealed electrical components. Solenoid shall have no loose parts when removed from the valve. Each unit shall have a single-valve, all brass, sampling point. Removal of the 1" solenoid valve shall be possible via an o-ring connector located under the valve after removal of the stainless steel access plate. The valve assembly shall be housed in a PVC enclosure and each unit shall be self-draining, non-freezing. All above-ground components shall be contained within a UV-resistant locking cover. Automatic flushing valves shall be as manufactured by Kupferle, or equal.

PART 3 - EXECUTION

3.1 PAINTING, COATING, AND LUBRICATING

- A. All iron parts of the hydrant, inside and outside, shall be thoroughly cleaned and thereafter, unless otherwise stipulated, all surfaces except the exterior portion above the ground line shall be coated or painted with, or dipped in, an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two (2) coats, the first being allowed to dry thoroughly before the second coat is applied.
- B. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two (2) coats of Koppers Primer 621 or Owner approved equal. After installation, each hydrant shall be painted with two (2) field coats of Glamortex Enamel as manufactured by the Inertol Company or Owner approved equal; color to be silver.

- C. All bronze, threaded, and contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rust proof compound to prevent damage in shipment and storage.

3.2 SETTING HYDRANTS

- A. Hydrants shall be placed at the locations indicated on the Drawings in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians shall be minimized. Contractor shall install proper "bury" hydrants or shall use, at no cost to GCDWR, proper length extensions to insure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of the Specifications. When placed behind curb, the hydrant barrel shall be so set that no portion of the pumper or hose nozzle caps shall be less than six (6) inches, nor more than twelve (12) inches from the gutter face of the curb. Place gravel as shown on the Drawings. All pipes connecting the fire hydrant to the main line shall be ductile iron pipe meeting these specifications or approved connecting pieces.
- B. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main must be through either a Ductile Iron Tee or a tapping sleeve and include an outlet valve at the point of connection. Using a tapping sleeve where the Drawings indicate a Tee shall not result in any additional cost to GCDWR.

END OF SECTION 33 12 19

SECTION 33 12 19.81

RELOCATE AND RECONNECT HYDRANTS, VALVES, AND METERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Existing Materials and Appurtenances
3.2	Work

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Ductile Iron Pipe (33 11 13.05).
4. Water Utility Distribution Fire Hydrants (33 12 19).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. The Contractor shall perform the Work of this item with due regard to the requirements of Section 33 11 13.05 Ductile Iron Pipe as concerns the overrun of authorized shutdowns, authorized shutdowns, and hours for authorized shutdowns.

1.3 WORK INCLUDED

- A. The Contractor shall, where specified, indicated on the Drawings, or directed by the Engineer, disconnect, relocate and reconnect existing hydrants, check valves and large meters.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all hydrants, valves, meters, and accessories to be used in construction.

- C. Per Section 33 05 16.13 Precast Concrete Utility Structures, Contractor shall furnish and install a pre-cast concrete vault with aluminum hatch. Shop drawings for the vault and hatch must be approved by the Engineer prior to installation.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 EXISTING MATERIALS AND APPURTENANCES

- A. Existing valves and hydrants, which are suitable for reuse, shall be cleaned and, if required, shall have their internal parts reworked, and shall be properly placed in the Work where indicated or required. Outlets on hydrants shall be re-oriented, if required.
- B. The Contractor shall perform the disconnecting, relocating, and connecting carefully so as to avoid damaging the materials or appurtenances. Materials or appurtenances damaged in the course of the Work shall be replaced or repaired by the Contractor at his own expense and to the approval of GCDWR.

3.2 WORK

- A. Relocate/Reconnect Existing Hydrant - Includes disconnection from existing mains, plugging and blocking openings in the main and reconnecting and/or relocating hydrant to new main in accordance with the manufacturer's recommendations and the requirements of these specifications. The placement of the relocated hydrant shall meet the requirements for fire hydrant installation as shown on the Drawings and/or specified in Section 33 12 19.
- B. Adjust Existing Hydrant – Where indicated on the Drawings or directed by the Engineer, the Contractor shall raise or lower the above ground portion of an existing hydrant to the elevations indicated or directed by the Engineer. All work shall be completed with compatible parts as provided by the fire hydrant manufacturer, or GCDWR approved equal.
- C. Salvage Hydrants and/or Valves – Includes removal of the hydrant, closing and plugging of hydrant valve, and abandonment of hydrant valve in place per these specifications. Hydrants for salvage shall be transported to a location designated by GCDWR.
- D. Relocate Large Meter/Check Valve/Vault - Relocate 3", 4", 6", and 8" water meters or check valves including removal of the existing meter and vault and reinstallation of the existing meters and vaults to the new location. Existing meters and vaults shall be carefully removed, stored (if construction phasing requires), and properly reinstalled in the Work (including all excavation and backfilling) where indicated or as required.
- E. Furnish and Install Concrete Vault - Vault shall be pre-cast concrete with aluminum hatch meeting the requirements of Section 33 05 16.13 of these specifications.

- F. Adjust Valve Box – Where indicated on the Drawings, required by existing or proposed grades, or as directed by the Engineer, the Contractor shall make adjustments to existing valves boxes so they are flush with grade. Adjustments shall be made by adding or removing sections of ductile iron pipe beneath the valve box. In non-paved locations, a concrete ring shall be placed around the top of the valve box. If the existing valve box is not plumb or centered over the operating nut, the Contractor shall re-center and the valve box and return it to a plumb position. Where valves are to be abandoned, the Contractor shall close the valve, remove the valve box, fill the resulting hole with suitable compacted fill material, and restore the surface to match the surrounding area. This work shall include all excavation, backfill, and restoration required to set the valve box as directed and return the site to its preconstruction conditions.
- G. All Work performed under this item shall be performed at the locations and in the manner indicated in the Drawings or as otherwise required by GCDWR.

END OF SECTION 33 12 19.81

SECTION 33 31 00

SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Manufacturers
2.2	Flowable Fill
2.3	Joints
2.4	PVC Pipe
2.5	HDPE Pipe
2.6	Ductile Iron Pipe
3.1	Bedding
3.2	Clean-Up
3.3	Connections
3.4	Cutting
3.5	Deflection Testing
3.6	Final Inspection Preceding Acceptance
3.7	Flowable Fill
3.8	General
3.9	Guarantee
3.10	Handling and Distribution
3.11	House Connections
3.12	Infiltration
3.13	Inspection Prior to Installation
3.14	Jointing
3.15	Low Pressure Air Testing
3.16	Safety Precautions
3.17	Storage
3.18	Television Inspection

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Clearing and Grubbing (31 11 00).
3. Excavation and Fill (31 23 00).
4. Erosion and Sedimentation Controls (31 25 00).

5. Turf and Grasses (32 92 00).
6. Utility Pipe Jacking (33 05 23.16).
7. Traffic Control (34 41 16.10).
8. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all the materials, perform all necessary excavation, and properly lay and test, at the locations indicated on the Drawings or directed, all pipe and all pipe specials of the sizes specified or indicated which are necessary for the proper completion of the Work.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Piping submittal shall, at a minimum, show in detail the nominal pipe size, manufacturer name or trademark, and specification designation in accordance with ASTM/ANSI, of all piping and accessories to be used in construction.
- C. The Contractor shall submit for approval, samples, specifications, and manufacturer's recommendations for making joints Contractor proposes to use. No pipe shall be laid until approval has been given by the Engineer and GCDWR.
- D. Transition joints between sewer pipes of different materials shall be accomplished by the use of adapters made especially for that purpose. Shop drawings must be submitted and approved by the Engineer prior to the use of any adapter for this purpose.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following or an approved equal:
 1. Polyvinyl Chloride (PVC) Pipe:
 - a. Certainteed, Inc.
 - b. Diamond Plastics, Inc.
 - c. J-M Eagle
 - d. Lamson Vylon Pipe

2. High Density Polyethylene (HDPE) Pipe:
 - a. ADS
 - b. ISCO Pipe
 - c. J-M Eagle
3. Ductile Iron Pipe (DIP):
 - a. American Cast Iron Pipe Company
 - b. U.S. Pipe
 - c. McWane Ductile
4. Accessories:
 - a. A-LOK Products, Inc.
 - b. Dresser Industries, Inc.
 - c. Harrington Corporation (HARCO)

2.2 FLOWABLE FILL

- A. General: It is the intent of these specifications to produce flowable, cementitious slurry by blending Class "C" fly ash and water. The slurry should be of consistency that is both flowable and self-leveling. It should also be such consistency that it can fill irregular shaped areas through gravity placement.
- B. Materials:
 1. Fly Ash - Fly ash shall meet ASTM Specifications C-618. Section 3.2, when sampled and tested in accordance with Sections 4, 6, and 8, unless otherwise shown in the plans. Fly ash shall be of the Class "C" designation containing a minimum of 25% CaO (hydrated lime). Fly ash shall be obtained from a source approved by the Engineer. Fly ash test certification shall be provided to the Engineer.
- C. Water - The water to be used in the slurry shall be clean, clear, and free of sewage, vegetable matter, oil, acid and alkali. Water known as potable may be used without testing. All other sources shall be tested in accordance with A.A.S.H.T.O. T-26 and approved by the Engineer.

2.3 JOINTS

- A. The pipe shall be joined with an integral bell, bell and spigot type rubber gasketed joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Joints shall meet the requirements of ASTM D3212.
- B. All fittings shall utilize rubber gasket joints. Gaskets shall conform to ASTM F477.
- C. Joint materials shall minimize infiltration, prevent entry of roots, resist disintegration, cracking, and breaking. Manufacturer's recommendations shall be followed implicitly in preparing pipe and making joints.
- D. PVC sewer mains eight-inch (8") and larger diameter shall NOT be joined by solvent cement with which the pipe surfaces are fused together.

E. Transitions between DIP and PVC:

1. Shall be accomplished by transition collar utilizing C900 x SDR Adapter, HARCO, or equal, meeting ASTM 1784 for material, ASTM D3212 for joints, ASTM F477 for gaskets, and ASTM D3034 and F1336 for fittings; or by utilizing a coated solid sleeve.
2. Transition joints will not be allowed within 36 feet of a manhole, when the end result would be 36 feet or less of PVC adjacent to a manhole.

2.4 POLYVINYL CHLORIDE PIPE (PVC)

- A. PVC pipe for four inch (4") lateral connection and fittings pipe shall be Schedule 40.
- B. PVC pipe may be used for six-inch (6") through twenty-four inch (24") diameter. PVC pipe and specials shall be of the bell and spigot type, meeting the requirements of ASTM D3034 SDR 35. The pipe shall be made of PVC plastic having a cell classification of 12454B as defined in ASTM D1784. Fittings shall be made of PVC plastic meeting ASTM D3034 and F1336.
- C. Pipe of four-inch (4") and six-inch (6") diameter shall not have laying lengths less than ten feet (10'). Pipe of eight-inch (8") and greater diameter shall have laying lengths no less than twelve feet (12'), and no greater than twenty feet (20'). The nominal laying length of wyes and tees shall be per ASTM D3034. Saddles are prohibited.
- D. No old pipe or specials which have been previously used, nor pipe or specials which have been rejected shall be allowed in the Work, and they shall be removed from the project promptly and not again offered for inspection.
- E. Each length of pipe shall be marked at intervals of five feet (5') or less on pipe barrel, in accordance with ASTM/ANSI to include manufacturer name or trademark, date of manufacture, nominal pipe size, and ASTM designation.
- F. Where specified, indicated on the Drawings, or directed by the Engineer, Class 50 Ductile Iron Pipe and specials shall be substituted in lieu of PVC pipe. Ductile Iron Pipe shall meet the requirements of Paragraph 2.6 Ductile Iron Pipe (DIP).

2.5 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

- A. HDPE sewer pipe shall be dual wall, corrugated pipe that has a smooth interior and an annular exterior corrugation; made of high density polyethylene resin that meets or exceeds ASTM D-3350 requirements, manufactured and tested in accordance with ASTM F-2648.
- B. HDPE sewer pipe shall be joined with watertight, bell and spigot joints with gaskets meeting the requirements of ASTM F-477, and joints meeting watertight performance requirements of ASTM D-3212.
- C. HDPE sewer pipe shall have laying lengths of twenty feet (20').

- D. Fittings shall be in accordance with ASTM F-2648 and be watertight meeting the requirements of ASTM D-3213. Manufacturer shall supply joint lubricant for use on the gaskets during assembly.
- E. Where indicated on the Drawings, or directed by GCDWR, Class 50 Ductile Iron Pipe and specials shall be substituted in lieu of HDPE pipe. Ductile Iron Pipe shall meet the requirements of Paragraph 2.6 Ductile Iron Pipe (DIP).

2.6 DUCTILE IRON PIPE (DIP)

- A. Where specified, indicated on the Drawings, or directed by the Engineer, DIP gravity sewerage pipe and fittings shall conform to the requirements of ANSI/ASTM A746, Ductile Iron Gravity Sewer Pipe. DIP shall be cast, clean, cement-lined, asphalt coated, tested, and certified at a single manufacturing facility.
- B. DIP thickness class shall be as indicated on the Drawings.
- C. Nominal laying lengths shall be eighteen feet (18') or twenty feet (20') for pipe diameters specified.
- D. DIP pipe shall be marked in accordance with ASTM/ANSI designations at intervals of five feet (5') or less on pipe barrel. As a minimum, pipe marking shall include manufacturer name or trademark, nominal pipe size, specification designation, and date of manufacture.

E. PUSH-ON JOINT PIPE AND FITTINGS

1. Push-On Ductile Iron Pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51.
2. Push-On Ductile Iron Fittings shall be manufactured with body thickness and radius of curvature conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
3. At a *minimum*, fittings four (4) inch through twenty (20) inch shall be rated for 350 psi, and twenty-four (24) inch through sixty-four (64) inch shall be rated for 250 psi.
4. Joint deflection shall be five degrees (5°) for four-inch (4") through twelve-inch (12"); four degrees (4°) for fourteen-inch (14"); three degrees (3°) for sixteen-inch (16") through twenty-four-inch (24"); and two and one-half degrees (2½°) for thirty-inch (30").

F. MECHANICAL JOINT PIPE AND FITTINGS

1. Mechanical Joint Ductile Iron Pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51.
2. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and fittings conforming ANSI/AWWA Standard C110/A21.10 or ANSI/AWWA C153/A21.53 and joints in accordance with ANSI/AWWA Standard C111/A21.11.

3. Mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with Tee Head Bolts of high strength, heat treated, cast iron containing 0.50 percent copper or high strength low-alloy steel having a minimum yield point strength of 40,000 psi and an ultimate tensile strength of 70,000 psi.
4. Gasket, bolts, and nuts shall conform to ANSI A21.11. Gaskets shall be of neoprene or rubber, unless specified otherwise, of such quality that they will not be damaged by the liquid or gases with which they come in contact.
5. Glands shall be of high strength cast iron.

G. GASKETS

1. PUSH-ON & MECHANICAL - Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on each spigot end. Lubricant shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather and shall adhere to either wet or dry pipe. **Only lubricant furnished with the pipe by the pipe manufacturer shall be used.**
2. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, and shall be styrene butadiene rubber (SBR).

H. EXTERIOR COATING

1. Where the pipe is located within ten feet (10') of a utility line that has cathodic protection that can cause a deleterious effect on the piping system, the exterior of ductile iron pipe shall be base-coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² (0.6554 oz/ft²) of pipe surface area. A finishing layer of asphaltic topcoat shall be applied to the zinc. The mean, dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "*Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer, Second Edition 2004-06-01.*"
2. Where soils with electrical or stray currents are encountered, polywrap may be added to the zinc-coated pipe for additional corrosion protection. Polyethylene tube encasement shall be prefabricated, manufactured and supplied in accordance with ANSI/AWWA C105/A21.5, "*Polyethylene Encasement for Ductile Iron Pipe Systems.*" The wrap shall be overlapped one foot in each direction at joints, and secured in place around the pipe, and any wrap at tap locations shall be polyethylene taped tightly to prevent the entrance of foreign matter prior to tapping and inspected for any needed repairs following the tap.

I. LININGS

1. PIPE
 - a. Cement mortar lining shall be to Standard thickness in accordance with ANSI/AWWA C104/A21.4

2. FITTINGS

- a. Cement mortar lining shall be to Double thickness in accordance with ANSI/AWWA C104/A21.4

PART 3 - EXECUTION

3.1 BEDDING

- A. For gravity sanitary sewer flow in PVC pipe material, as a minimum, Class 'B' Bedding shall be used. Additional bedding material may be required dependent upon laying conditions, or as directed by the Engineer.
- B. For gravity sanitary sewer flow in DIP pipe material, as a minimum, Class 'C' Bedding shall be used. Additional bedding material may be required dependent upon laying conditions, or as directed by the Engineer.
- C. For pressurized sanitary sewer flow (Force Main), see *Standard Pump Station Specifications, Section 33 11 13.05, Paragraph 3.1.E.*
- D. For laying pipe in rock trench, the trench shall be made to conform to the general dimensions required, and the trench bottom shall be undercut to allow a minimum of six inches (6") of bedding material to be placed and compacted to establish the required sub-grade elevation. Sides and bottom of sewers shall be supported by compacting materials in place, so as to ensure an even bearing surface for the pipe. Particular care shall be taken that pipes are not permitted to rest upon or against solid or projecting portions of rock.
- E. No pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. The supporting of pipe on wood blocks, loose brick, etc., shall NOT be permitted. Defects due to settlement shall be corrected by the Contractor at no expense to GCDWR.
- F. Take care to avoid contact between the pipe and mechanical compaction equipment so as not to damage the pipe. Do not use compaction equipment directly over the pipe until sufficient Initial Backfill has been placed to assure that such equipment shall not damage or disturb the pipe.
- G. Additional bedding may be required as determined by bedding class required dependent upon pipe material, laying conditions, or direction of the Engineer.

3.2 CLEAN-UP

- A. A thorough cleanup shall be made before final acceptance and final payment is made. All excess rock shall be removed, private and public property shall be restored to original condition, and all excess pipe and fittings shall be removed.

3.3 CONNECTIONS

- A. When making connection to existing sewers, the Contractor shall remove all bulkheads and shall make proper connections to structures and sewers as

specified, indicated on the Drawings, or directed by the Engineer or GCDWR. Contractor shall make all necessary pipeline and sewer connections where required. No extra payment shall be made for this Work, but the entire cost of same shall be considered as having been included in the Unit Prices Bid.

- B. Where pipe is connected to a concrete or masonry structure which has no existing stub out or cored hole, Contractor shall make such connection *only* with a core into the structure, and provide a flexible manhole boot.

3.4 CUTTING

- A. Whenever a pipe requires cutting, the pipe shall be cut in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. The end shall then be beveled in accordance with manufacturer's recommendations for field beveling.

3.5 DEFLECTION TESTING

- A. Deflection tests shall be required, when in the opinion of GCDWR CCTV Inspection, there is reason to suspect excessive deflections; and said tests shall be performed no sooner than thirty (30) days following completion of backfill unless otherwise approved. Deflection tests shall be performed by GCDWR with the GCDWR Inspector present. Maximum ring deflection of the pipe, under load, shall be limited to five percent (5%) of the inside pipe diameter.
- B. All pipe failing to maintain the minimum deflection diameter shall be considered improperly installed and shall be re-laid or replaced by the Contractor.

3.6 FINAL INSPECTION PRECEDING ACCEPTANCE

- A. Final inspection may include a visual inspection of each section of sewer by looking from manhole to manhole with the aid of reflected sunlight or an electric light. Such light used for inspection shall be plainly visible from manhole to manhole. Light reflected along the pipe walls from manhole to manhole shall not be considered as plainly visible light and shall be reason for rejection of the section of sewer as not being laid true to line and grade. The pipe shall be true to both line and grade; shall show no leaks, shall be free from cracks and protruding joint materials and contain no deposits of sand, dirt, or other materials. All finished Work shall be neat in appearance of first class workmanship.

3.7 FLOWABLE FILL

- A. Equipment:
 - 1. The equipment used by the Contractor shall be capable of properly blending the materials into a homogeneous mixture, suitable for the intended use and complying with all specifications included herein.

2. Equipment shall be capable of continuous mixing. Elapsed time, from the time materials are introduced into the mixing unit, until they are gravity fed from the mixer, shall not exceed (1) minute.
 3. Equipment that requires the use of chemical retarders or other additives is not acceptable without written permission of the Engineer. All equipment shall be approved by the Engineer prior to starting work.
- B. Fly Ash Storage and Delivery:
1. Fly ash shall be stored and handled in closed, waterproof containers until being introduced into the mixing equipment.
 2. If fly ash is furnished in trucks, each truck shall have the weight of fly ash certified on public scales.
 3. Reclaimed fly ash or fly ash that has been exposed to moisture shall be rejected.
- C. Construction Methods: Bulkheads shall be built at both ends of the structure intended for abandonment or casing pipe. Placement of the slurry should start at a point nearest the downstream bulkhead; placement should be through a manhole or inlet. A vent hole should be used to allow for air to escape. Placement shall continue until material is expelled through the vent hole and slurry backs up through the manhole or inlet. Once this happens, the equipment is moved upstream to the nearest manhole or inlet, and the procedure is repeated until the structure is completely filled.
- D. Sampling and Testing:
1. Samples shall be taken at the rate of one (1) per 8-hour shift, unless otherwise directed by the Engineer. Cylinders shall be cast and field cured at the worksite for a minimum of six (6) hours before being taken to the lab. Compressive strength shall be a minimum 100-psi at 28 days.
 2. Prior to starting the Work and no later than 48 hours before placement, the Contractor shall submit to the Engineer in writing both a method statement and mix design.
- E. If required by the Engineer, the flowability shall be checked by the use of the U.S. Army Corps of Engineers "Flow Cone Test Method". Maximum efflux time is 10-16 seconds; this is an optional requirement. The Contractor shall hire a reputable testing lab acceptable to the Engineer to perform the above mentioned tests.
- 3.8 GENERAL
- A. All pipe shall be thoroughly cleaned before being laid, and shall be kept clean until acceptance of the completed Work. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes shall be used.

- B. All trenches shall be kept free from water when pipe laying is in progress, and no water shall be allowed to rise within twelve inches (12") of the bottom of the pipe until jointing is completed.
- C. Pipe and specials shall be laid accurately to required lines and grades and shall be uniformly supported along their entire length. Bottoms of excavations shall be properly trimmed and bell holes dug to properly support joints. Size of bell holes shall be kept to a minimum, but shall be large enough to permit the proper making of joints.
- D. The open end of uncompleted pipelines shall be provided with a temporary stopper carefully fitted so as to keep dirt and other substances from entering. This stopper shall be maintained in position at all times when laying is not actually in progress.

3.9 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from the date of Final Completion all lines, appurtenances, trenches, and other disturbed surfaces.
- B. The Contractor shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle, he/she shall promptly furnish and place fill to original grade. Should any leaks or trench settlement occur under the new pavement, the Contractor shall be held responsible for the cost of all repairs, including pavement replacement.

3.10 HANDLING AND DISTRIBUTION

- A. Pipe shall be carefully transported, stored, and handled to prevent damage to the pipe or bell. Damaged pipe or bells shall be cause for rejection of the pipe. Pipe shall be stored in such manner as to keep the interior free of dirt or other foreign matter.
- B. Stringing out of pipe more than two (2) days in advance of installation shall not be permitted.

3.11 SERVICE CONNECTIONS

- A. Provision shall be made in sewer mains for Service Connections as specified, indicated on the Drawings, or directed by the Engineer or GCDWR. Service Connections for each building sewer lateral shall be made by installing in the sewer main, at forty-five degrees (45°) above the horizontal axis of the sewer main, a 'Wye' (for PVC pipe), or a 'Tee' (for Ductile Iron Pipe). All Service Connections shall be six-inch (6") diameter.
- B. Service Connections out of manholes, as indicated on the Drawings or as directed by the Engineer or GCDWR, shall extend from the manhole a minimum of ten feet (10'). All stub outs shall be stopped with mechanical plug, joints equal to that specified, and properly installed and braced to prevent leakage

during periods of testing. All pipes laid out of manholes shall connect to the manhole by utilizing a cored hole with a flexible manhole boot.

- C. Service Connections shall be properly stopped with a mechanical plug and marked appropriately on the ground surface.
- D. For sewer mains exceeding twelve feet (12') in depth, Contractor shall use a Deep House Connection. This connection shall utilize a DIP 'Tee' on the main line, DIP service line placed vertically, and topped by a DIP 'Tee' and plug. Connection assembly shall be such that the elevation of the upper 'Tee' shall not be less than five feet (5') below finish grade, and at such elevation as to properly receive the building sewer lateral. Allow a minimum of one percent (1.0%) slope from building sewer lateral elevation to the Service Connection elevation.
- E. When Service Connections are so located that those on opposite sides of the street come to the same point in the sewer, the Contractor must install a separate 'Tee' for each Service Connection.
- F. In general, it is the intent to locate building sewer laterals during construction.
- G. Service Connections shall extend from the main line to five feet (5') outside of road right-of-way, easement line, or as indicated on the Drawings or directed by GCDWR.
- H. Replace or restore lawns and landscaped areas per requirements of Specification Section 32 92 00 Turfs and Grasses.
- I. Where indicated on the Drawings, or as directed by the Engineer, Class 50 ductile iron pipe and specials shall be substituted in lieu of PVC Service Connections. Ductile Iron Pipe and specials shall meet the requirements of this specification section, Paragraph 2.6 Ductile Iron Pipe (DIP).

3.12 INFILTRATION

- A. On newly installed sewers sixteen-inch (16) or less diameter, no infiltration or leaks shall be allowed. Any infiltration flowing at the low point of a project must be eliminated prior to approval.
- B. On large diameter mains (greater than sixteen-inch (16") diameter), the allowable infiltration shall not exceed 75 gallons per day/inch diameter/mile. Visible or known leaks shall not be allowed regardless of total infiltration.

3.13 INSPECTION PRIOR TO INSTALLATION

- A. Pipe shall be inspected and tested at the mill or warehouse by an approved, independent testing laboratory to determine conformity with requirements of ASTM Standards. Signed and dated certificates stating results of inspection and tests shall accompany each shipment and shall be a prerequisite to acceptance of the shipment on the Work by the Engineer.
- B. Prior to lowering pipe and specials into the trench, a field inspection may be made by the Engineer.

3.14 JOINTING

- A. When pipes are ready for jointing, bell interior and spigot surface shall be cleaned of all dirt and foreign matter, coated with manufacturer's approved lubricant, and pipes shoved home. Care shall be exercised after laying to prevent deflection or separation of the joint just made. All joints shall be made in the trench, and only one (1) joint shall be made at a time.
- B. All pipe ten-inch (10") diameter and smaller shall be joined using a pry bar and block. On pipe larger than ten-inch (10") diameter, mechanical assistance may be necessary.
- C. When the joint is completed, the sewer shall have a smooth, unobstructed invert, and the pipe shall be true to grade and alignment. If the invert protrudes above the invert of adjacent pipe it shall be removed and replaced.
- D. After the pipe has been properly embedded and joints made, Initial Backfill materials shall be carefully tamped on each side of the pipe between the walls of the excavation and the pipe before Final Backfill is performed as specified under Specification Section 31 23 00 Excavation and Fill.
- E. Great care shall be used to secure water tightness and to prevent damage to or disturbing of joints during backfilling, or at any other time after the pipes have been laid and the joints have been made. There shall be no walking on or working over the pipe except as may be necessary in tamping, until there is cover no less than one foot (1') in depth over the top of the pipe.
- F. All joints showing leakage shall be uncovered and the joints remade at Contractor's expense.
- G. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation in which frost exists, nor when the Engineer deems that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

3.15 LOW PRESSURE AIR TESTING

- A. After completing backfill of a sewer line section, conduct a low pressure air test of all pipe constructed, using methods and devices acceptable to GCDWR. Prior to testing for acceptance, the pipe should be cleaned by passing through the pipe a full gauge squeegee. It shall be the responsibility of the Contractor to have the pipe clean. Perform such test using the following general procedures:
 - 1. Temporarily plug line segment between two (2) manholes using plugs having airtight fittings through which low pressure air can be introduced into the pipe segment being tested.
 - 2. Introduce low pressure air into the test pipe segment until the internal air pressure reaches 4.5 psig above water pressure, if any.
Where high ground water is known to exist, the height in feet of ground water above the invert of the sewer shall be divided by 2.31 to establish the pounds of pressure that shall be added to the internal air pressure used for the test.

3. Wait at least two (2) minutes for air temperature in the test segment to stabilize while internal air pressure remains a minimum of 3.5 psig above ground water pressure.
4. Bleed internal air pressure to exactly 3.5 psig above ground water pressure.
5. Accurately determine the elapsed time for internal pressure to drop to 3.0 psig above ground water pressure.
6. The air test is acceptable if elapsed time is no less than shown by the following table:

<u>PIPE DIAMETER</u>	<u>ELAPSED TIME</u> <u>Minutes/100 feet</u>
6-Inch	.7
8-Inch	1.2
10-Inch	1.5
12-Inch	1.8
15-Inch	2.1
18-Inch	2.4

- B. Air test shall not be required on pipe larger than 18 inches in diameter.
- C. Permanently correct excessive leakage determined by air testing, and repeat operations until Engineer witnesses a successful test on each line segment in accordance with ASTM F1417. If the pipe installation fails to meet these requirements, the Contractor shall determine at his/her own expense, the source or sources of leakage, and he/she shall repair (if the extent and type of repairs proposed by the Contractor is approved by GCDWR) or replace all defective materials or workmanship. Final acceptance of each section or run of sewer tested shall not be issued until leakage has been reduced to rates not exceeding the maximum specified. The Contractor shall furnish all facilities and personnel for conducting tests. All wyes, tees, or end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

3.16 SAFETY PRECAUTIONS

- A. The low pressure air test may be dangerous to personnel if a line is over pressured or plugs are installed improperly. It is extremely important that the plugs be installed so as to prevent their sudden expulsion. Observe the following safety precautions:
 1. No one shall be allowed in the manholes during testing.
 2. Install all plugs securely.
 3. When lines are to be tested, it may be necessary that the plugs be braced as an added safety factor.

- 4. Do not over pressurize the lines.
 - B. Final acceptance of each section or run of sewer tested shall not be issued until leakage has been reduced to rates not exceeding the maximum specified herein as permissible.
 - C. The required measurements for leakage shall be made by the Engineer, but the Contractor shall furnish all labor, materials, and equipment; including hose, weirs, and water supply, as may be necessary in making test. No direct or separate payment shall be made for these tests but the cost thereof shall be included in the Unit Prices Bid for pipe installation.
- 3.17 STORAGE
- A. Store pipe on a flat surface so the barrel is evenly supported. Do not stack higher than 4 feet. For extended storage, PVC pipe must be covered with an opaque material to shield it from the sun's rays. Bells must be stacked in opposing directions on alternate rows so they are not supporting the full load.
- 3.18 TELEVISION INSPECTION
- A. During the progress of construction and upon completion of the same, GCDWR shall inspect, by closed circuit television, all sewers inclusive for leakage, faulty joints, or faulty pipe. The Contractor shall not remove temporary access roads, bridges, and creek crossings until authorized to do so by the Engineer.

END OF SECTION 33 31 00

SECTION 34 41 16.10

TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
2.2	Worker Safety Apparel
2.3	Traffic Control Devices
3.1	Maintaining Traffic
3.2	Traffic Control

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00).
2. Exploratory Excavations (02 32 19).
3. Paving Removal (02 41 13.13)
4. Utility Line Removal (02 41 13.23)
5. Removal of Construction Material (02 42 11)
6. Clearing and Grubbing (31 11 00)
7. Excavation and Fill (31 23 00).
8. Erosion and Sedimentation Controls (31 25 00).
9. Asphalt Paving (32 12 16)
10. Sidewalks, Curbs, and Gutters (32 16 13)
11. Roadway Construction (34 71 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, equipment, and labor (including employment of off-duty Gwinnett County Police Officer(s)), necessary to maintain traffic control during construction. This Work shall consist of furnishing, installing, maintaining, and removing necessary traffic signs, pedestrian signs, barricades, lights, signals, cones, pavement markings, and other traffic control devices, as specified by MUTCD,

indicated on the Drawings, or as directed by the Engineer or GCDWR; and shall include flagging and other means for guidance and protection of vehicular, worker, and pedestrian traffic, and shall include both maintaining existing devices and installing additional devices through the Work Zone.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail, the type, number, and location of all traffic control measures to be used in the execution of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, all materials furnished for traffic control shall meet the requirements of the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Sections 148 and 150, latest edition; Georgia Department of Transportation, Special Provision, Section 150-Traffic Control, latest edition; and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

2.2 WORKER SAFETY APPAREL

- A. All workers within the right-of-way who are exposed to traffic or to work vehicles and construction equipment shall wear high-visibility safety apparel that meets the Performance Class for the risk exposure.

2.3 TRAFFIC CONTROL DEVICES

- A. All traffic control devices used during the execution of the Work shall meet the Standards utilized in the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

PART 3 - EXECUTION

3.1 MAINTAINING TRAFFIC

- A. All working operations of the Contractor, Subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highway, and structures encountered in the prosecution of the Work under this item.
- B. The Contractor shall proceed with the Work in such manner as shall permit regular transaction of business by the GCDOT and/or property owner without delay or danger

to life or property, and shall place necessary barricades, warning signs, signals, lights, and if necessary, flaggers or Police Officer(s) for the protection of the traveling public.

- C. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give a minimum of twenty-four (24) hour notice to owner(s)/tenant(s) of private drives before interfering with them.
- D. In making open-cut street crossings, Contractor shall not block more than one-half ($\frac{1}{2}$) of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side of the street to facilitate traffic flow.

3.2 TRAFFIC CONTROL

- A. Contractor's proposed plan of operation shall supplement the approved traffic control plan as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. All traffic control devices shall be in an acceptable condition when first installed on the Project and shall be maintained throughout the construction period. All unacceptable traffic control devices shall be replaced within twenty-four (24) hours.
- C. In the execution of the Work, if it becomes necessary to remove any existing signs, markers, etc., they shall be removed, stored and reinstalled as directed by the Engineer or GCDWR, to line and grade in the same condition as when removed.
- D. All temporary traffic control devices shall be removed within seven (7) calendar days after completion of construction.
- E. When necessary to provide a safe work zone for the Contractor and GCDWR employees, off-duty Police Officer(s) may be utilized to assist in maintaining safe traffic control. Use of Police Officer(s) shall be used when safety necessary, in areas of high traffic volume, installation in roadways, road closures and lane closures, or in areas of low visibility. The Contractor shall contact the Gwinnett County Police Department Uniform Division Office at (770) 513-5820 to schedule an off-duty Police Officer(s). Arrangements for Police Officer(s) must be made a minimum of forty-eight (48) hours prior to the Work to allow time for Police Officer(s) to be scheduled. Depending on the situation, the Police Officer(s) onsite may request additional Police Officer(s), if needed.

END OF SECTION 34 41 16.10

SECTION 34 71 00
ROADWAY CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	General Conditions
3.2	Materials and Workmanship
3.3	Restoring Driveway and Parking Area Pavements
3.4	Roadway Permits
3.5	Restoring Roadway Pavements

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00)
2. Removal of Construction Material (02 42 11)
3. Paving Removal (02 41 13.13)
4. Cast-in-Place Concrete (03 30 00).
5. Excavation and Fill (31 23 00).
6. Asphalt Paving (32 12 16).
7. Sidewalks, Curbs, and Gutters (32 16 13)
8. Traffic Control (34 41 16.10)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.
 1. Where section numbers are identified throughout this specification, the reference is to the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, latest edition.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to restore all pavements (parking areas, driveways, sidewalks, curbs, gutters, etc.) of whatever

construction and irrespective of the type, which may be damaged, disturbed, or required to be removed in the process of the Work.

- B. These items shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, gravel, asphalt and other bituminous material necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall furnish samples, manufacturer's product data, test reports, and material certifications as required above in Paragraph 1.1.B RELATED SECTIONS.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For asphalt and other bituminous paving, refer to Specification SECTION 32 12 16 ASPHALT PAVING, PART 2 – PRODUCTS.
- B. For concrete paving, sidewalks, curbs, and gutters, refer to Specification SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS, PART 2 – PRODUCTS.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

- A. Contractor's attention is directed to the provisions of Specification SECTION 31 23 00 EXCAVATION AND FILL, Paragraph 3.1 BACKFILLING, requiring Final and Sub-base backfill and compaction of backfill under areas to be paved. Any settlement which may occur during the Warranty Period of one (1) year following Substantial Completion certification, shall be corrected at the Contractor's expense, including repaving and/or replacing of streets, curbs, gutters, parking areas, and driveways which settle during the Warranty Period.
- B. The Contractor shall repave all areas over trenches in public streets as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR, promptly after completion of Final and Sub-base backfill to provide full use of the street with a minimum of delay.
- C. No additional payment shall be made for excavation or disposal of excavated material required for placement, or removal of backfill placed above the required elevation of the pavement or for preparation of sub grade, and the cost thereof shall be considered as being included in the Unit Prices Bid for paving and curbing items.

- D. Should settlements, cracks, or other indications of failure appear in adjoining pavements, the adjoining damaged paving shall be removed per provisions of SECTION 02 41 13.13 PAVING REMOVAL, Paragraph 3.1 TRENCH PAVING REMOVAL, to the extent necessary to secure firm, undisturbed bearing, and shall be repaved to Standards as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- E. Where necessary to cut a concrete sidewalk, driveway, or parking area, entire slabs or sections shall be removed and replaced to an edge of paving or joint, unless otherwise directed by GCDWR.
- F. The Contractor shall replace all sidewalks removed or disturbed by the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Sidewalks shall be constructed to the same dimensions and materials as were originally placed. The sub-base shall be thoroughly rolled or tamped and shall be wet just before, if necessary, concrete is placed, but shall show no pools of water.
- G. The Contractor shall restore all curbs, combination curbs and gutters, which have been removed or disturbed in the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Curbs and gutters shall be made to conform accurately in size, line, grade, and materials as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. In restoring curbs and gutters, the subsoil and foundation material shall be compacted as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, so as to prevent any settlement of concrete curb and/or gutter.
- H. In paved areas, the Contractor shall adjust all utility structures (manhole frame/cover, vault tops, valve boxes, etc.) to final grade per provisions of SECTION 33 05 16.13 PRECAST CONCRETE UTILITY STRUCTURES.

3.2 MATERIALS AND WORKMANSHIP

- A. Materials to be used in the repair and restoration of pavements, driveways, sidewalks, and curbs and gutters shall be as specified above in this section in Paragraph 2.1 MATERIALS. All materials removed during the excavation of the Work shall be disposed of by the Contractor per provisions of SECTION 02 42 11 REMOVAL OF CONSTRUCTION MATERIAL. All workmanship shall be first class.

3.3 RESTORING DRIVEWAY AND PARKING AREA PAVEMENTS

- A. The Contractor shall restore driveway and parking area pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed and backfill completed, the Contractor shall furnish, place and maintain wherever the pavements have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. Driveways and parking areas shall be constructed as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, but concrete shall not be less than 4 inches thick. Surface finish is to match existing; edges are to be saw cut in straight lines, both horizontally and vertically; expansion joints to

be used as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative. In general, concrete driveways shall be replaced from back of curb to a point ten (10) back from back of curb, or to the closet expansion joint nearest the construction disturbance. The limits of this type of restoration shall be approved by GCDWR prior to construction of that area in order to determine payment quantities.

- B. All Concrete shall conform to Specification SECTION 03 30 00 CAST-IN-PLACE CONCRETE, Paragraph 2.1 CONCRETE.

3.4 ROADWAY PERMITS

- A. The Contractor's attention is called to the requirements that Contractor must obtain all road opening permits from GCDOT, and must assist GCDWR in obtaining all permits required by the Georgia Department of Transportation.
- B. All fees shall be borne by the Contractor.

3.5 RESTORING ROADWAY PAVEMENTS

- A. The Contractor shall restore roadway pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore and maintain wherever the pavements or road surfaces have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- B. All roadway restoration shall be done, and all highway utilities and traffic controls are to be maintained, in accordance with the laws, ordinances, rules, regulations and Standards, including the use of standard signs, of the jurisdictional authority in which such pavement is located. The Contractor shall provide all such bonds or checks, which may be required by the highway authorities to ensure proper restoration of paved areas, at no cost to GCDWR. All road closures and detours must be submitted and approved by the authorities within whose jurisdiction they are located.
- C. The Contractor shall resurface the entire street from curb to curb, or any other area as directed by the Engineer or GCDWR. Asphaltic concrete paving shall conform to the requirements of SECTION 32 12 16 – ASPHALT PAVING.
- D. If prior to the expiration of the Warranty Period, the asphalt, concrete or stone road surfaces within the lines of excavation, or adjacent thereto, shall have been damaged or injured, due to undermining, or for any other cause which may be attributed to the Work by the Contractor, then the Contractor shall remove such damaged or injured surfaces, foundations of same, and all loose earth. Contractor shall then backfill and compact damaged area as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, and furnish, place, and maintain an asphalt, concrete or stone road surface until the Warranty Period has expired.

- E. Asphalt, concrete or stone road surfaces, which the Contractor is required to replace, shall at the expiration of the Warranty Period, be in as good or better condition than at the time of Contract award.
- F. All cuts required in restoring pavements shall be made by channeling machine, pneumatic tools, or such other methods as shall furnish a clean, straight cut both horizontally and vertically, in the pavement and pavement base without undue shattering.

END OF SECTION 34 71 00

Appendix A

Geotech Reports



ECS Southeast, LLC

Limited Geotechnical Engineering Report
Harbins Landing Sewer Interceptor &
Pump Station Decommissioning

Drowning Creek Road
Dacula, Georgia

ECS Project No. 10:12886

February 25, 2026





ECS SOUTHEAST, LLC

Geotechnical • Construction Materials • Environmental • Facilities

February 25, 2026

Mr. Jimmy Powell
Gwinnett County DWR
684 Winder Highway NE
Lawrenceville, GA 30045

ECS Project No. 10:12886

Reference: Limited Geotechnical Engineering Report
Harbins Landing Sewer Interceptor & Pump Station Decommissioning
Harbins Road
Dacula, Georgia

Dear Mr. Powell:

ECS Southeast, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed-upon scope of work as outlined in our Proposal No. 10:20906, dated November 5, 2025, as authorized by Mr. Jimmy Powell with Gwinnett County on December 9th, in accordance with our Master Service Agreement, along with the PO Number: 229861. This report presents our understanding of the project's geotechnical aspects, along with the results of the field exploration and our findings.

It has been our pleasure to serve Gwinnett County DWR during the design phase of this project. We would appreciate the opportunity to remain involved throughout the continuation of the design phase and would like to provide our services during construction-phase operations as well to verify the subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Southeast, LLC

Tyler K. Schrama
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APPENDICES

Appendix A – Diagrams

- Figure 1 - Site Location Diagram
- Figures 2 to 5 - Exploration Location Diagrams

Appendix B – Field Operations

- Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
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- Boring Logs B-1 through B-2
- Seismic Refraction Investigation Results

Appendix C – Supplemental Report Documents and Calculations

- GBA Important Information about This Geotechnical-Engineering Report

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information using seismic refraction and soil test borings along the proposed alignment approximately 2.4 miles long in Dacula, Georgia. The alignment runs along the eastern side of Summit Valley Residences, follows Drowning Creek, and terminates near the western end at the Apalachee River.

The findings presented for this report are based on the results of our geophysical exploration and project information provided by Gwinnett County DWR. This report contains the results of our geophysical exploration and site characterization, the field techniques used to collect the data, the findings, and outlines possible limitations of the seismic refraction method.

1.2 SCOPE OF SERVICES

1.2.1 Seismic Refraction

Seismic refraction is commonly used to determine the depth and competency of subsurface materials, such as soil, partially weathered rock (PWR), and competent rock. The method is often employed to evaluate the rippability characteristics expected during the mass grading phase of a construction site. For this analysis, we performed forty-five (45) seismic refraction test arrays along the force main line alignment. This assessment includes the topographical high points of the alignment and roughly 60% of its length. The exploration diagram in Appendix A shows the locations and orientations of the seismic arrays, based on GPS coordinates and compass readings collected in the field. The endpoints of the seismic arrays were marked by a survey crew and designated with green, white, and red flagging stakes. Blue/white flagging tape was used wherever the seismic arrays deviated by more than 20 feet from the surveyed endpoints. Start and end points have latitude and longitude coordinates. These coordinates were collected at each location and are recorded on the seismic profiles.

1.2.2 Field Exploration

This exploration aimed to assess the subsurface conditions at two pre-selected locations to a depth of 25 feet or until auger refusal, whichever came first. We drilled boreholes to examine soil and groundwater conditions and collected representative soil samples to determine relevant engineering properties.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION AND SITE DESCRIPTION

The project alignment runs along the eastern side of Summit Valley Residences, following Drowning Creek and ending near the western edge at the Apalachee River in Dacula, Gwinnett County, Georgia. It is bordered to the north by University Highway (US-29) and to the south by residential neighborhoods and local roads such as Franklin Circle and Whitley Road.

The terrain along the route varies from steep slopes to relatively flat areas and is mainly wooded with deciduous and evergreen forests. The route crosses several streams and roads, including Drowning Creek, Drowning Creek Road, and the sidewalk running parallel to the Apalachee River. A Site Location Diagram is included in Appendix A (Figure 1).



**Imagery of Project Alignment and Surrounding Condition
(Google Earth Imagery dated December 13, 2025)**

2.2 REGIONAL GEOLOGY

The site is in the Piedmont Region of Georgia. This site is in a geologic region mapped by Lawton, D.E., and others (1976) on the Geologic Map of Georgia for the Georgia Geological Survey as Precambrian-Paleozoic aged granite gneiss and undifferentiated. McConnell and Abrams (1984), in their work on the Geology of the Greater Atlanta Region for the Georgia Geological Survey, further mapped this as the Atlanta Group for the late Precambrian to early Paleozoic, composed of Lithonia Gneiss.

The natural soils at the site consist primarily of residual materials formed from the in-place physical and chemical weathering of the underlying parent bedrock. The relative density of the residual soils is primarily dependent upon the degree of weathering, surface disturbance, groundwater action, and residual mineral bonding. The shear strength of residual soils is anisotropic and varies significantly from point to point. Soils with the flaky minerals oriented parallel to the potential shear plane and the slickenside surfaces have lower shear strengths.

The boundary between soil and rock is not clearly defined. A transitional zone called Partially Weathered Rock (PWR) is normally found above the parent rock. PWR is defined for engineering purposes as residual material with standard penetration resistances of more than 100 blows per foot. Weathering is facilitated by fractures, joints, and the presence of less resistant rock types. Consequently, PWR and hard rock profiles are irregular, and zones of PWR or rock may occur within the soil mantle well above the general bedrock level. In some cases, boulders can be found in the upper soil matrix.

Groundwater levels are irregular in the Piedmont Region. The surface of the groundwater table is largely determined by topography and is generally parallel to the ground surface. It can exhibit some distortions due to differences in vertical and horizontal permeability. The groundwater table can fluctuate several feet with seasonal rainfall.

Based on the online Soil Survey of Gwinnett County, Georgia, as prepared by the US Department of Agriculture Soil Conservation Service, a summary of the predominant soil types (within the upper 5 feet below original grade) at the site and their characteristics is included in the following table and a map of the various soil types is provided in Appendix A of this report.

Soil Type	Constituents	Parent Material	Internal Drainage	Seasonal High-Water Table (inches)
Altavista fine sandy loam, 0 to 2 percent slopes	Fine sandy loam, sandy clay loam, sandy loam	Alluvium	Moderately Well drained	18 to 30
Appling sandy loam, 6 to 10 percent slopes, moderately eroded	Sandy loam, sandy clay loam, sandy clay, clay, sandy clay loam, sandy loam	Residuum	Well drained	80+
Appling-Hard Labor complex, 2 to 6 percent slopes	Sandy loam, sandy clay, sandy clay loam	Residuum	Well drained	80+
Ashlar, Rion, and Wateree soils, 10 to 25 percent slopes	Sandy loam, unweathered bedrock	NA	Well drained	80+
Chewacla silt loam, 0 to 2 percent slopes, frequently flooded	Silt loam, silty clay loam, sandy clay loam, silt loam	Alluvium	Somewhat poorly drained	6 to 24
Pacolet sandy loam, 2 to 6 percent slopes, moderately eroded	Sandy loam, clay loam, sandy loam	Residuum	Well drained	80+
Pacolet sandy clay loam, 10 to 15 percent slopes, moderately eroded	Sandy clay loam, clay, sandy loam	Residuum	Well drained	80+
Toccoa fine sandy loam, 0 to 4 percent slopes, frequently flooded	Fine sandy loam, sandy loam	Alluvium	Moderately Well drained	30 to 60
Wehadkee soils, 0 to 2 percent slopes, frequently flooded	Silt loam, loam, clay loam, sandy clay loam	Alluvium	Poorly drained	0 to 12
Wedowee sandy loam, 10 to 25 percent slopes, eroded	Sandy loam, loam, sandy clay, sandy clay loam	NA	Well drained	80+

3.0 FIELD EXPLORATION AND RESULTS

3.1 GEOPHYSICAL EXPLORATION PROGRAM

Seismic refraction is a non-invasive technique used to determine the depth and layer velocities (or densities/hardnesses) of soil, PWR, and rock. Layer velocities are particularly useful in determining the excavation equipment and techniques required for earthwork activities. To explore the subsurface conditions at this site, a total of forty-five (45) seismic refraction traverses (SL-1 through SL-41) were

performed in the designated locations; in some instances, individual lines were divided into segments A and B.

For this project, our seismic profiles were 110 and 230 feet long, with geophones spaced at 10-foot intervals. The array and energy source configuration for the investigation provided an effective depth of approximately 35 feet below the existing ground surface for the 110-foot arrays and up to approximately 60 feet for the 230-foot arrays. During the sampling process, the geophones measure compression waves generated by a sledgehammer striking an aluminum plate and send the information to a 24-channel seismograph for timing, storage, stacking, and enhancement. As the compression waves refract through harder or denser layers of strata in the subsurface, the wave velocities increase. By varying the source location relative to the receiver array, a graph of time vs. distance is generated. This is used to calculate velocities (and inferred stratal densities) and the depths of the underlying materials. Changes in surface elevation along each array were measured and recorded using survey-level rod-and-hand leveling; these methods were incorporated into the analysis.

3.2 SUBSURFACE SEISMIC REFRACTION RESULTS

The field-collected raw data were reduced to velocity models, which served as the basis for the seismic traverse diagrams provided in Appendix B. Tomographic processing was performed on each data set. This method provides a subsurface velocity model that shows subtle vertical and horizontal changes in the underlying soil and rock. The tomographic results for the models consist of color-contour data representing the measured compression wave velocity. These data points were used to annotate a geologic interpretation on each model by delineating subsurface layers where compression wave velocities change.

Each layer contains labels that identify its geologic interpretation and any possible lateral velocity changes within the layer. By using the annotated layer interpretation in conjunction with tomographic contouring, the nature of the layer interface can be determined. A narrow, tight tomographic contour at a layer interface would indicate a sharp transition between the adjacent layers. On the other hand, an area of wide, consistent contours would suggest that the layer interfaces are more gradational between soil overburden, PWR horizons, and ultimately competent rock.

The following defines our layer-based interpretation of the profile geology, categorizing velocities into three general groups. Because the difficulty of excavation increases with compression wave velocity, we have included soils, saprolite, partially weathered rock, and competent rock.

0 – 2,000 ft/sec: Soils – including all material such as topsoil, undocumented fill material, and residual soils that are relatively easy to excavate using conventional earth excavation equipment.

2,000 – 3,000 ft/sec: Denser Soils/Saprolite – Soils and highly weathered rock near the consistency of soils that may be more difficult to excavate while using conventional earth excavation equipment when approaching near the 2,500 to 3,000 ft/sec.

3,000 – 4,000 ft/sec: Partially Weathered Rock - (PWR) is a transitional material between soil and rock that retains the rock's relic structure.

3,500 – 5,000 ft/sec: Denser Partially Weathered Rock and/or Fractured Rock

>5,000 ft/sec: Mass Rock – Mass rock is normally indicative of a very hard or very dense material, such as boulders, rock lenses, or the upper surface of bedrock. This material normally requires blasting in trenches and mass excavations.

3.2.1 Partially Weathered Rock and Mass Rock

The seismic models indicate highly variable soil layer thicknesses that transition into dense PWR and competent rock. The depth to PWR varies considerably across the site, with most models along the western portion of the alignment showing PWR at depths ranging from approximately 8 to 25 feet below ground surface. Most models, except for SL-20, SL-18, and SL-16, display competent rock within tested depths of investigation. The shallowest occurrence of competent rock was identified at SL-40, where rock appears to be within approximately 2 feet below the ground surface.

In some areas, the refraction of data appears to be influenced by the presence of the water table. Where this condition was suspected, additional MASW processing was performed and incorporated into the corresponding models to better constrain the interpreted subsurface conditions. Six of the forty-one arrays exhibited discrepancies within the shear-wave datasets that warrant notation. These inconsistencies are likely related to groundwater conditions.

Excavation in soil and soil/saprolite should be easily accomplished using standard excavation equipment. Mass excavation in material designated as PWR will likely require ripping using a single-tooth ripper on an appropriately sized bulldozer. Due to confinement and equipment limitations, trench excavations in PWR will likely require blasting. All mass and trench excavation will require blasting in areas interpreted as rock.

The excavation of weathered rock and rock can have a substantial impact on the cost and schedule of the proposed construction. This discussion considers two general classes of materials for the purposes of describing excavatability. Residuum and weathered rock will be used as the terms for the excavated materials.

In confined excavations, such as utility trenches, excavating dense residual soils typically requires large track-mounted backhoes. Excavation of the harder phases of weathered rock typically requires the use of excavators with hydraulic jackhammers or light blasting. Refusal materials (apparent rock) normally require blasting in trench excavations. Blasting in utility trenches should be done carefully to avoid damage to the surrounding materials. When the material to be excavated requires blasting, the contractor should comply with local jurisdiction requirements and guidelines.

We recommend the following rock definition for trench excavation:

Blast Rock (approximately 2,500 to 5,000 plus ft/sec): Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent) and occupying an original volume of at least one-half cubic yard.

Blasting should only be conducted where ripping cannot excavate materials and in locations permitted. We recommend removing excavatable soils first with conventional grading equipment (scrapers and loaders). We do not recommend leaving soil overburden in place during blasting because determining

blast rock quantities becomes very difficult, and costs are generally higher. In addition, residual soil overburden will increase the rock's confining pressure and reduce the effectiveness of blast charges. Loose-fill or blasting mats can be placed over the blast area to control fly rock. Rock blasting is very expensive. Hence, control of quantities is important. If requested, ECS can aid in estimating or qualifying the blast rock quantities.

We note that the weathering process in the Piedmont geology can be erratic, and significant variations in the depths of the denser materials can occur in relatively short distances. In some cases, isolated boulders or thin rock seams may be present in the soil matrix and remain undetected by the borings performed.

3.3 GEOPHYSICAL LIMITATIONS

Good correlation has been demonstrated in site investigations that use geotechnical methods, such as boring or test pits, and seismic refraction. However, with any geotechnical or geophysical subsurface investigation, limitations exist, such as:

- 1) Seismic refraction is a geophysical method that infers subsurface properties based on the data collected at the ground surface.
- 2) The seismic refraction method is only capable of interpreting layers of increasing velocity (density or hardness) with depth. Lower-velocity zones underlying higher-velocity layers may be masked by denser, shallower materials.
- 3) The presence of a well-established groundwater table can produce a shallow, flat layer with a characteristic seismic velocity of approximately 5,000 ft/sec. If present, this groundwater zone can be mistaken for competent rock and can also create a masking effect on the lower velocity layers that are below it. Typically, this influence is only encountered when test locations are in or very near the proximity and elevation of a floodplain.

This report reflects subsurface conditions found only at the test locations and is limited to material directly below the geophone arrays. Variations in the subsurface materials should be expected.

3.4 DRILLING EXPLORATION PROGRAM

The subsurface conditions discussed in the table below and those shown on the boring logs are estimates based on interpretations of the boring data, informed by accepted geotechnical engineering judgment. We note that the transition between different soil strata is usually less distinct than that shown on the boring logs. Please refer to individual boring logs in Appendix B for more details. All elevations listed in our boring logs, cross sections, and summary tables are sourced from Google Earth and are approximate.

The subsurface conditions discussed in the table below and those shown on the boring logs are estimates based on interpretations of the boring data, informed by accepted geotechnical engineering judgment. We note that the transition between different soil strata is usually less distinct than that shown on the boring logs.

Stratum	Description	Ranges of SPT ⁽¹⁾ N-values (bpf ⁽²⁾)
N/A	Surface Material - The surface layer at boring locations B-1 and B-2 consisted of approximately 5 and 4 inches of topsoil, respectively. Topsoil thickness may be variable across the project site. Observed topsoil depths do not include root balls, which could be significantly deeper.	N/A
I	Fill Soils ⁽³⁾ – Soils identified as undocumented fill were encountered beneath the surface materials at each of the two borings. The undocumented fill soils were generally described as very loose to medium dense clayey Sand (SC).	2 to 16
II	Residual Soils – Residual soils were encountered beneath the fill at Borings B-1 and B-2. The residual soils were generally described as loose to medium dense silty Sand (SM).	9 to 18
III	Partially Weathered Rock ⁽⁴⁾ - Partially Weathered Rock (PWR) sampled as silty Sand (SM) was encountered beneath the residual soil at Boring B-1. The top of PWR was at a depth of approximately 17 feet below the existing grade.	>50

Notes:

- (1) Standard Penetration Testing.
- (2) Blows per foot.
- (3) Fill may be any material that has been transported and deposited by man. Undocumented fill is considered any material placed without moisture-density records from the time it was originally placed.
- (4) Partially Weathered Rock (PWR) is a transitional material between soil and rock, which retains the relic structure of the rock and exhibits Standard Penetration resistances greater than 100, but still can be penetrated by the power auger.

3.4.1 Groundwater Observations

Groundwater observations were made during sampling and upon completion of drilling operations. Water levels were measured and recorded in our boring logs (Appendix B) and in the subsurface summary table below.

4.0 DESIGN RECOMMENDATIONS

4.1 GENERAL

A proposed conceptual layout of the project alignment is shown in Figures 2 through 10 in Appendix A. Geotechnical-related concerns identified during this study that may impact the project include: 1) the presence of alluvial soils and loose residual soils, 2) the presence of shallow groundwater, 3) the presence of undocumented fill, 4) the presence of moisture-sensitive soils, and 5) the presence of PWR. Each of these concerns is discussed in more detail in the following sections of this report.

4.1.1 Geotechnical Implications of Alluvial Soils

Alluvial Soils: Although alluvial soils were not encountered within the two borings performed, alluvial soils were depicted on the Soil Survey Map and should be expected in low-lying areas, wetlands, and near Drowning Creek. The alluvial soils are depicted as Altavista fine sandy loam (AkA), Chewacla silty loam (Cfs), Toccoa fine sandy loam (ToA), and Wehadkee soils (Wed) on the soil survey map attached to this report.

Loose Residual Soils: As mentioned, portions of the residual soils were of lower consistency, with N-values of 9 bpf at depths near the existing groundwater table. Loose soils with lower N-values near the groundwater table can often be unstable and/or provide poor to marginal support for foundations.

Upon stripping the topsoil/root system in these described areas, soft alluvial/residual soils and shallow groundwater could be encountered. Where these conditions are encountered, the exposed subgrade will likely be highly unstable, which could require remedial efforts, including partial undercutting, dewatering, and replacement within the cut sections.

During installation of the new 24-inch DIP, the proposed bearing surface should be evaluated in the field by an ECS representative. We typically recommend using 6 to 12 inches of #57 stone for bedding. Additional remedial efforts and stabilization may be required depending on the conditions encountered during construction.

4.1.2 Design Implications of High Groundwater

Shallow groundwater was not encountered in our two borings; however, based on Soil Survey maps and the MASW interpretation from Traverses SL-5, SL-11, SL-14, SL-16, SL-20, and SL-22. Temporary and permanent dewatering efforts using sump pumps and French drains may be required before earthwork operations or construction on this site. *Depending on the invert grade at the bottom of the 24-inch DIP main, groundwater may be encountered. We recommend that the designer plan for buoyancy/uplift conditions.*

4.1.3 Implications of Undocumented Fill

As previously noted, undocumented fill materials were encountered in the 2 borings performed to depths from approximately 12 and 17 feet below the existing ground surface, respectively. Based on the proposed average depth of 6 to 10 feet for the new water main, it appears that some of the existing fill soils (where encountered) may be removed during excavation and general construction. However, the deeper fills may still be in place depending on the depth of construction.

Lower consistency fill soils may not provide adequate support for the new watermain. If very soft soils or pockets of debris, organics, stumps, etc., exist below the proposed pipe invert elevations and are not removed during construction, localized excessive differential settlements could occur in response to ongoing volume changes in the fill. If deeper fill soils do exist in other sections of the project, some remedial efforts may be required.

During installation of the new 24-inch DIP main, the proposed bearing surface should be evaluated in the field by an ECS representative. Any soft or poor-quality fill soils that may be observed should be over-excavated 1 to 2 feet below the proposed invert elevation and replaced with #57 stone, GAB, or other acceptable fill. The actual extent of this over-excavation will be determined at the time of construction. We typically recommend using 6 to 12 inches of #57 stone for bedding, depending on the conditions encountered.

4.1.4 Moisture-Sensitive Soils

The silty/clayey soils that may be encountered during excavation could be moisture-sensitive and will become unstable when their moisture content exceeds their optimum. Adequate site drainage should be implemented at the onset of construction and maintained throughout the construction process. Care should be taken to keep construction traffic to a minimum during wet periods. Water should not be allowed to pond in construction areas. If these materials are reused as structural backfill in areas of existing pavements or driveways, we recommend blending them with more sandy soils to reduce their plasticity.

An ECS representative should evaluate wet soils. These soils may require reworking (scarification, aeration, and re-compaction) or removal. This will need to be determined at the time of construction. Some undercutting of the soft silty soils, if encountered during construction, should be anticipated during building pad and pavement subgrade preparation. ***Reworking (aeration and drying) wet soils should be expected by the site grading contractor and accounted for in the construction schedule.***

4.1.5 Implications of Shallow PWR

PWR materials were encountered in Boring B-1 at a depth of 17 feet. It is unlikely that this will be encountered during excavation at this location; however, as previously discussed, several traverses encountered shallow PWR and Rock within the top 5 to 10 feet and will likely be encountered within the project alignment.

Guidelines for difficult excavations are included in the next section of this report. We do not recommend supporting structures on dissimilar materials, such as rock and soil. To that end, we recommend establishing a grade to ensure a minimum “cushion” of 12 inches of crushed stone beneath the force main pipes. Some light blasting or hydraulic spades/hammers may be needed to ensure this “cushion” is present.

4.2 DIFFICULT EXCAVATION

Difficult excavation techniques will likely be needed in areas where PWR or rock is located within the planned excavations. As previously discussed, PWR and/or rock materials were encountered within 10 feet of the existing ground surface at several traverses across the project alignment.

In mass excavation for general site work, dense soils can usually be removed by ripping with a single-tooth ripper attached to a large crawler tractor or by breaking them out with a large front-end loader. In confined excavations such as utility trenches, removing PWR may require large backhoes, hydraulic hammers, or light blasting.

Rock materials will usually require blasting for removal in all types of excavations. Any blasting during foundation excavations must be carefully controlled to minimize damage to bearing materials and to nearby buildings or roadways/utilities. In addition, vibration monitoring and pre-blast condition surveys are prudent for any buildings within 100 to 200 feet of blasting activity. The gradation of the material removed by ripping or blasting will be erratic. As such, its usability as fill may be limited without processing (i.e., crushing) to provide a suitable gradation for proper placement and compaction.

We recommend the following rock excavation definition:

Trench Excavation

Blast Rock: Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent) and occupying an original volume of at least one-half cubic yard.

Blasting should only be conducted where the materials cannot be excavated when using a backhoe with the specified curling force. We recommend removing excavatable soils first with conventional grading equipment (scrapers and loaders). We do not recommend leaving soil overburden in place during blasting because determining blast rock quantities becomes very difficult, and costs are generally higher. In addition, residual soil overburden will increase the rock's confining pressure and reduce the effectiveness of blast charges. Loose-fill or blasting mats can be placed over the blast area to control fly rock. Rock removal by blasting is costly. Hence, control of quantities is essential. If requested, ECS can assist in estimating or qualifying blast rock quantities.

4.3 Temporary Dewatering

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the project's geotechnical and other aspects. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from any site dewatering system shall be discharged in accordance with all local, state, and federal requirements.

4.3.1 Stabilization of Wet or Soft Subgrades

If wet or soft subgrades are encountered during subgrade preparation, ECS should be notified so the conditions can be evaluated and further recommendations provided. Stabilization of soft or wet subgrades should be performed before placing new structural fill for the embankment.

Conceptually, subgrade stabilization involves removing the surface vegetation, topsoil, and soft soils down to a firm subgrade. The exposed subgrade should be dewatered. Pumps and /or diversion trenches should be used to remove the standing water. This should be performed under the on-site ECS representative's observation.

Once the subgrade is de-watered and stripped to a firm subgrade, the bottom of the excavation should be covered with a woven geosynthetic for soil stabilization and reinforcement, such as Mirafi® 600X geotextile (or similar strength material). The geosynthetic should then be covered with approximately 12 to 18 inches of #57 stone to provide a firm working surface, protect the geotextile, and reduce subgrade pumping. Adjacent layers of geosynthetic or geogrid should be overlapped a minimum of 18 inches.

The stone should be spread across the geosynthetic and densified with lightweight tracked equipment. Care should be taken to avoid contact of the tracked equipment with the geosynthetic. A second layer of geotextile fabric should be placed over the stone prior to filling with soil fill or additional aggregate (ABC or #57 stone).

4.4 TEMPORARY EXCAVATION SUPPORT

Our exploration did not include an analysis of slope stability for any temporary excavations. We recommend that temporary excavations without seepage be no steeper than 1.5H:1V. Excavation protection (i.e., sheeting or shoring) should be utilized for excavations subject to saturated soils and/or groundwater seepage.

During construction, temporary excavations should be regularly evaluated for signs of movement, seepage, or an unsafe condition. Stormwater runoff should be diverted away from the excavations. If near-vertical trench walls are planned in excavations deeper than 4 feet, a trench box or other temporary shoring must be used to meet OSHA safety requirements.

All temporary excavations must be configured to conform to OSHA 29 CFR Part 1926, Occupational Safety and Health Standards – Excavations. Localized temporary excavations that cannot be safely configured in strict conformance with OSHA's unsupported slope or benching requirements will require temporary earth retention systems (TERS). Depending on the excavation configuration and groundwater seepage conditions, systems such as trench boxes, shoring, sheeting, or other suitable systems may be feasible. Regardless, the TERS shall consider site-specific geotechnical conditions, the excavation configuration, and the surrounding infrastructure.

All TERS systems should be designed by a qualified professional engineer and installed by a specialty contractor having sufficient experience with the chosen system. Site safety shall be the sole responsibility of the Contractor and his Subcontractors.

Water seepage may be observed emerging from the excavated trench during construction, particularly during seasonal wet periods or during significant rainfall events. Typically, sump pits and pumps are sufficient to remove seepage water from the excavation. The excavation should be monitored during construction for potential instability. Once field conditions are exposed, adjustments such as flattening the excavation slope may be required to improve stability. If the sump pits and pumps are inadequate, well points may be required. Dikes and/or diversion trenches may be required to redirect surface water away from the excavation. If seepage is observed, the excavation should be re-evaluated by ECS.

Based on local experience and the project-specific borings, the following soil parameters have been estimated for sandy, silty, clayey soils (SM, SC, ML, MH, CL) and may be used in the design of the earth support systems:

- Coefficient of Earth Pressure "At Rest" (K_0) = 0.50
- Coefficient of Active Earth Pressure (K_a) = 0.36
- Coefficient of Passive Earth Pressure (K_p) = 2.77
- Moist Unit Weight of Soil = 120 pcf
- Angle of Internal Friction (ϕ) = 28 degrees

4.5 BACKFILL PLACEMENT

The preparation of proposed water main trench subgrades should be observed on a full-time basis by a representative of ECS to document that any unsuitable materials have been removed and that the subgrade is suitable for support of the proposed construction and/or fills.

Fill materials should consist of approved material free of organic matter and debris, with rocks less than 6 inches, and a Liquid Limit less than 50 and a Plasticity Index less than 20. Unacceptable fill materials include topsoil, organic materials, lightweight material with a maximum dry density of less than 95 pcf, and highly plastic silts and clays. As mentioned, highly plastic silts (MH) were encountered in some borings, which will require blending with sandier soils to reduce their plasticity prior to use as structural fill.

Unsuitable materials removed during grading operations should be either stockpiled for later use in landscaped areas or placed in approved disposal areas, either on-site or off-site.

Fill operations should be monitored on a full-time basis by a qualified soil technician from ECS to ensure that the minimum compaction requirements are met. At least one compaction test should be conducted for every one-foot compacted lift. The elevation and location of the tests should be clearly identified and recorded at the time of fill placement.

Fill materials should be placed in lifts not exceeding one (1) foot in thickness, loose, and moisture-conditioned to within +/- 3 percent of the optimum moisture content to facilitate proper compaction. Controlled fill soils should be compacted to a minimum of 95 percent of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Method.

5.0 CLOSING

ECS has prepared this report to guide the geotechnical aspects of the project's design and construction. This report should not be used as a contract document nor referenced on any project drawings. This report is provided for the exclusive use of Gwinnett County DWR and its project-specific design team. This report is not intended to be used or relied upon in connection with other projects or by other third parties. ECS disclaims liability for any such third-party use or reliance without express written permission.

We have performed our services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of a similar size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

The description of the proposed project is based on information provided by Gwinnett County DWR to ECS. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

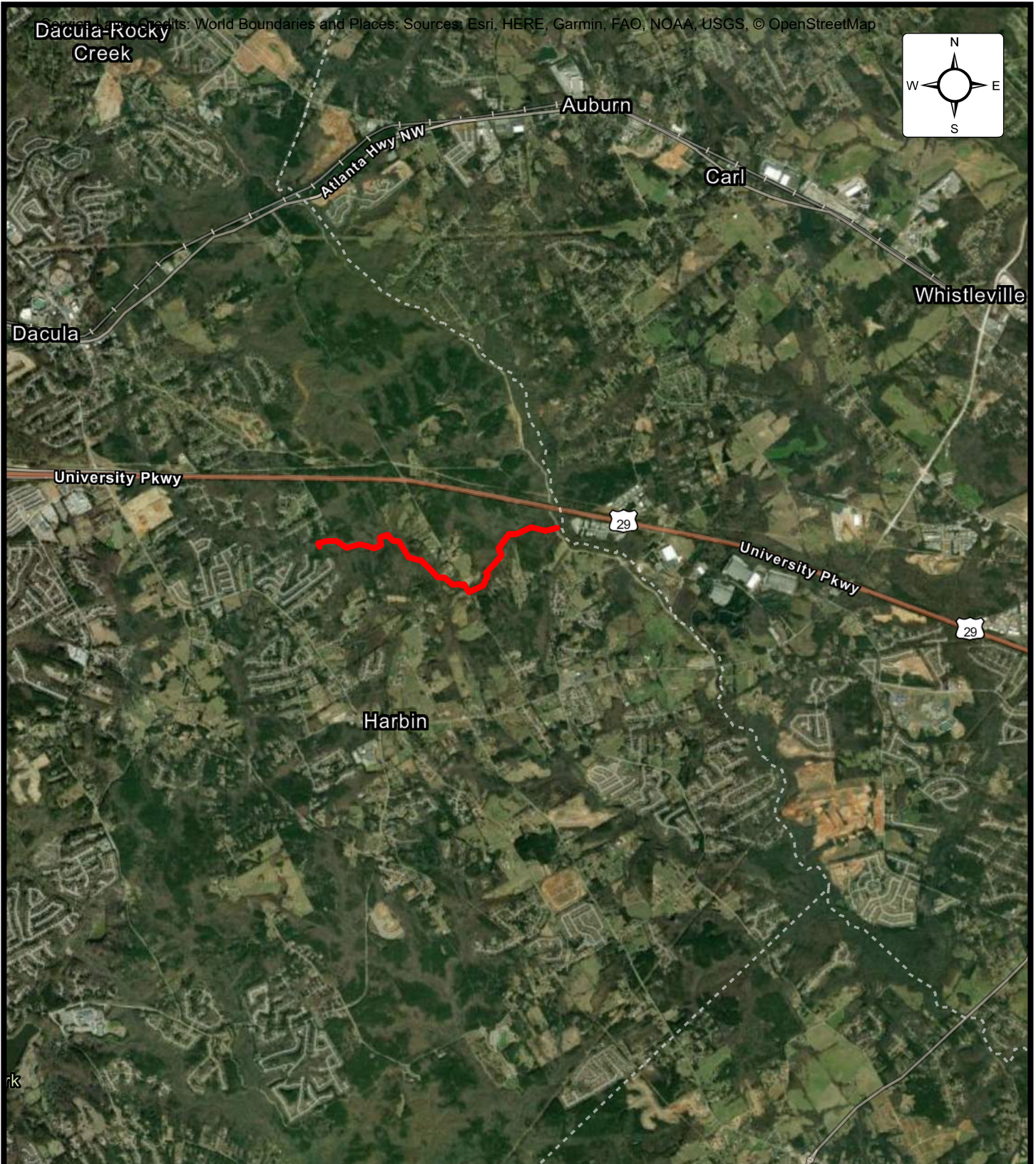
Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. We would be pleased to provide an estimate of the cost for these services at the appropriate time. Please contact Mrs. Katelynn B. Garrett, P.G., by email (kgarrett@ecslimited.com) or at our office number (770-590-1971).

APPENDIX A – Diagrams & Reports

Figure 1 - Site Location Diagram

Figures 2 to 5– Exploration Location Diagrams

Web Soil Survey – Soil Map



SITE LOCATION DIAGRAM
Harbins Landing PS Decom Plans
Drowning Creek RD, Dacula, Georgia
Gwinnett County DWR

PRINCIPAL KJH
SCALE 1" = 1mi
PROJECT NO. 10:12886
FIGURE 1
DATE 2/18/2026



LEGEND

- Approximate Boring Location
- B-#** Boring Designation

Seismic Refraction Testing



PROJECT:
Harbins Landing Sewer Interceptor & Pump Station Decommissioning
Dacula, GA

PREPARED FOR:
Gwinnett County DWR

FIGURE NAME:
EXPLORATION LOCATION DIAGRAM

REFERENCE:
Google Earth Aerial
12/23/2025

REVISIONS	
JOB NO.	10:12886
SCALE	1"=750'
DRAWN	ZRT 1/2026
APPR.	TKS 1/2026



PROJECT:
Harbins Landing Sewer Interceptor & Pump Station Decommissioning
Dacula, GA

PREPARED FOR:
Gwinnett County DWR

FIGURE NAME:
EXPLORATION LOCATION DIAGRAM

REFERENCE:
Google Earth Aerial
12/23/2025

REVISIONS	

JOB NO.	10:12886
SCALE	1"=300'
DRAWN	ZRT 1/2026
APPR.	TKS 1/2026

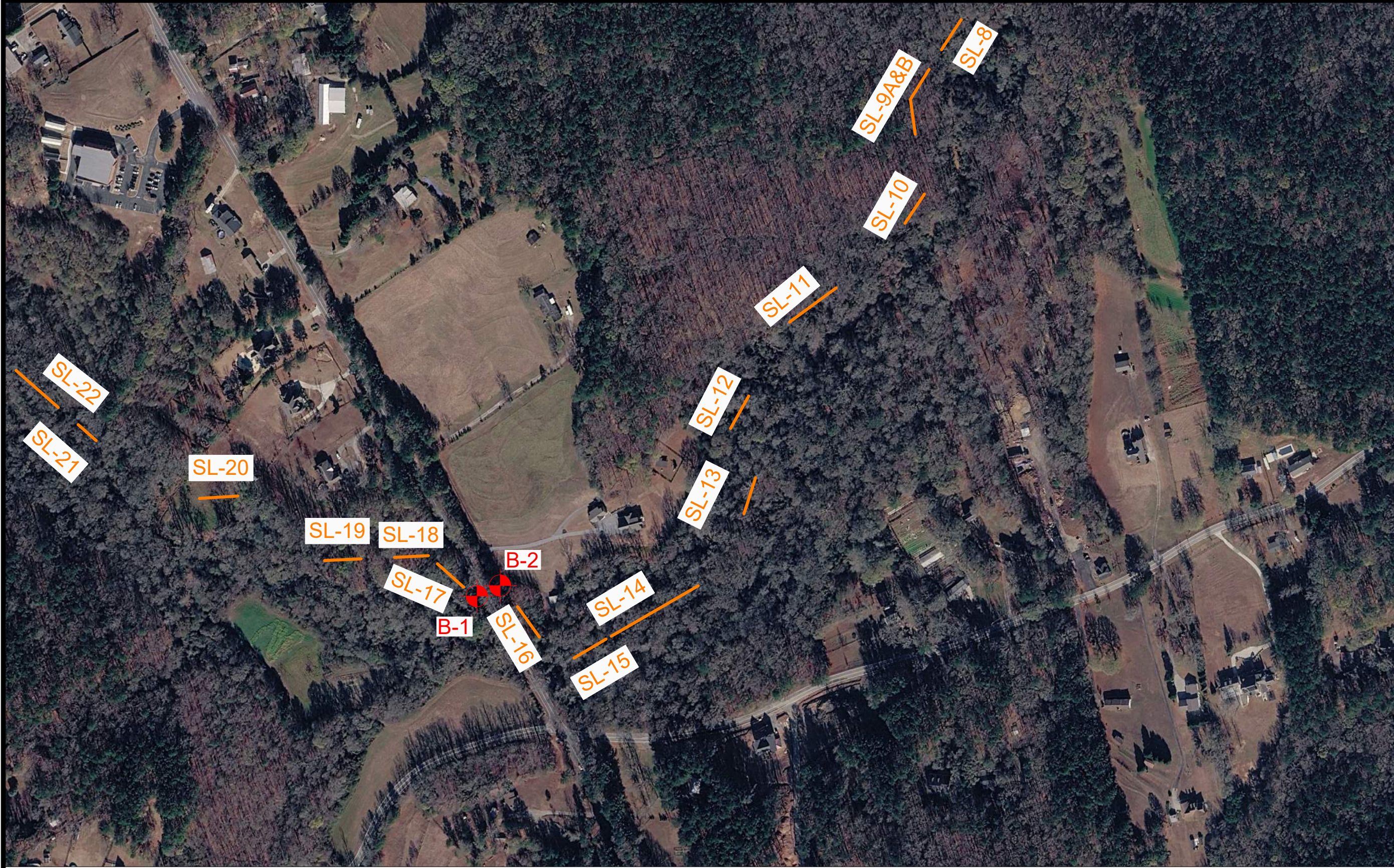
Figure No.:
3

LEGEND

-  Approximate Boring Location
- B-#** Boring Designation

 Seismic Refraction Testing





PROJECT:
Harbins Landing Sewer Interceptor & Pump Station Decommissioning
Dacula, GA

PREPARED FOR:
Gwinnett County DWR

FIGURE NAME:
EXPLORATION LOCATION DIAGRAM

REFERENCE:
Google Earth Aerial
12/23/2025

REVISIONS	

JOB NO. 10:12886

SCALE 1"=300'

DRAWN ZRT 1/2026

APPR. TKS 1/2026

Figure No.:

4

LEGEND

-  Approximate Boring Location
- B-#** Boring Designation

 Seismic Refraction Testing





PROJECT:
Harbins Landing Sewer Interceptor & Pump Station Decommissioning
Dacula, GA

PREPARED FOR:
Gwinnett County DWR

FIGURE NAME:
EXPLORATION LOCATION DIAGRAM

REFERENCE:
Google Earth Aerial
12/23/2025

REVISIONS	

JOB NO. 10:12886

SCALE 1"=300'

DRAWN ZRT 1/2026

APPR. TKS 1/2026

Figure No.:
5

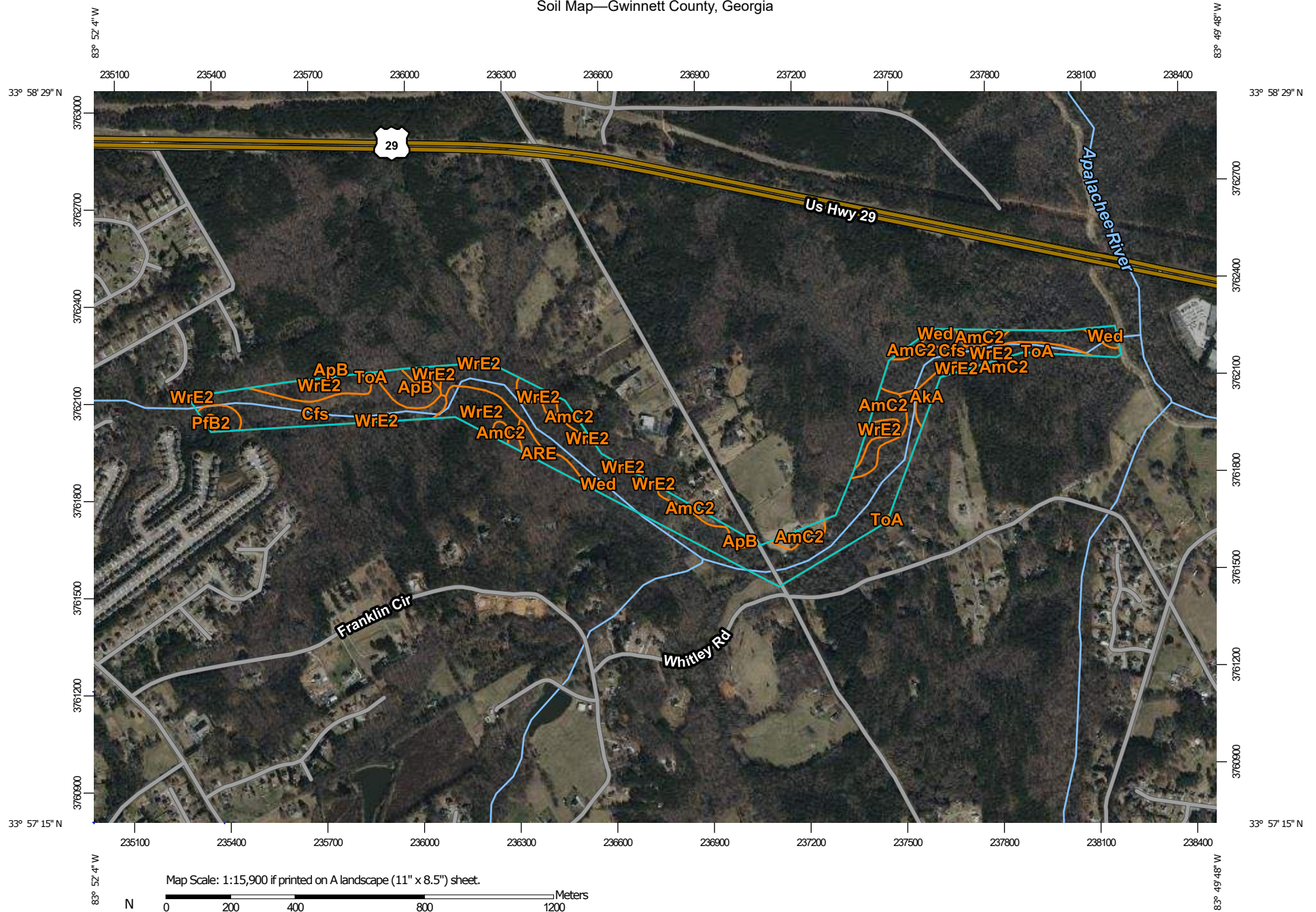
LEGEND

-  Approximate Boring Location
- B-#** Boring Designation

 Seismic Refraction Testing



Soil Map—Gwinnett County, Georgia



Map Scale: 1:15,900 if printed on A landscape (11" x 8.5") sheet.

0 200 400 800 1200 Meters

0 500 1000 2000 3000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: UTM Zone 17N WGS84



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

2/25/2026
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Gwinnett County, Georgia

Survey Area Data: Version 16, Sep 2, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 4, 2023—Feb 18, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AkA	Altavista fine sandy loam, 0 to 2 percent slopes	1.6	1.5%
AmC2	Appling sandy loam, 6 to 10 percent slopes, moderately eroded	10.3	9.3%
ApB	Appling-Hard Labor complex, 2 to 6 percent slopes	1.3	1.2%
ARE	Ashlar, Rion, and Wateree soils, 10 to 25 percent slopes	6.4	5.8%
Cfs	Chewacla silt loam, 0 to 2 percent slopes, frequently flooded	25.5	23.1%
PfB2	Pacolet sandy loam, 2 to 6 percent slopes, moderately eroded	0.4	0.3%
PgD2	Pacolet sandy clay loam, 10 to 15 percent slopes, moderately eroded	1.8	1.6%
ToA	Toccoa fine sandy loam, 0 to 4 percent slopes, frequently flooded	2.4	2.2%
Wed	Wehadkee soils, 0 to 2 percent slopes, frequently flooded	45.0	40.8%
WrE2	Wedowee sandy loam, 10 to 25 percent slopes, eroded	15.6	14.1%
Totals for Area of Interest		110.3	100.0%

APPENDIX B – Field Operations

Subsurface Exploration Procedure: Standard Penetration Testing (SPT)

Reference Notes for Boring Logs

Boring Logs B-1 and B-2

Seismic Refraction Investigation Results



SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.



**Drilling Methods May Vary—* The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.



REFERENCE NOTES FOR BORING LOGS

MATERIAL^{1,2}

	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	GW WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM SILTY GRAVEL gravel-sand-silt mixtures
	GC CLAYEY GRAVEL gravel-sand-clay mixtures
	SW WELL-GRADED SAND gravelly sand, little or no fines
	SP POORLY-GRADED SAND gravelly sand, little or no fines
	SM SILTY SAND sand-silt mixtures
	SC CLAYEY SAND sand-clay mixtures
	ML SILT non-plastic to medium plasticity
	MH ELASTIC SILT high plasticity
	CL LEAN CLAY low to medium plasticity
	CH FAT CLAY high plasticity
	OL ORGANIC SILT or CLAY non-plastic to low plasticity
	OH ORGANIC SILT or CLAY high plasticity
	PT PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION	PARTICLE SIZES
Boulders	12 inches (300 mm) or larger
Cobbles	3 inches to 12 inches (75 mm to 300 mm)
Gravel: Coarse	¾ inch to 3 inches (19 mm to 75 mm)
Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand: Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")	<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP ⁴	SPT ⁵ (BPF)	CONSISTENCY ⁷ (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT ⁷	COARSE GRAINED (%) ⁸	FINE GRAINED (%) ⁸
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective (ex: "Silty")	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT ⁵	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS⁶

	WL (First Encountered)
	WL (Completion)
	WL (Seasonal High Water)
	WL (Stabilized)

FILL AND ROCK

FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

¹Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

²To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

³Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

⁴Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

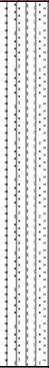
⁵Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

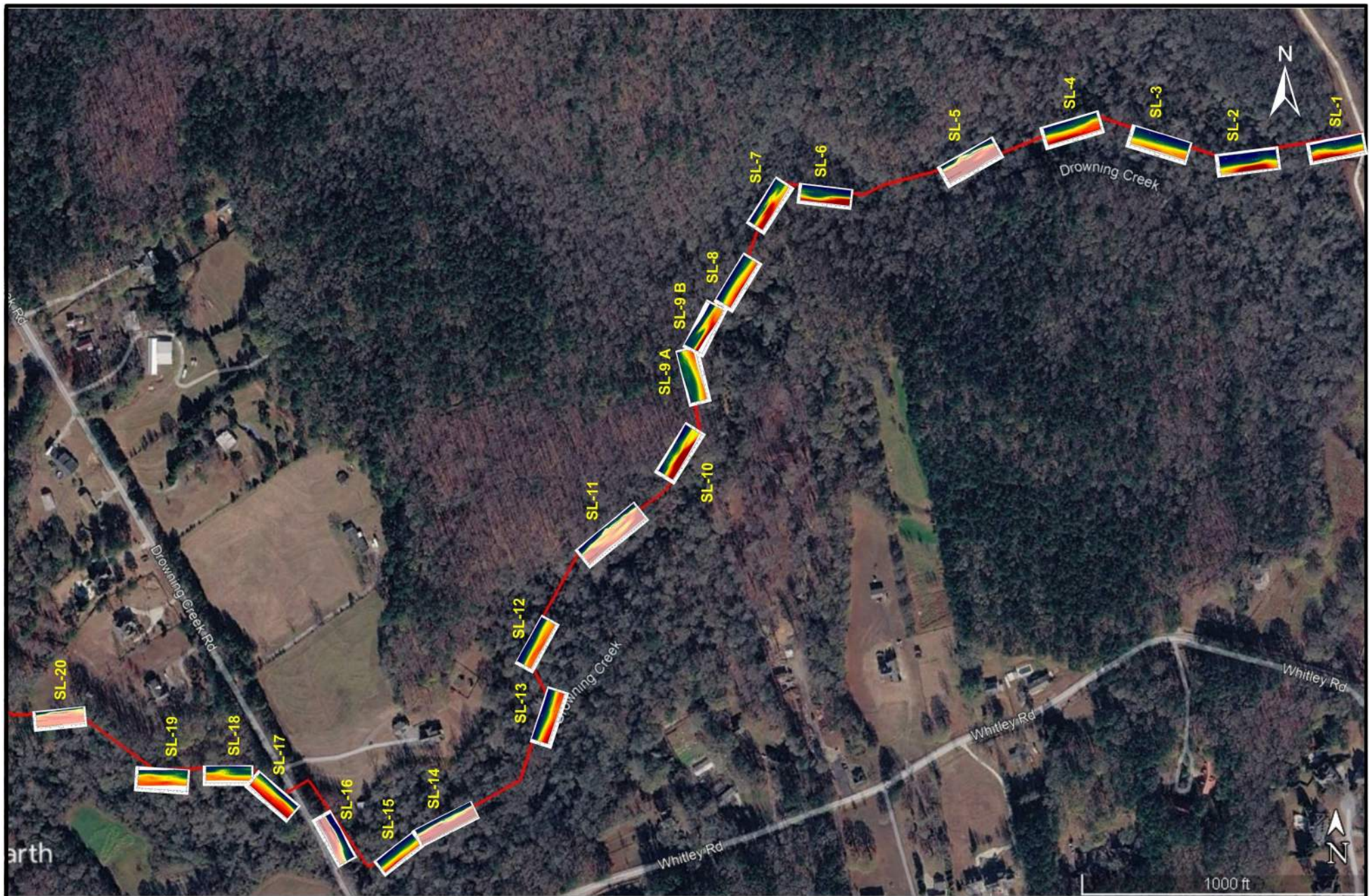
⁶The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

⁷Minor deviation from ASTM D 2488-17 Note 14.

⁸Percentages are estimated to the nearest 5% per ASTM D 2488-17.

CLIENT: Gwinnett County DWR				PROJECT NO.: 10:12886		BORING NO.: B-01		SHEET: 1 OF 1													
PROJECT NAME: Harbins Landing PS Decom Plans				DRILLER/CONTRACTOR: Betts Environmental																	
SITE LOCATION: Drowning Creek RD, Dacula, Georgia, 30019								LOSS OF CIRCULATION													
LATITUDE: 33.961998		LONGITUDE: -83.845462		STRUCTURE: Water Main		SURFACE ELEVATION: 894+/-		BOTTOM OF CASING													
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TC/PR/MS/MC/SPT-N VALUE)*	SPT		Recovery %		RQD %		Fines% F		MC%			
					Topsoil [Thickness=5"].					0 10 20 30 40 50		0 20 40 60 80 100		0 20 40 60 80 100		0 20 40 60 80 100		0 20 40 60 80 100			
	S-1	SS	18	18	FILL - (SC) CLAYEY SAND - orangish brown, moist, loose.				4-3-3 (6)	6											
5.0	S-2	SS	18	18				890	3-3-4 (7)	7											
	S-3	SS	18	18					3-3-3 (6)	6											
					As above but medium dense.																
10.0	S-4	SS	18	18				885	3-6-10 (16)	16											
					(SM) SILTY SAND - gray, contains mica and rock fragments, moist, loose.																
15.0	S-5	SS	18	18				880	2-4-5 (9)	9											
					(PWR) PARTIALLY WEATHERED ROCK SAMPLED AS SILTY SAND - gray, moist.																
20.0	S-6	SS	2	2				875	50/2" (50/2)	50/2											
	S-7	SS	8	8				870	4-50/2" (50/8)	50/8											
					END OF BORING at 25 FT																
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL																					
WL (First Encountered):				BORING STARTED: 01/08/2026				CAVE IN DEPTH: 17 FT													
WL (Completion): 19 FT				BORING COMPLETED: 01/08/2026				HAMMER TYPE: Automatic													
WL (Seasonal High Water):				EQUIPMENT: GeoProbe 7822DT		LOGGED BY: ZRT		DRILLING METHOD: Hollow Stem Auger (0'-25')													
WL (Stabilized): Not Measured																					
GEOTECHNICAL BOREHOLE LOG																					

CLIENT: Gwinnett County DWR				PROJECT NO.: 10:12886		BORING NO.: B-02		SHEET: 1 OF 1			
PROJECT NAME: Harbins Landing PS Decom Plans				DRILLER/CONTRACTOR: Betts Environmental							
SITE LOCATION: Drowning Creek RD, Dacula, Georgia, 30019								LOSS OF CIRCULATION			
LATITUDE: 33.962027		LONGITUDE: -83.845394		STRUCTURE: Water Main		SURFACE ELEVATION: 892+/-		BOTTOM OF CASING			
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DISTANCE (IN)	SAMPLE RECOVERY (IN)	DESCRIPTION OF MATERIAL	STRATIGRAPHY	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/RS/MC/SPT-N VALUE)*	SPT Recovery % RQD % Fines% F MC%	
5.0	S-1	SS	18	18	Topsoil [Thickness=4"].			890	2-2-3 (5)	⊗-5	
					FILL - (SC) CLAYEY SAND - orangish brown, contains mica, moist, loose.						
					As above but very loose.						
	S-2	SS	18	18				2-1-2 (3)		⊗-3	
	S-3	SS	18	18				WoH-1-2 (3)		⊗-3	
10.0	S-4	SS	18	18	As above but tannish brown.			885	2-1-1 (2)		⊗-2
					As above but medium dense.			880			
15.0	S-5	SS	18	18					7-6-7 (13)		⊗-13
20.0					(SM) SILTY SAND - grayish brown, contains mica and rock fragments, moist, loose.			875	4-4-5 (9)		⊗-9
	S-6	SS	18	18							
					As above but wet, medium dense.				870		
	S-7	SS	18	18					4-8-10 (18)		⊗-18
END OF BORING at 25 FT											
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL											
▽ WL (First Encountered):					BORING STARTED: 01/08/2026			CAVE IN DEPTH: 10 FT			
▼ WL (Completion): 22 FT					BORING COMPLETED: 01/08/2026			HAMMER TYPE: Automatic			
▽ WL (Seasonal High Water):					EQUIPMENT:		LOGGED BY:		DRILLING METHOD:		
▽ WL (Stabilized): Not Measured					GeoProbe 7822DT		ZRT		Hollow Stem Auger (0'-25')		
GEOTECHNICAL BOREHOLE LOG											

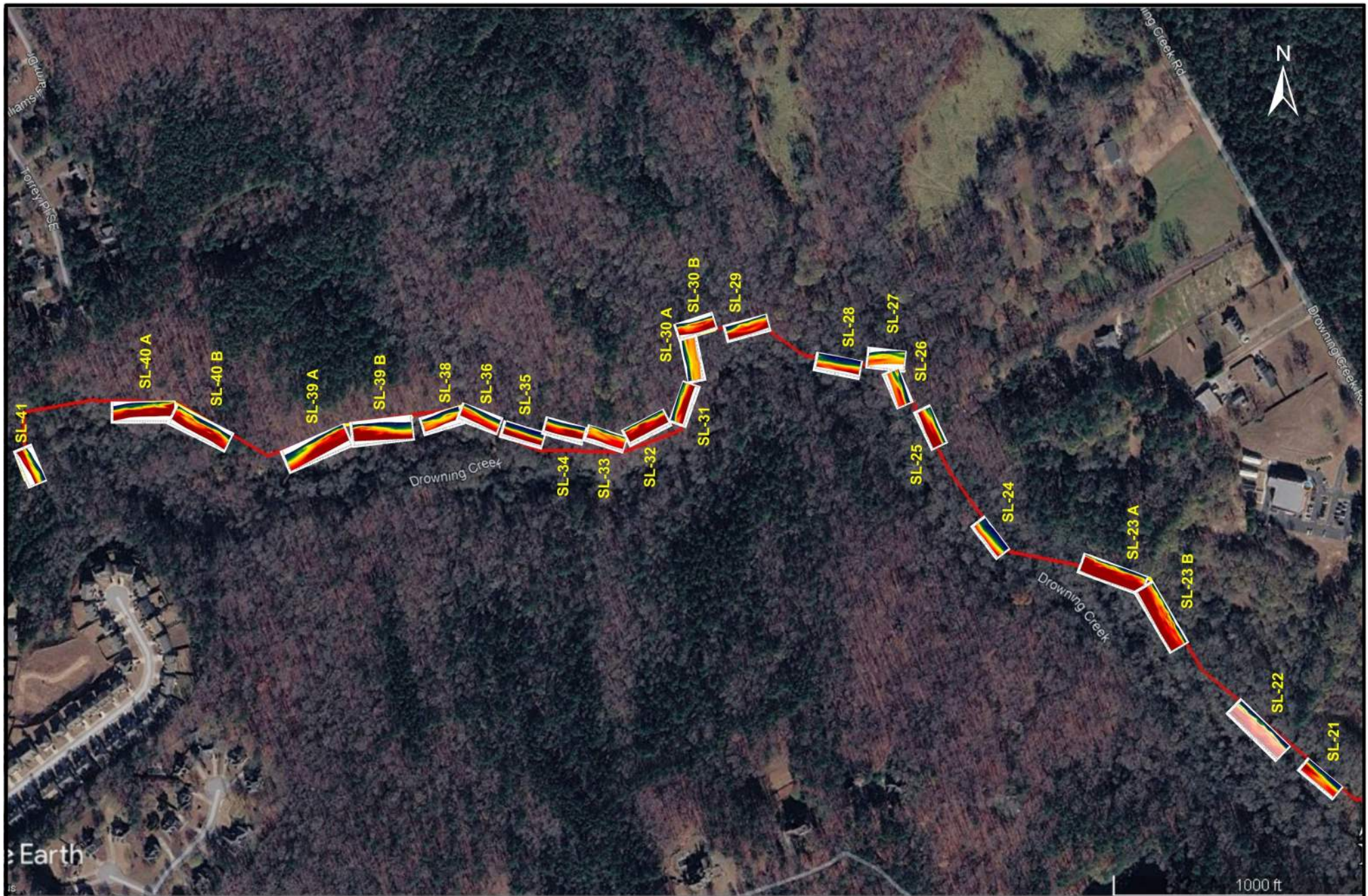


Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Dacula, Georgia

Gwinnett County DWR

Seismic Refraction Investigation
Composite - 1
Seismic Array Summary
February 9, 2026



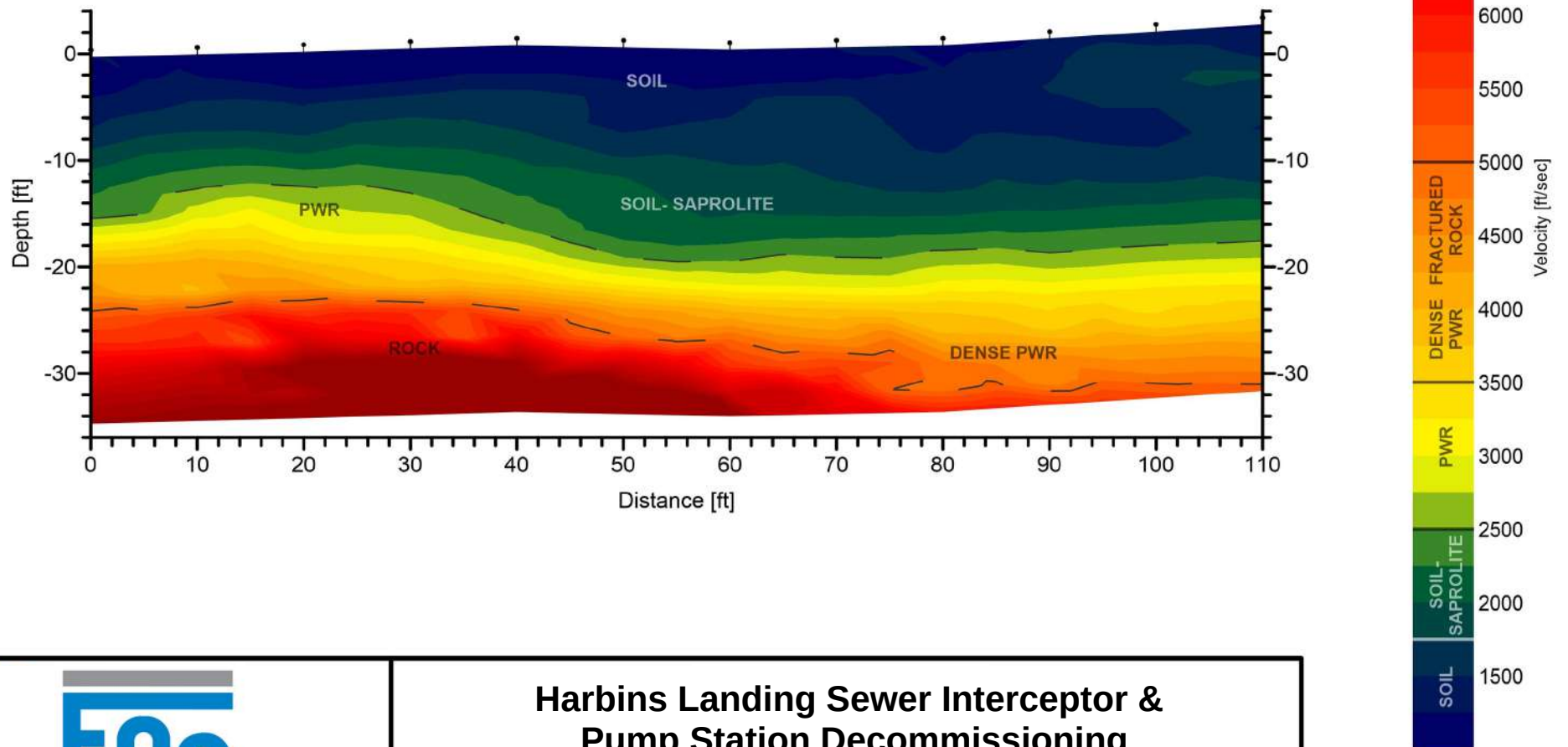
Harbins Landing Sewer Interceptor & Pump Station Decommissioning Dacula, Georgia Gwinnett County DWR

Seismic Refraction Investigation
Composite - 2
Seismic Array Summary
February 9, 2026

SL-1

SW
N 33°58'5.10"
W 83°50'1.68"

NE
N 33°58'5.28"
W 83°50'0.42"



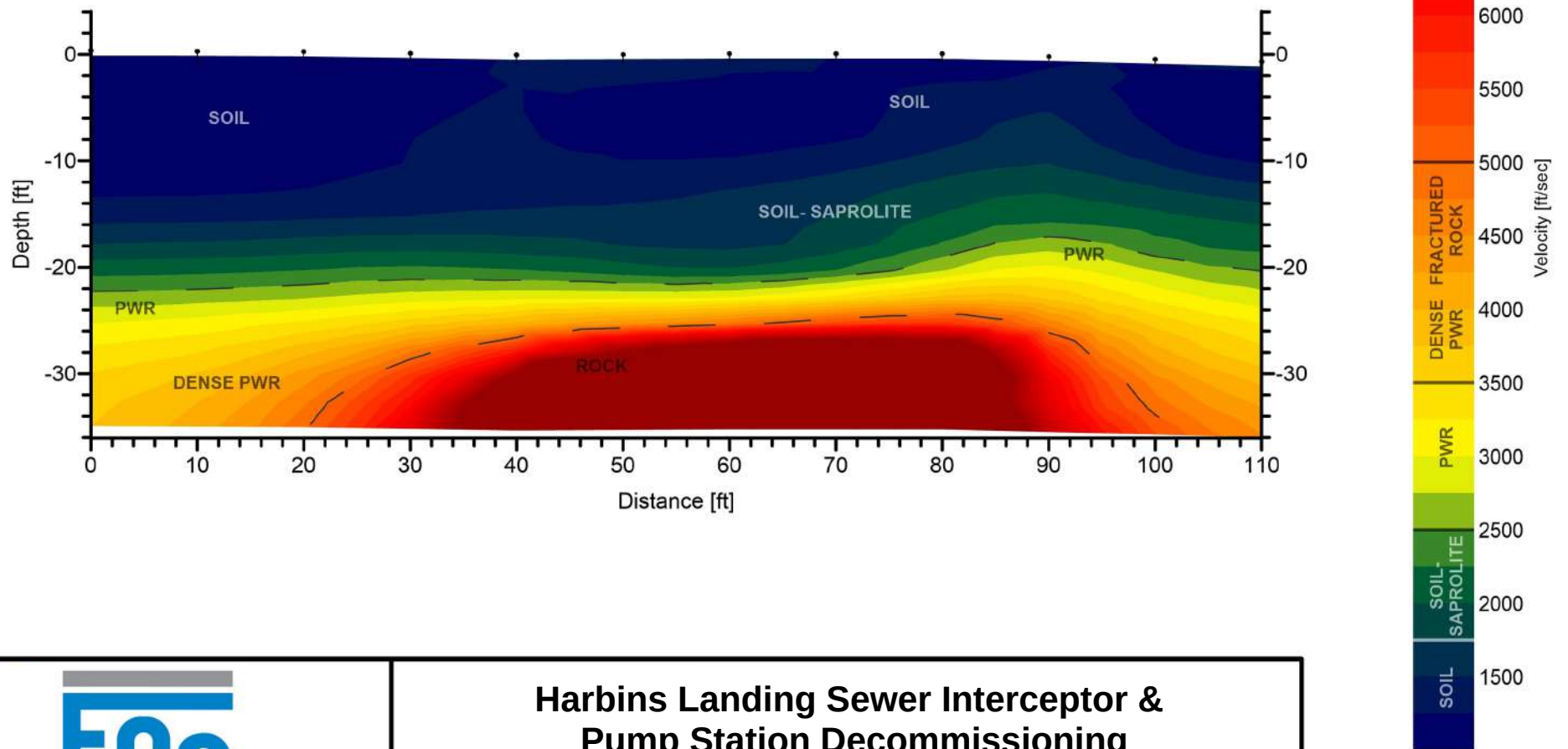
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-2

SW
N 33°58'4.56"
W 83°50'5.82"

NE
N 33°58'4.74"
W 83°50'4.50"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

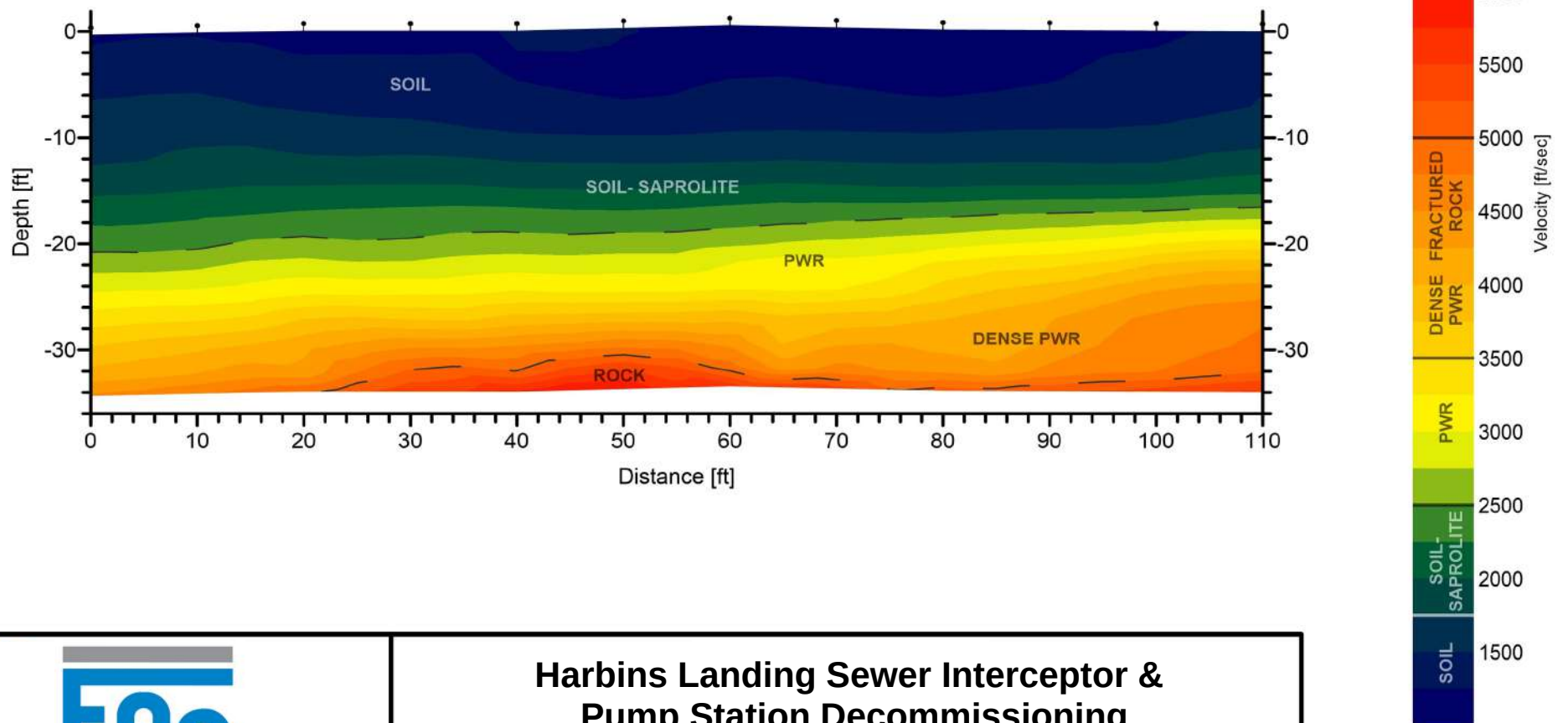
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-3

NW
N 33°58'5.58"
W 83°50'9.36"

SE
N 33°58'5.22"
W 83°50'8.04"



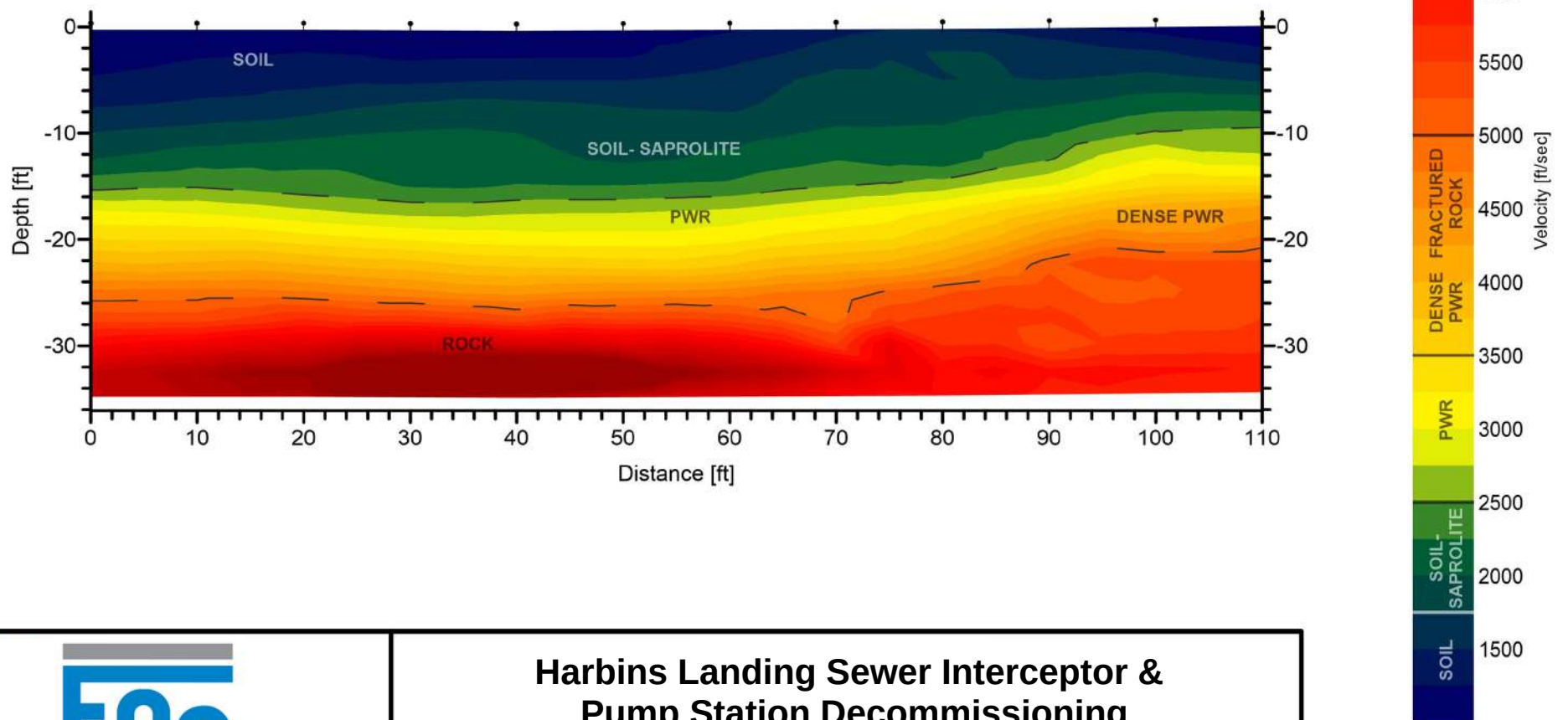
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-4

SW
N 33°58'5.64"
W 83°50'12.24"

NE
N 33°58'6.00"
W 83°50'10.98"



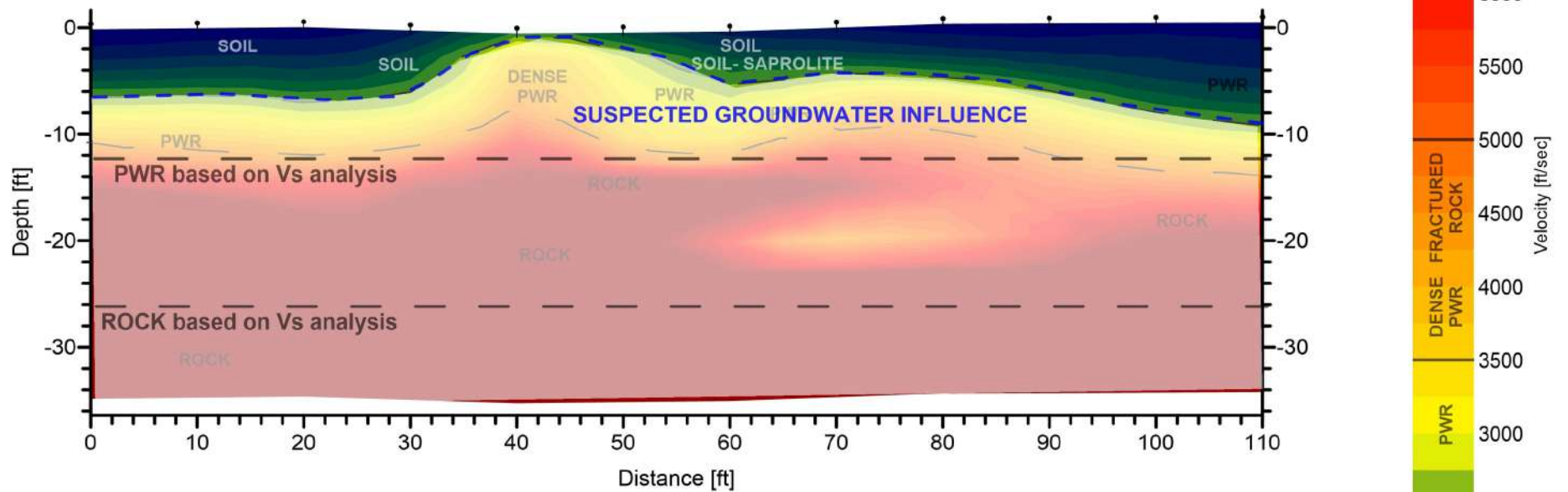
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-5

SW
N 33°58'4.38"
W 83°50'16.92"

NE
N 33°58'4.92"
W 83°50'15.66"



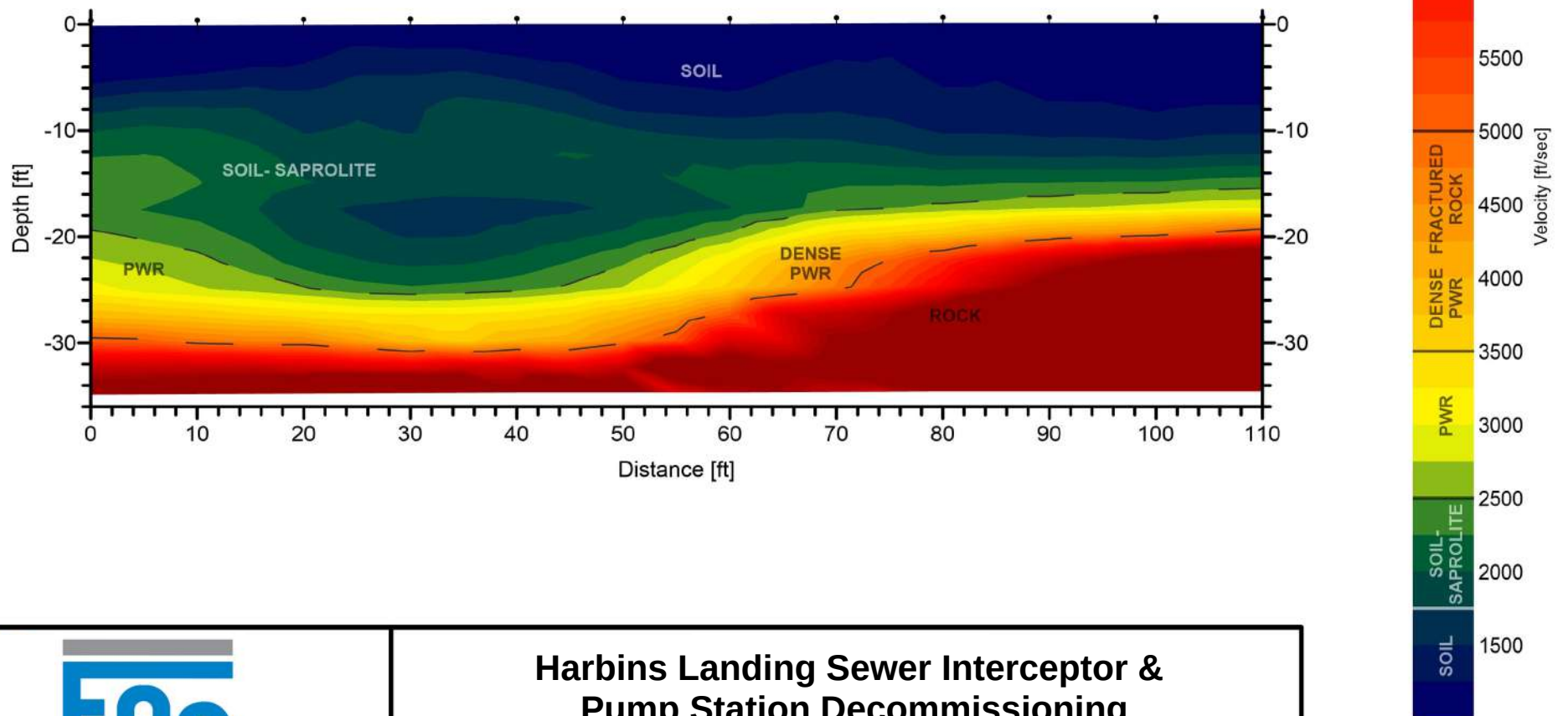
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-6

NW
N 33°58'3.60"
W 83°50'22.74"

SE
N 33°58'3.48"
W 83°50'21.42"



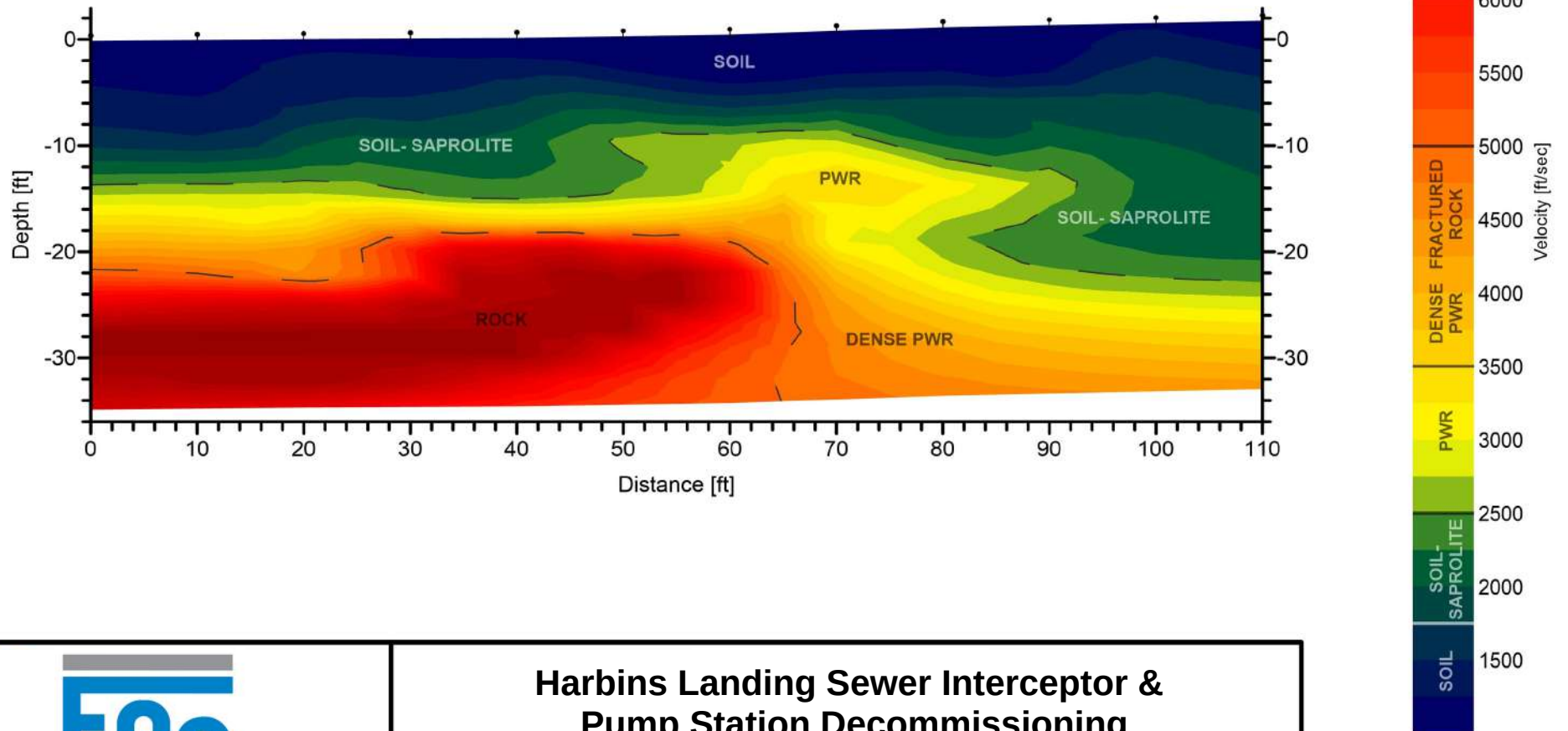
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-7

SW
N 33°58'2.94"
W 83°50'24.54"

NE
N 33°58'3.78"
W 83°50'23.88"



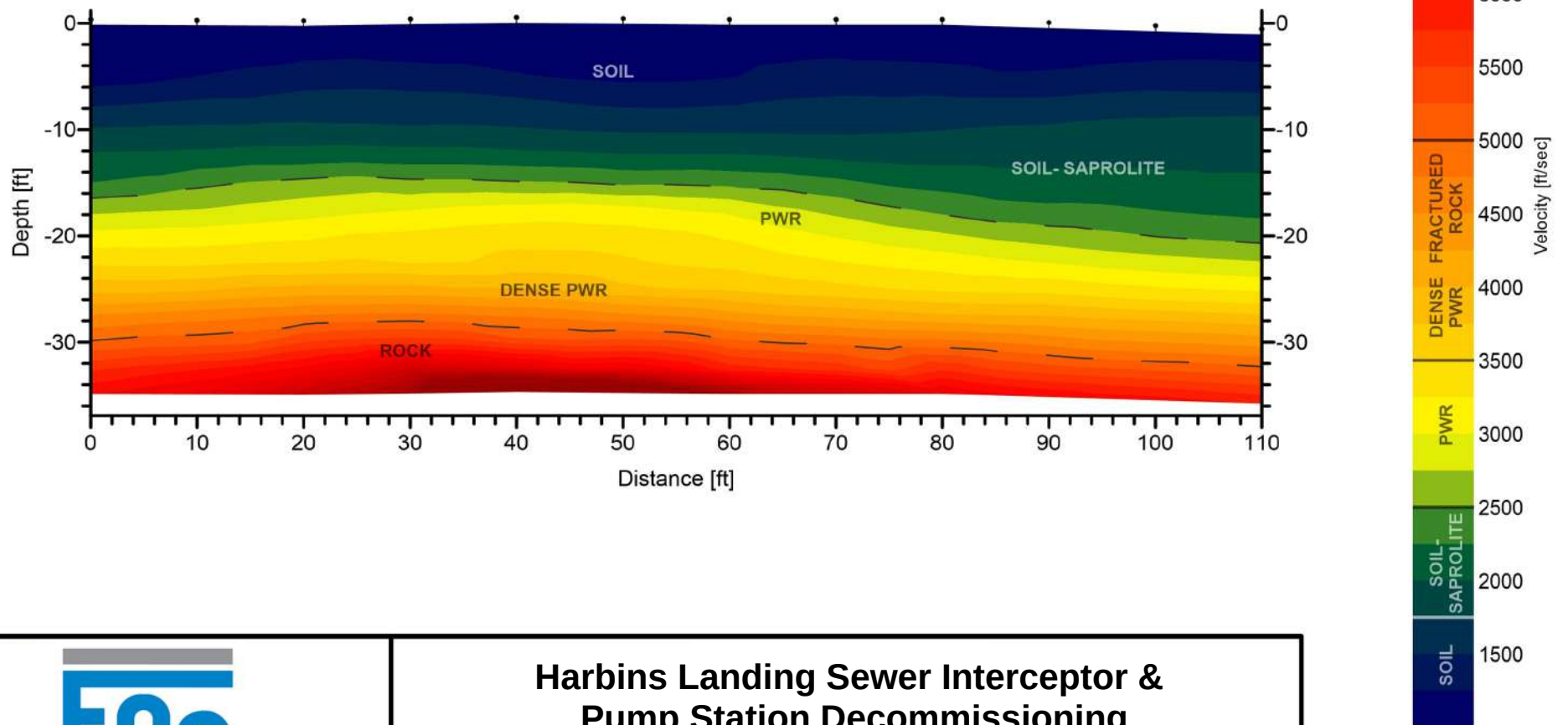
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-8

SW
N 33°57'59.58"
W 83°50'26.34"

NE
N 33°58'0.48"
W 83°50'25.68"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

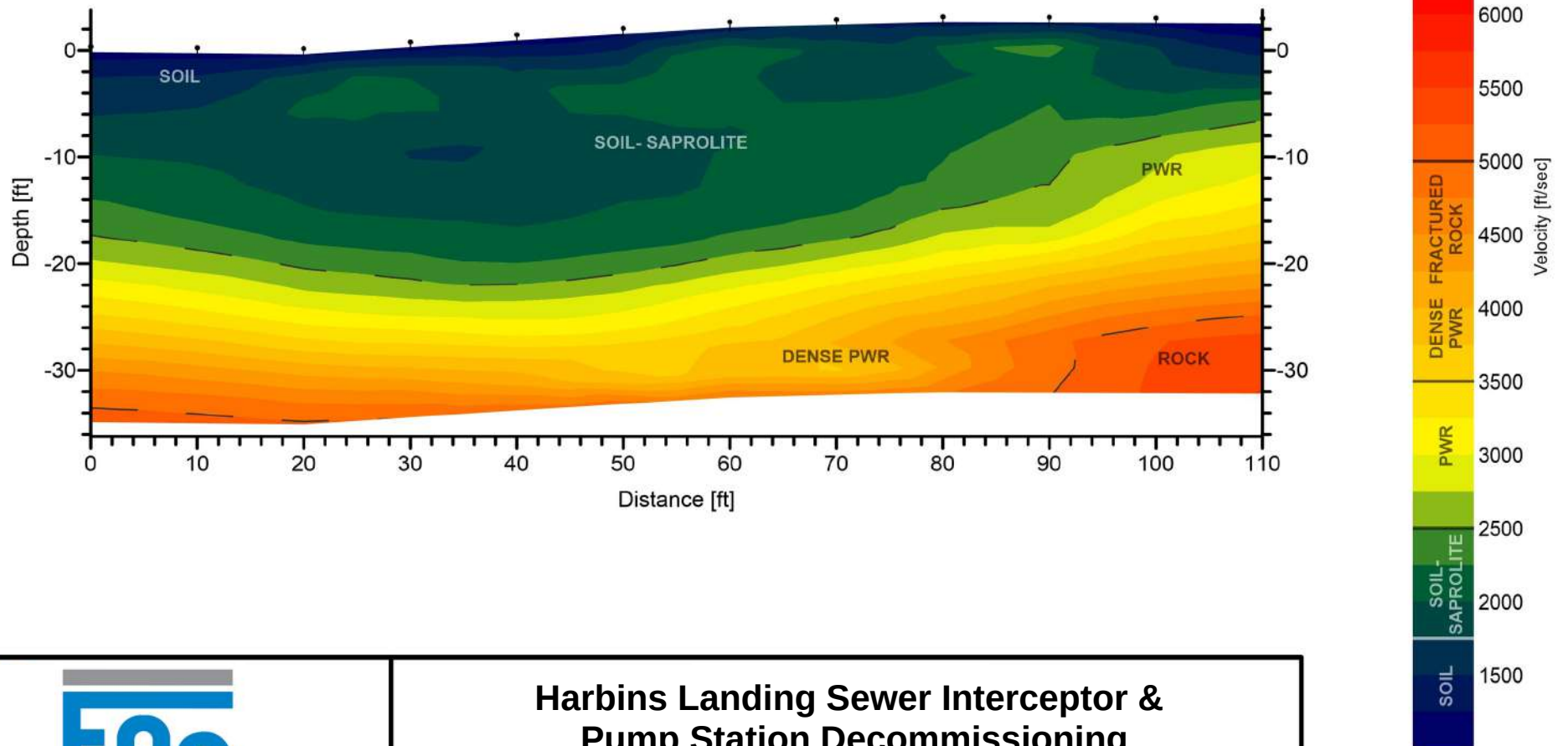
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-9A

SE
N 33°57'56.88"
W 83°50'27.30"

NW
N 33°57'58.02"
W 83°50'27.54"



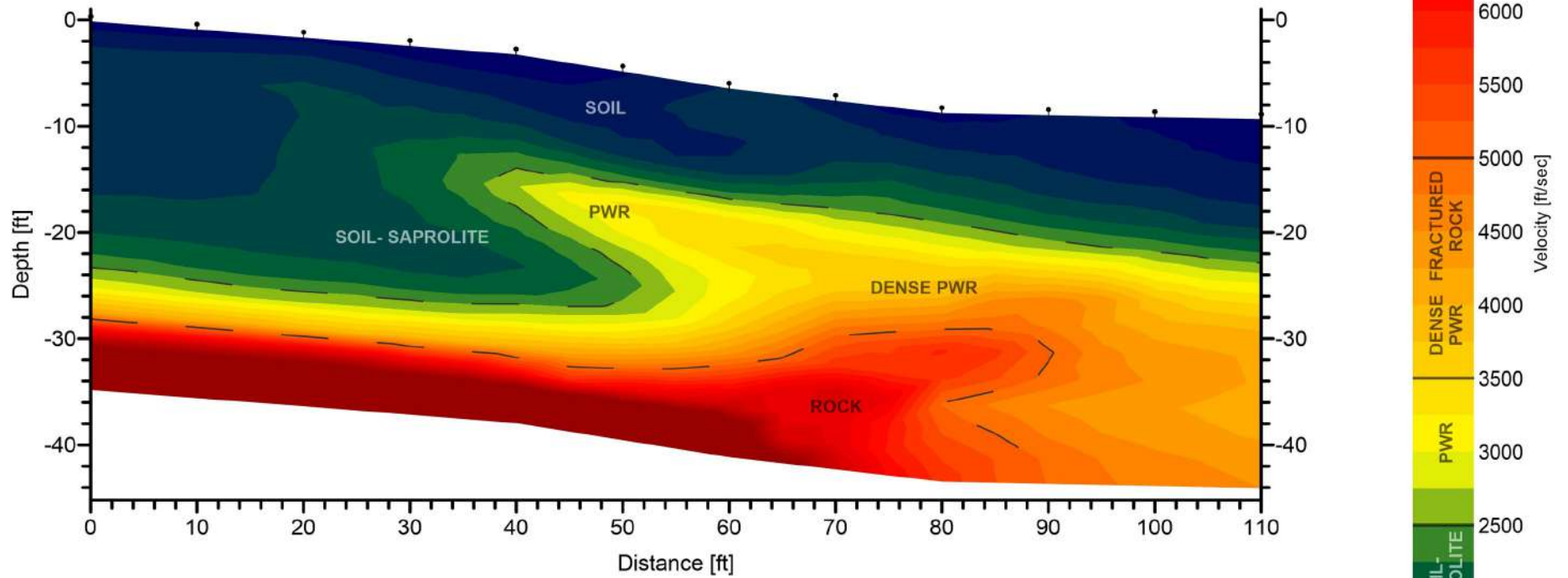
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-9B

SW
N 33°57'58.02"
W 83°50'27.54"

NE
N 33°57'58.92"
W 83°50'26.88"



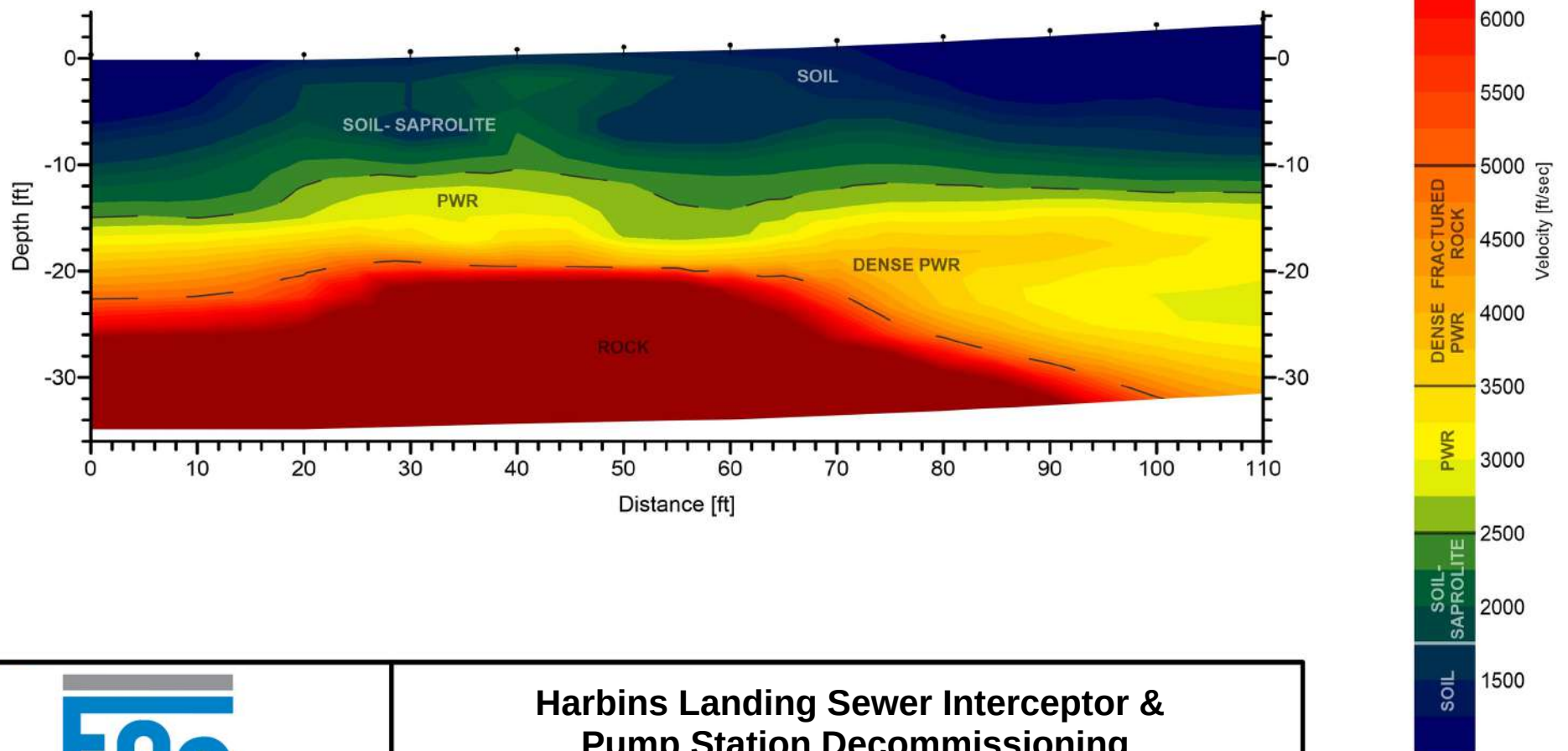
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-10

SW
N 33°57'54.24"
W 83°50'27.66"

NE
N 33°57'55.14"
W 83°50'26.94"



**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

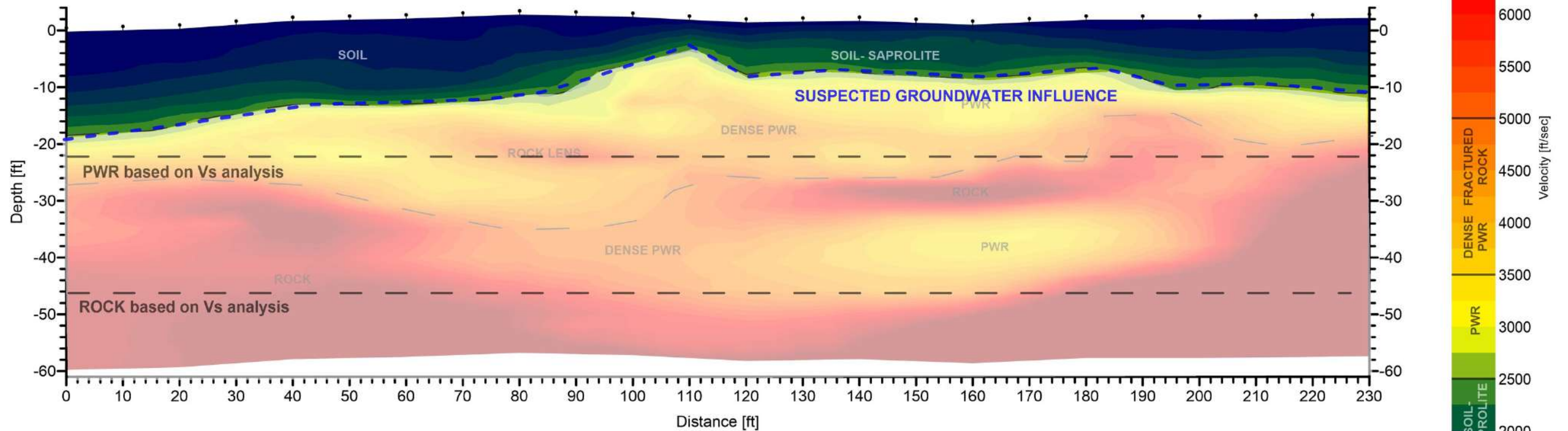
SL-11

SW

N 33°57'51.30"
W 83°50'31.92"

NE

N 33°57'52.74"
W 83°50'29.88"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

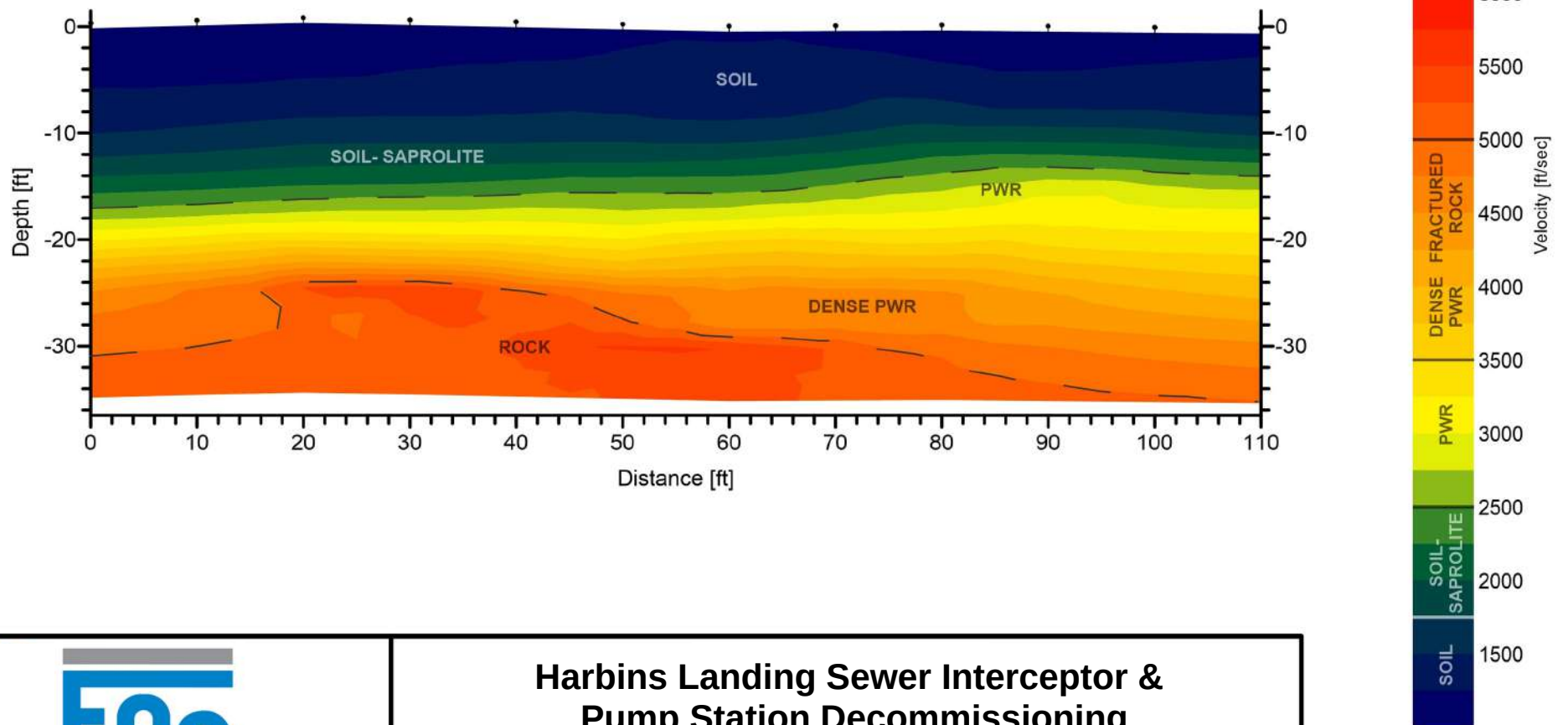
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-12

SW
N 33°57'47.70"
W 83°50'34.26"

NE
N 33°57'48.66"
W 83°50'33.60"



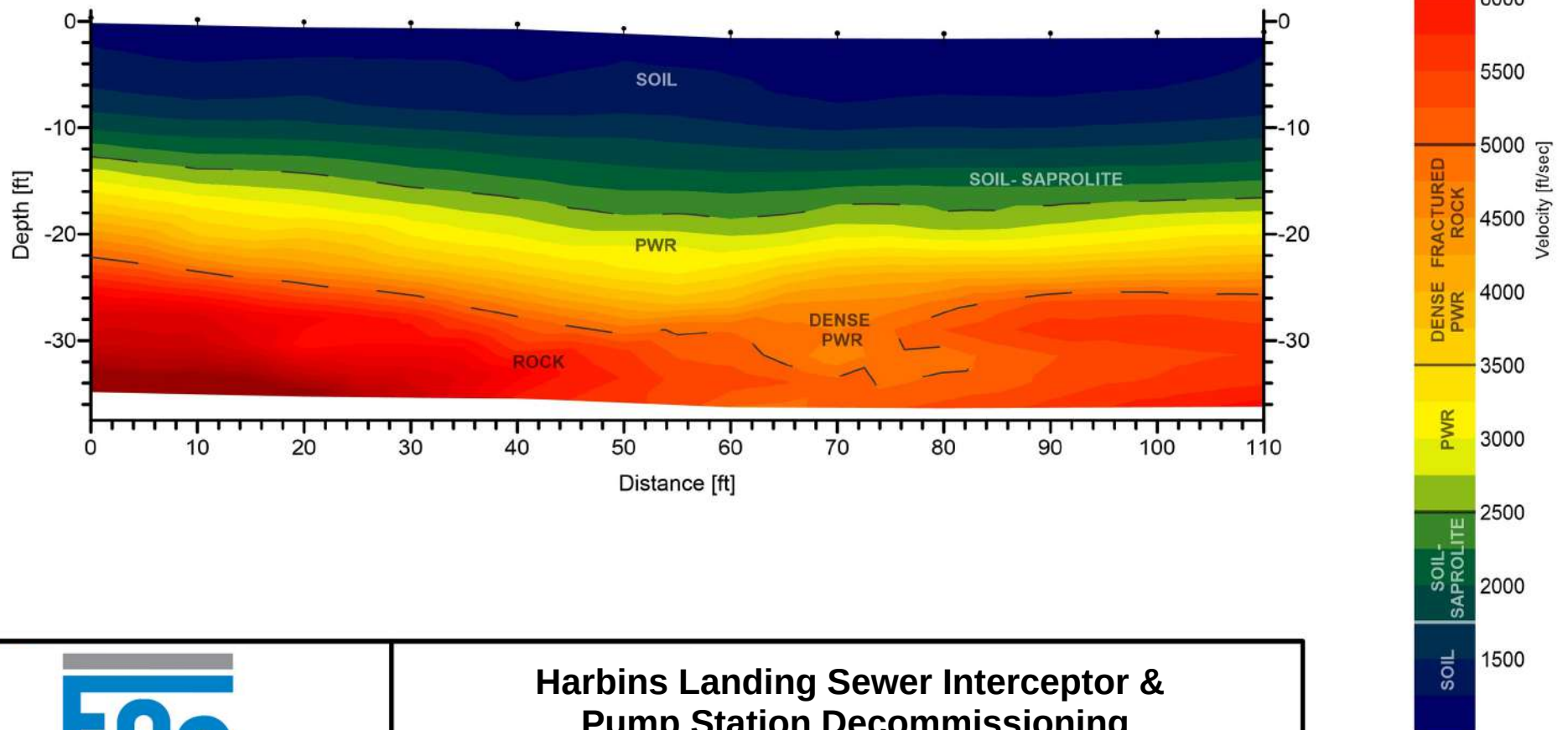
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-13

SW
N 33°57'45.36"
W 83°50'33.60"

NE
N 33°57'46.38"
W 83°50'33.18"



**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

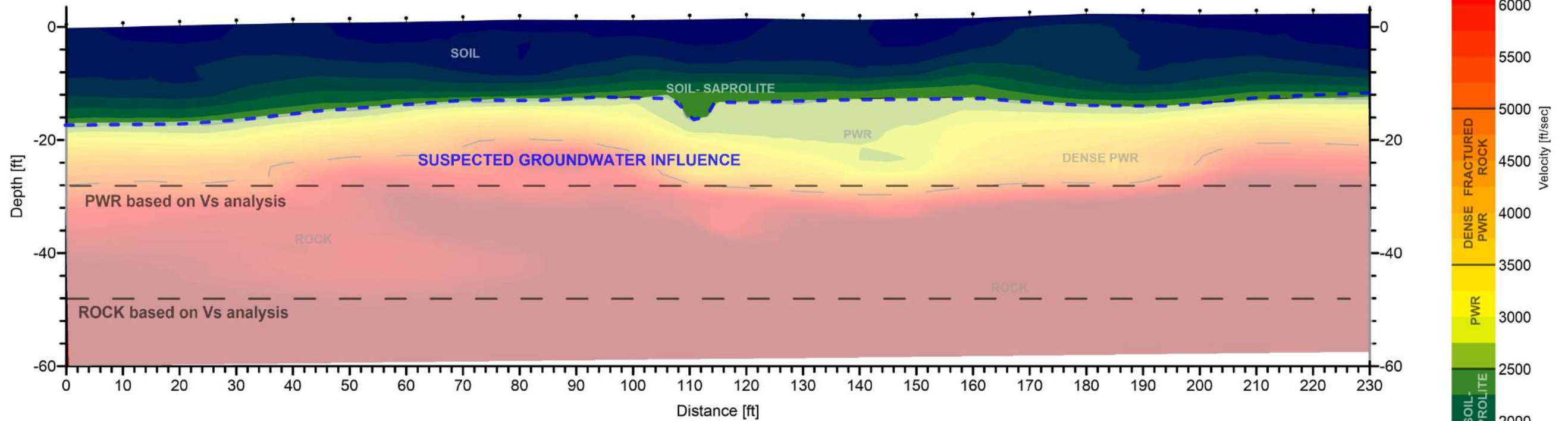
SL-14

SW

N 33°57'41.82"
W 83°50'38.64"

NE

N 33°57'42.72"
W 83°50'36.24"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

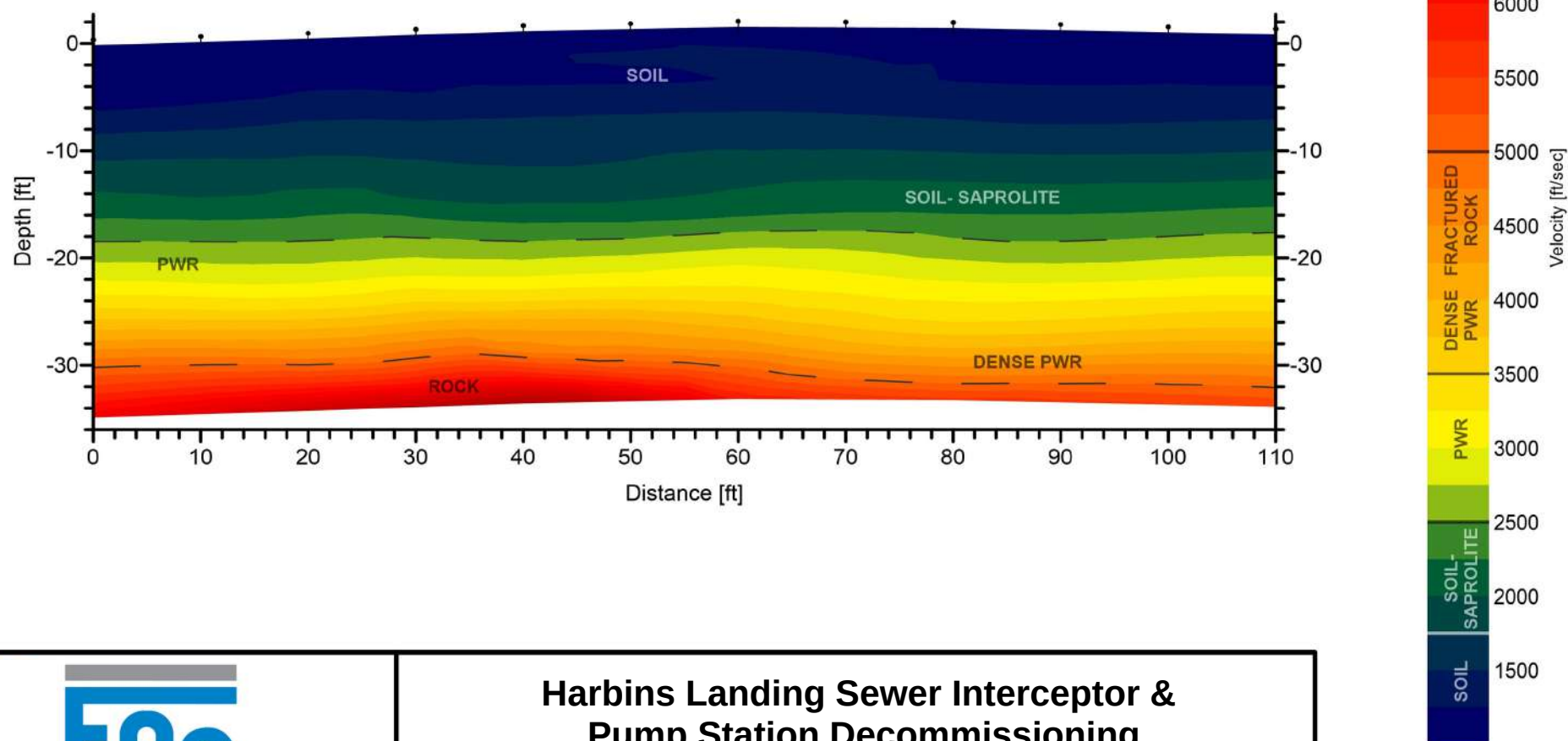
SL-15

SW

N 33°57'40.92"
W 83°50'39.60"

NE

N 33°57'41.58"
W 83°50'38.58'



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

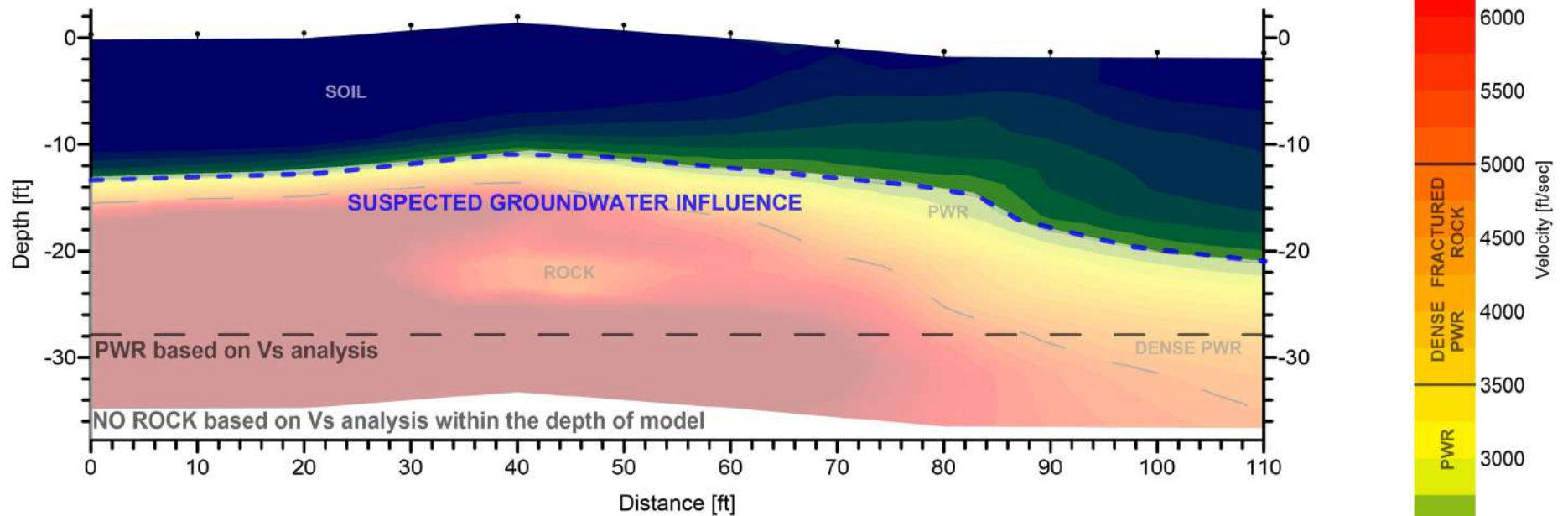
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-16

NW
N 33°57'42.42"
W 83°50'42.12"

SE
N 33°57'41.58"
W 83°50'41.52"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

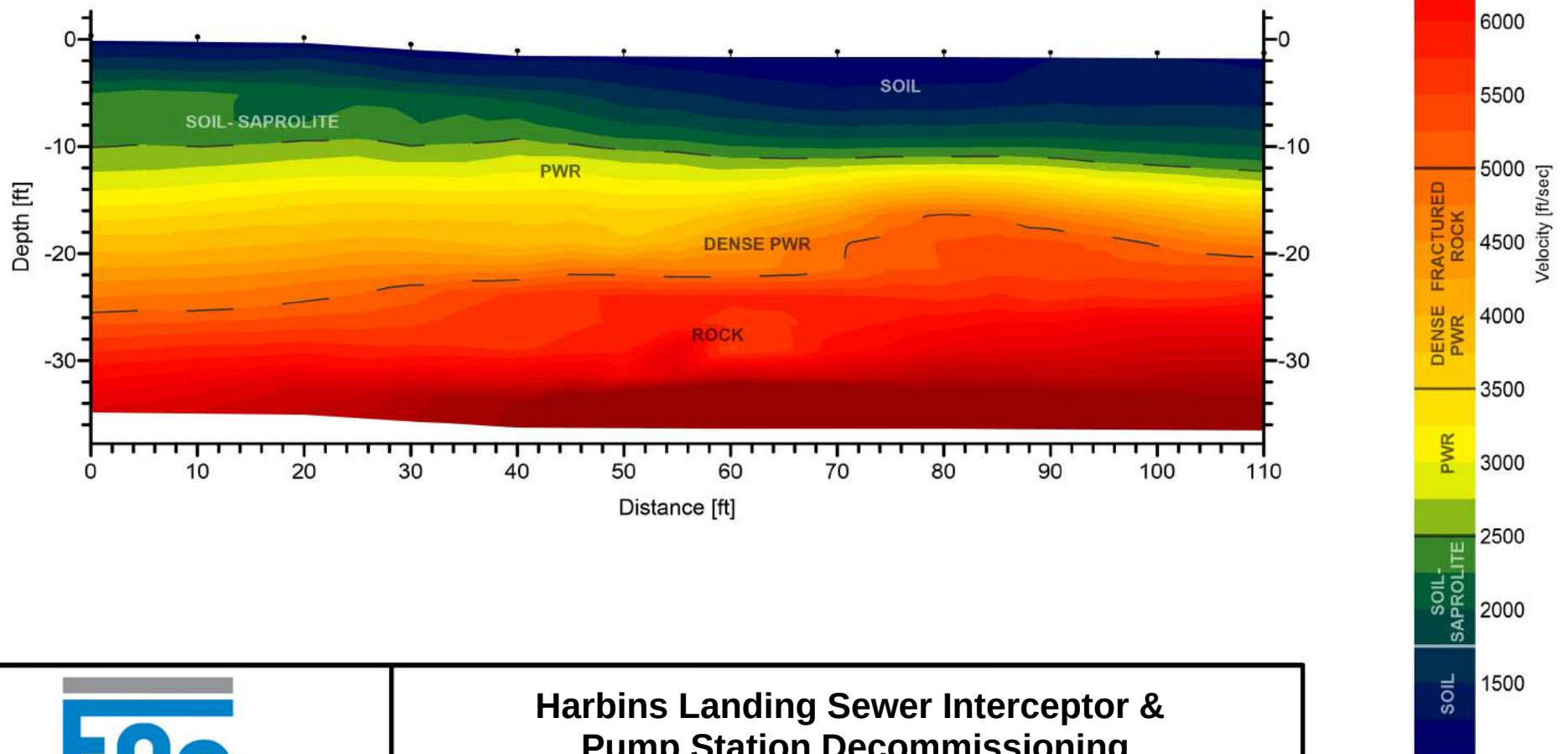
SL-17

NW

N 33°57'43.74"
W 83°50'44.88"

SE

N 33°57'43.14"
W 83°50'43.98'



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

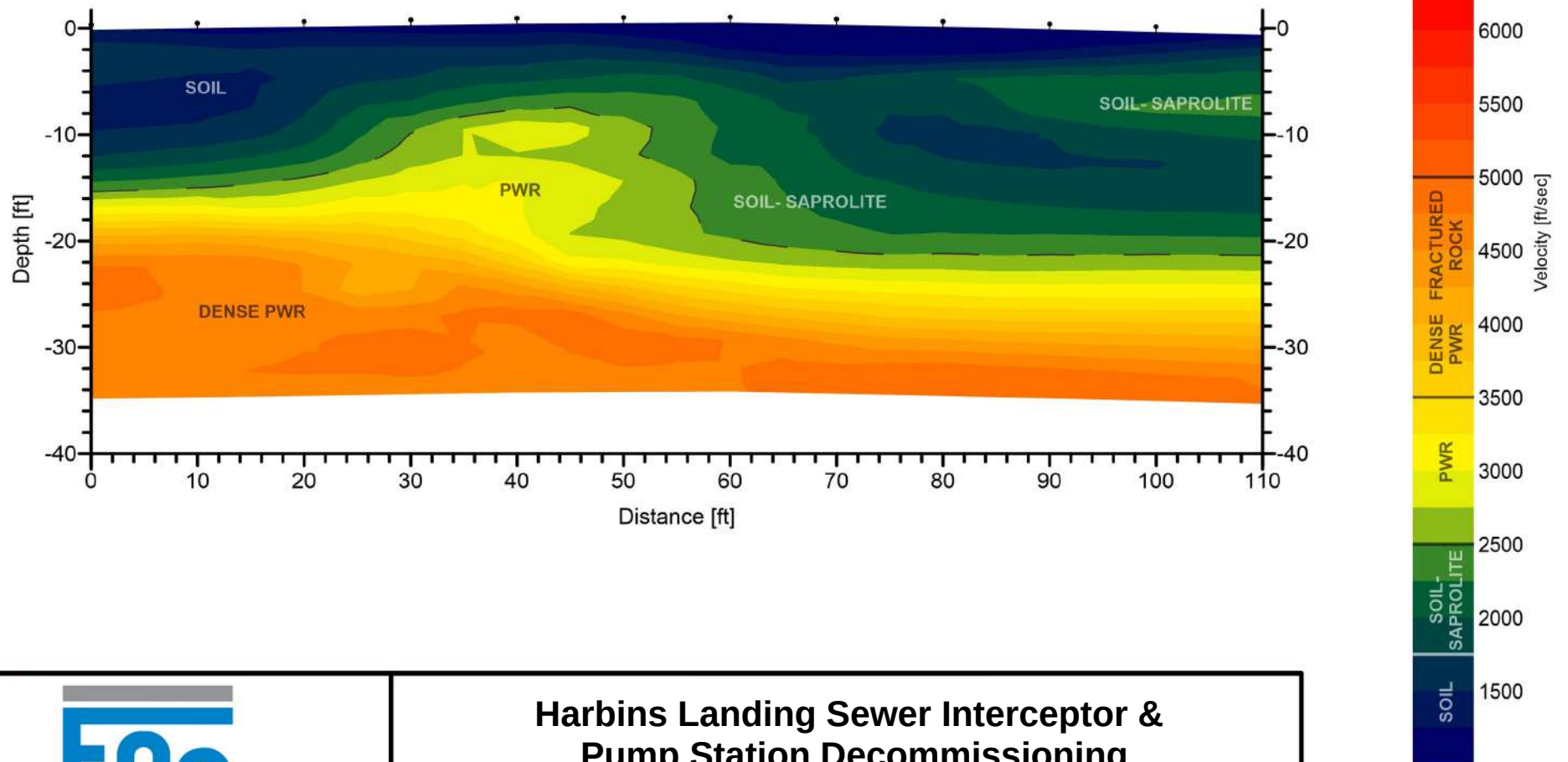
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-18

SW
N 33°57'43.98"
W 83°50'46.50"

NE
N 33°57'44.04"
W 83°50'45.18"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

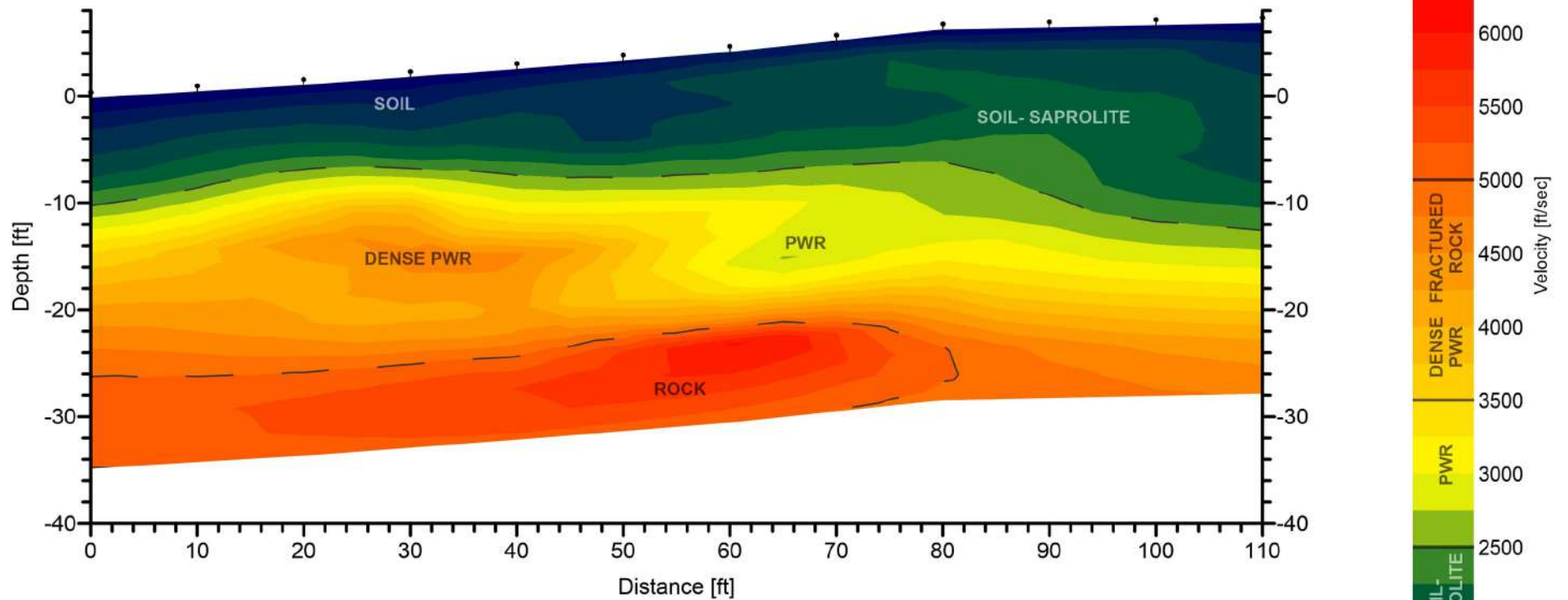
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-19

NW
N 33°57'43.92"
W 83°50'49.08"

SE
N 33°57'43.86"
W 83°50'47.82"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

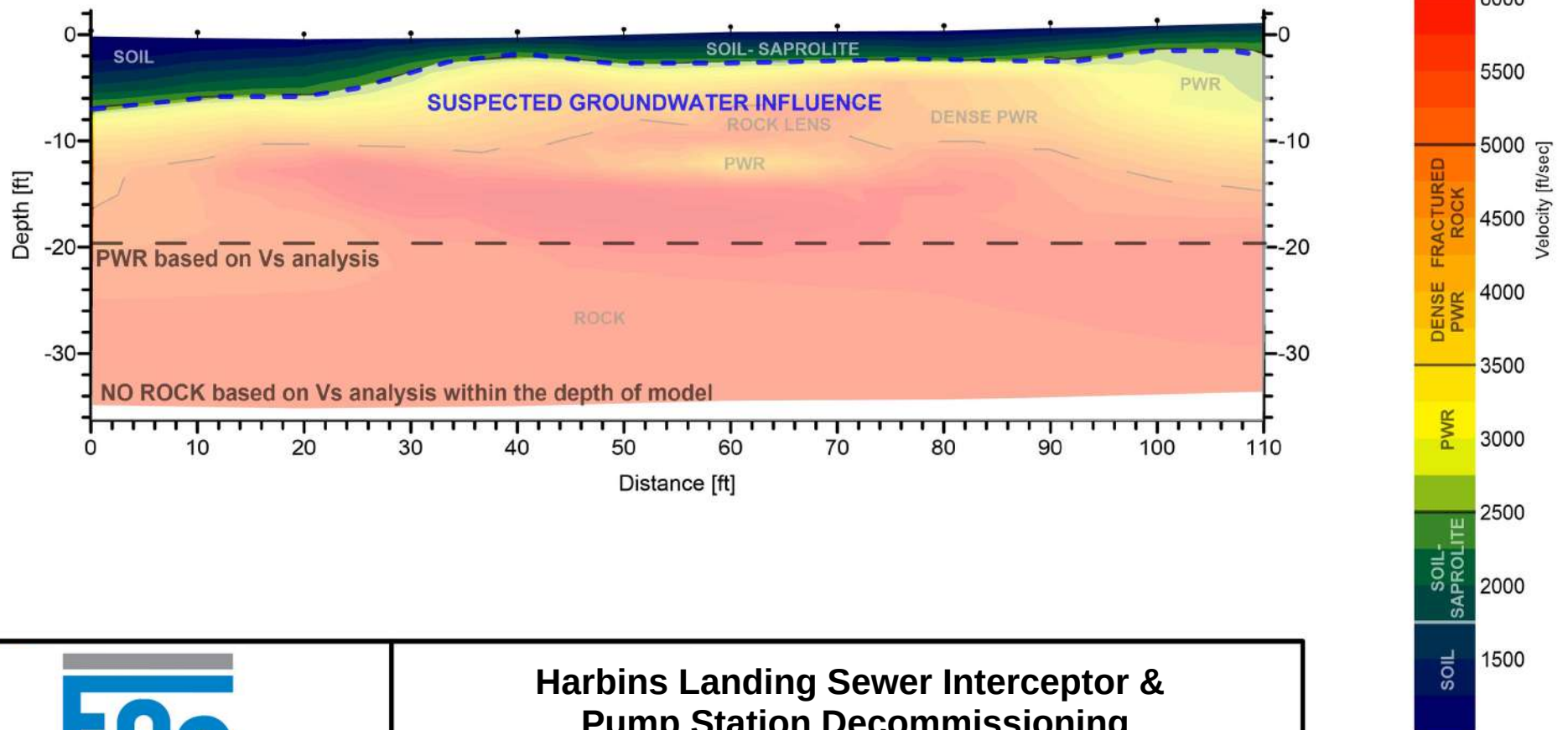
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-20

SW
N 33°57'45.84"
W 83°50'53.58"

NE
N 33°57'45.90"
W 83°50'52.26"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

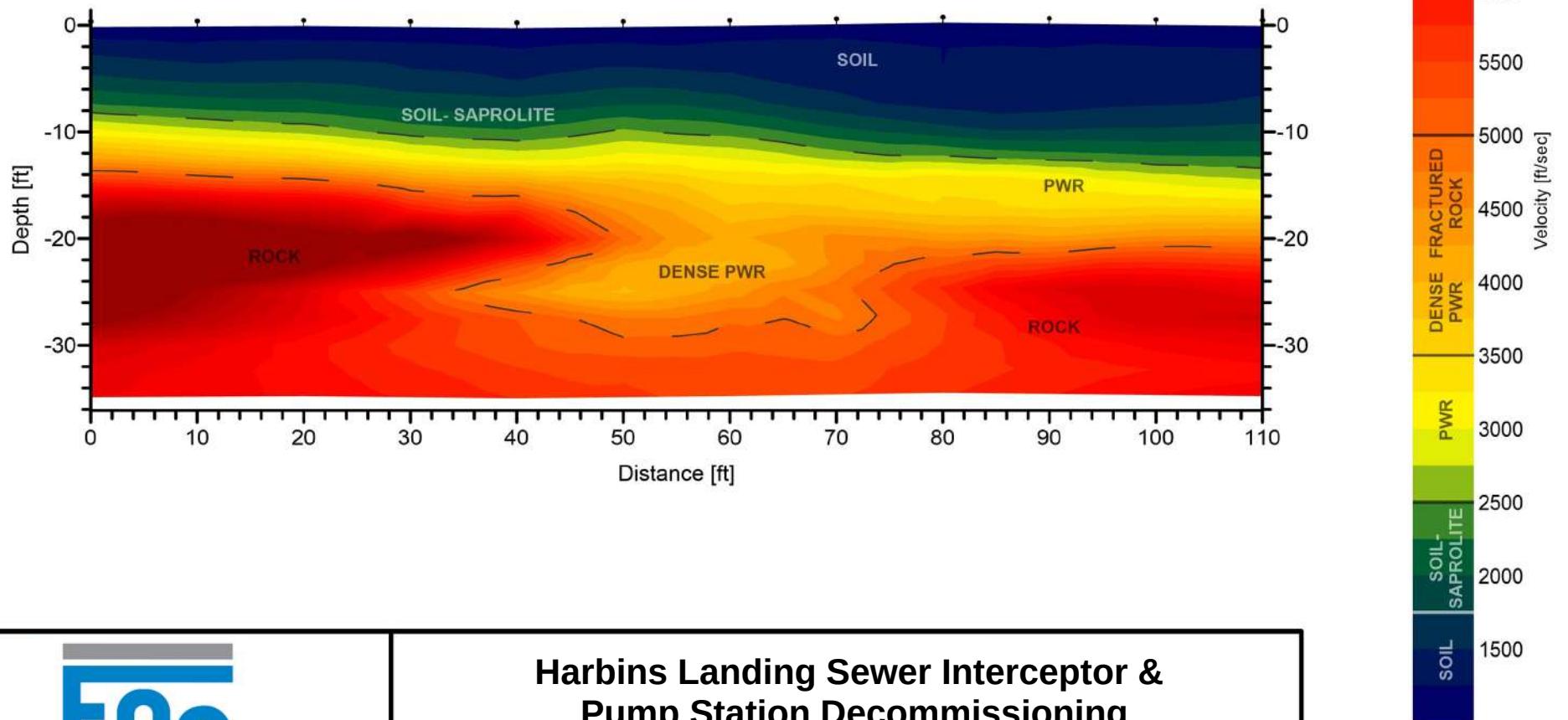
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-21

NW
N 33°57'46.98"
W 83°50'56.64"

SE
N 33°57'46.26"
W 83°50'55.68"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

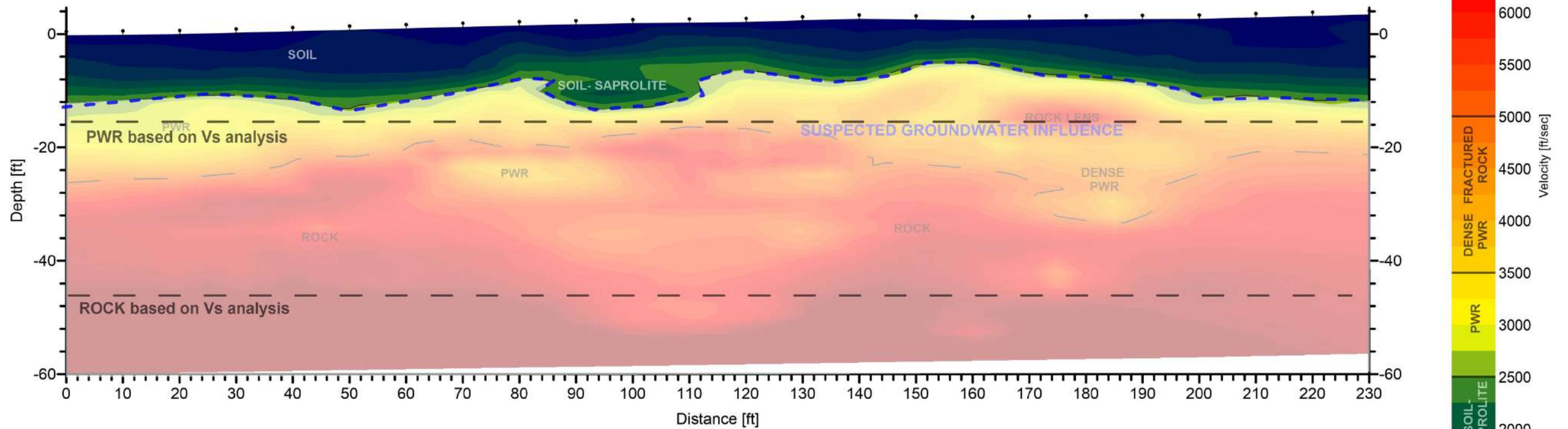
SL-22

NW

N 33°57'49.01"
W 83°50'59.52"

SE

N 33°57'47.56"
W 83°50'57.58"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

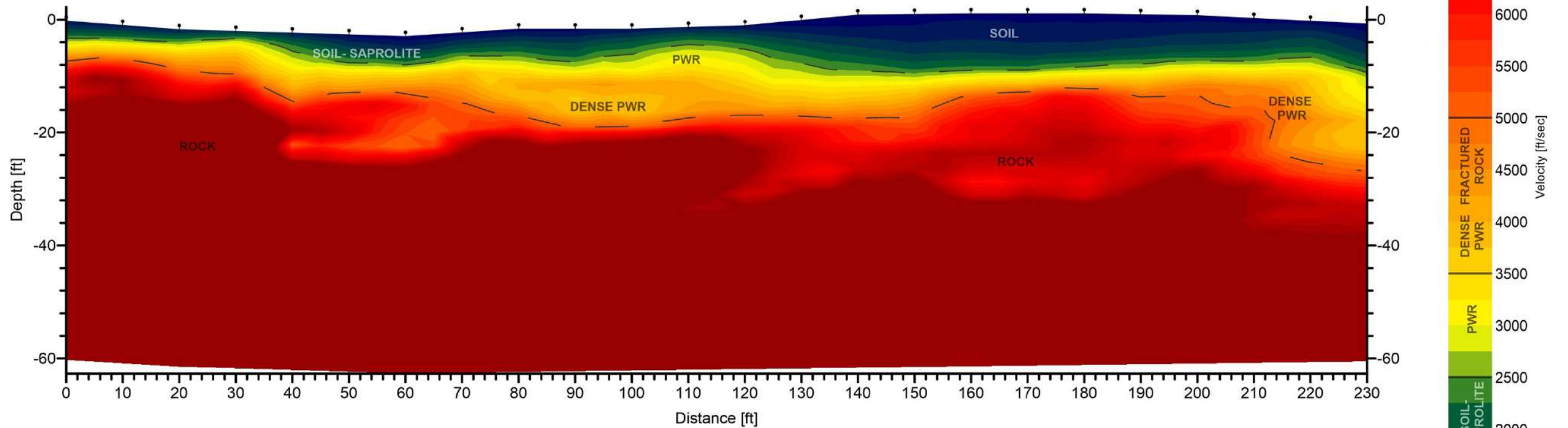
Gwinnett County DWR
Seismic Refraction Investigation

January 30, 2026

SL-23A

NW
N 33°57'53.97"
W 83°51'5.75"

SE
N 33°57'53.21"
W 83°51'3.28"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

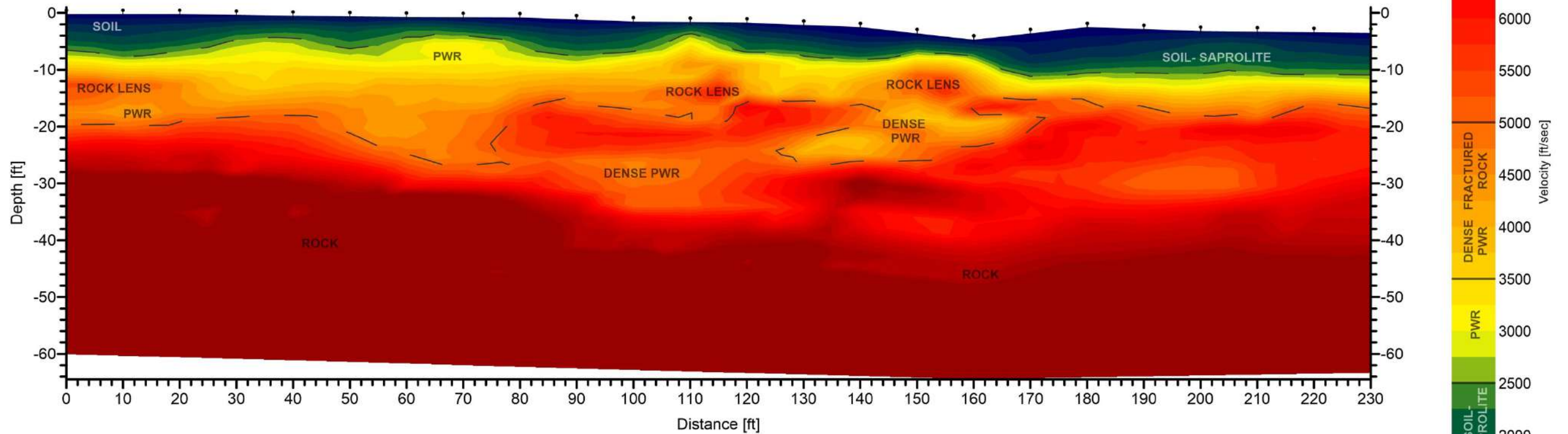
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-23B

NW
N 33°57'53.20"
W 83°51'3.30"

SE
N 33°57'51.31"
W 83°51'1.92"

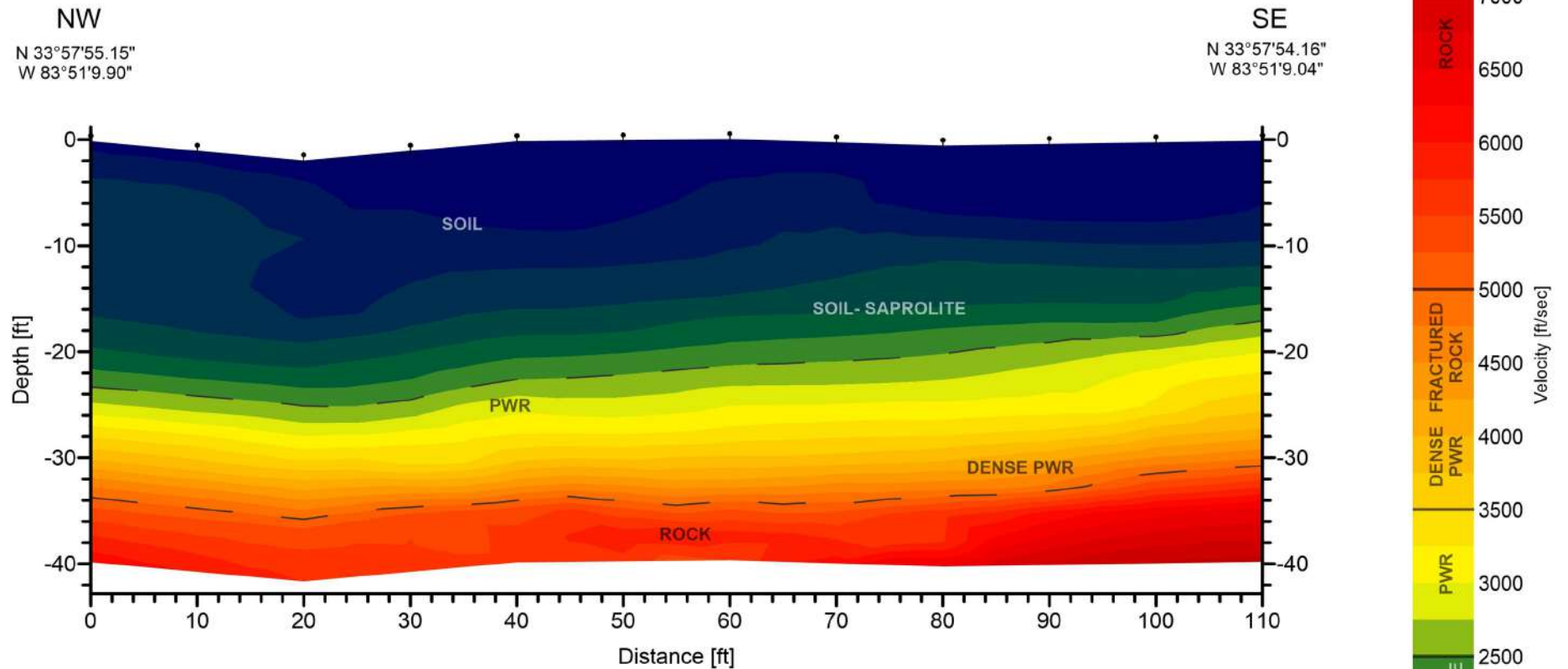


Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-24



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

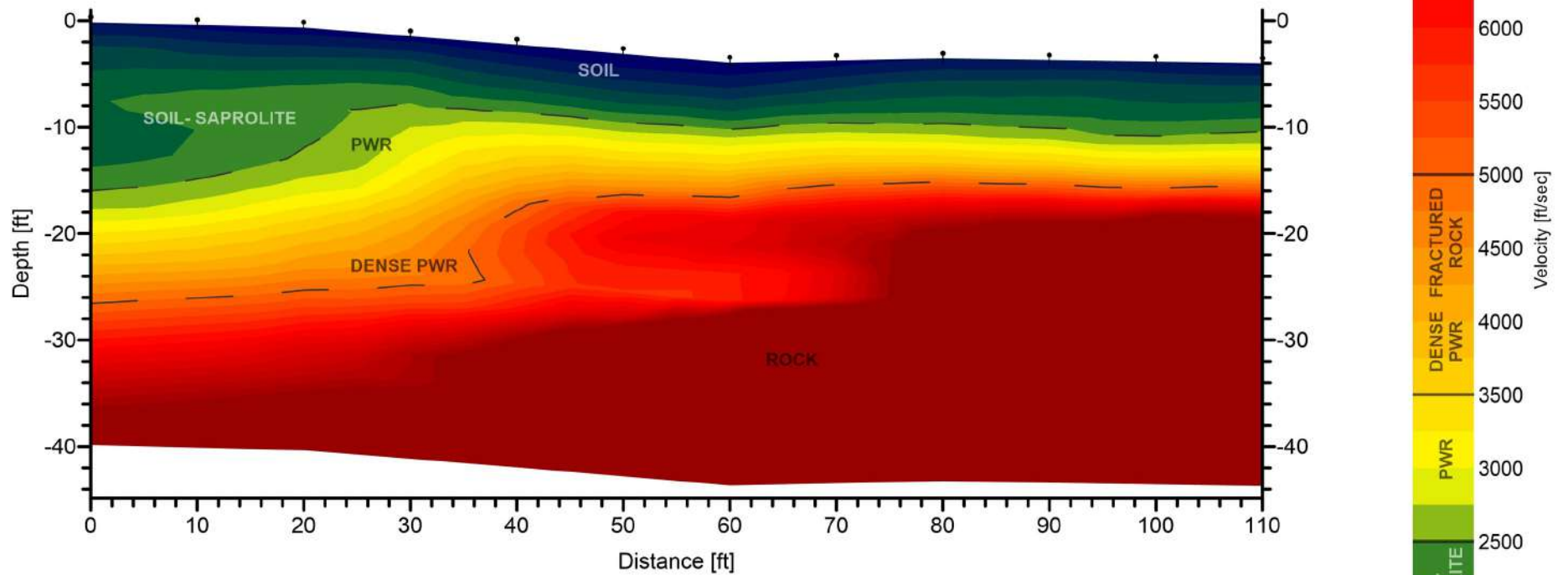
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-25

NW
N 33°57'58.68"
W 83°51'12.59"

SE
N 33°57'57.69"
W 83°51'11.95"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

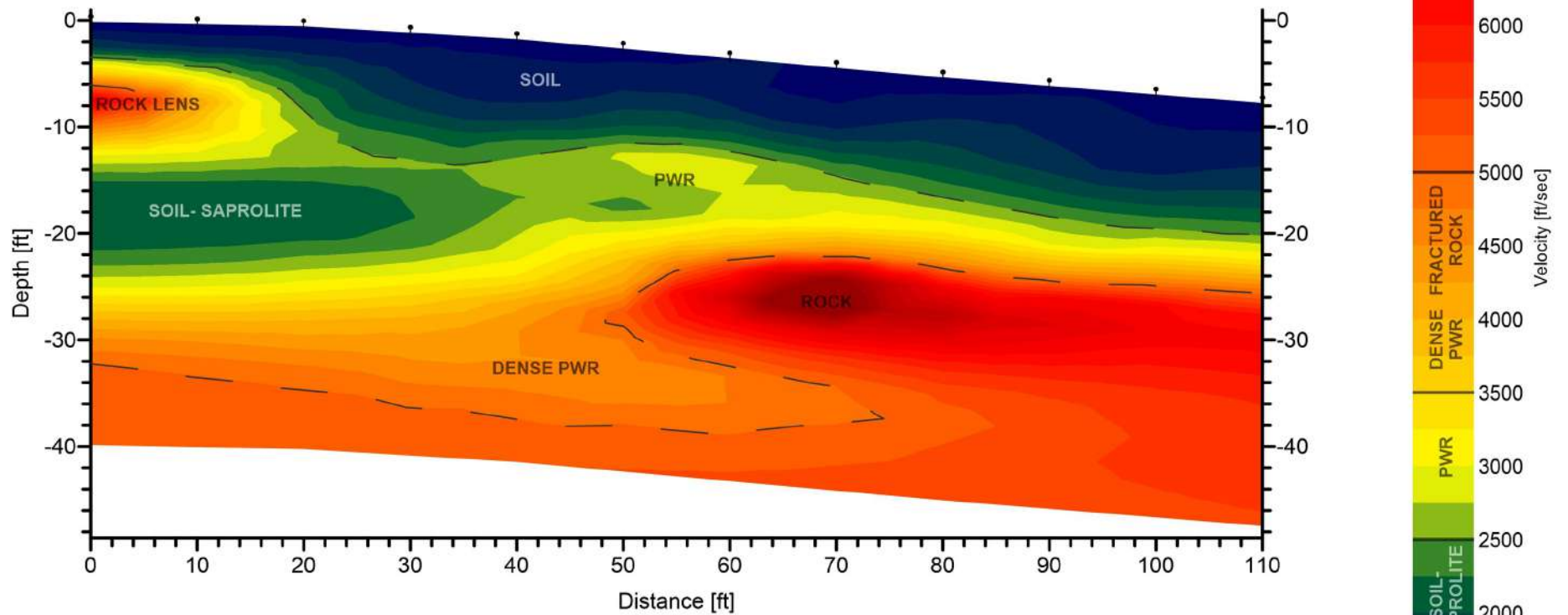
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-26

NW
N 33°58'0.24"
W 83°51'13.58"

SE
N 33°57'59.29"
W 83°51'12.99"



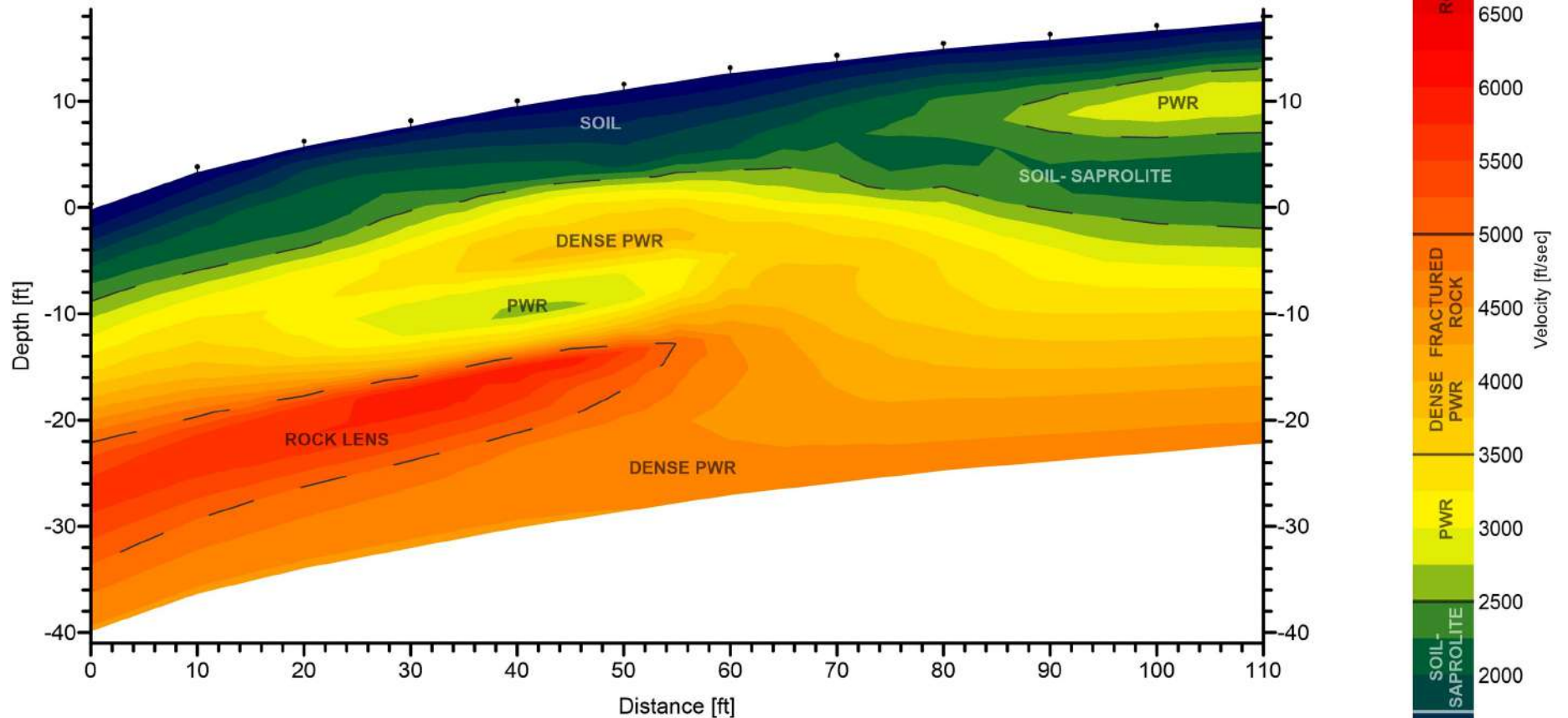
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-27

NW
N 33°58'0.30"
W 83°51'14.35"

SE
N 33°58'0.17"
W 83°51'13.15"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

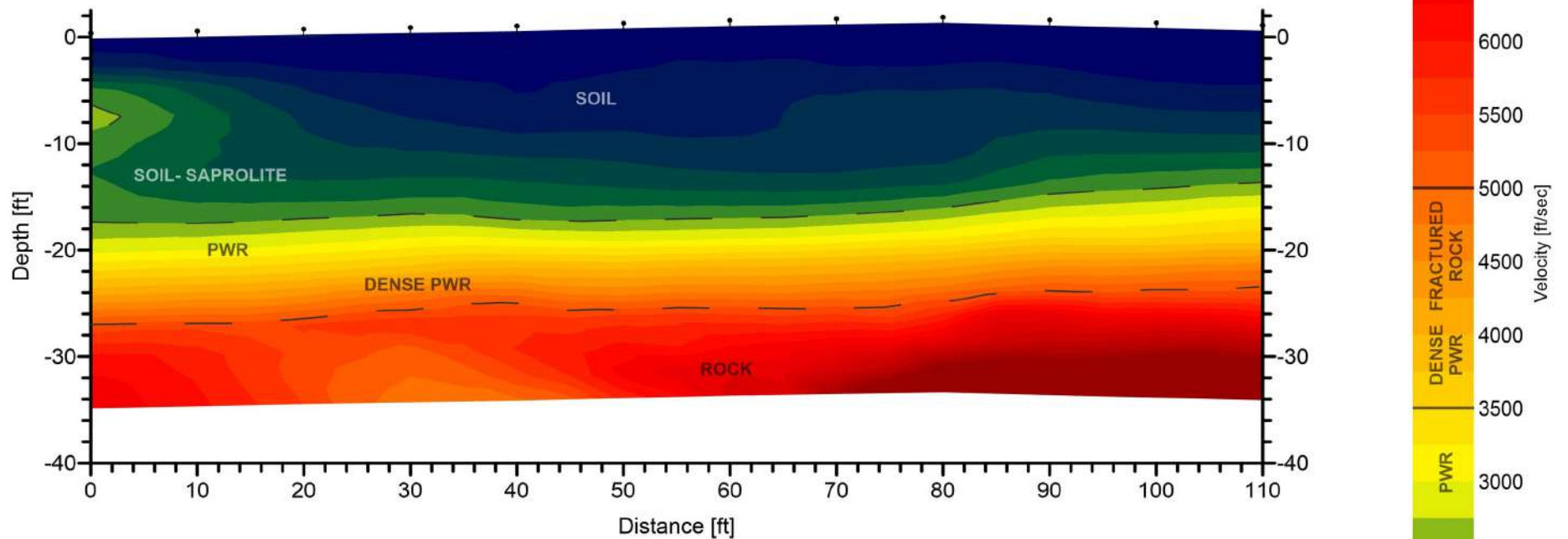
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-28

NW
N 33°58'0.62"
W 83°51'16.19"

SE
N 33°58'0.44"
W 83°51'14.94"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

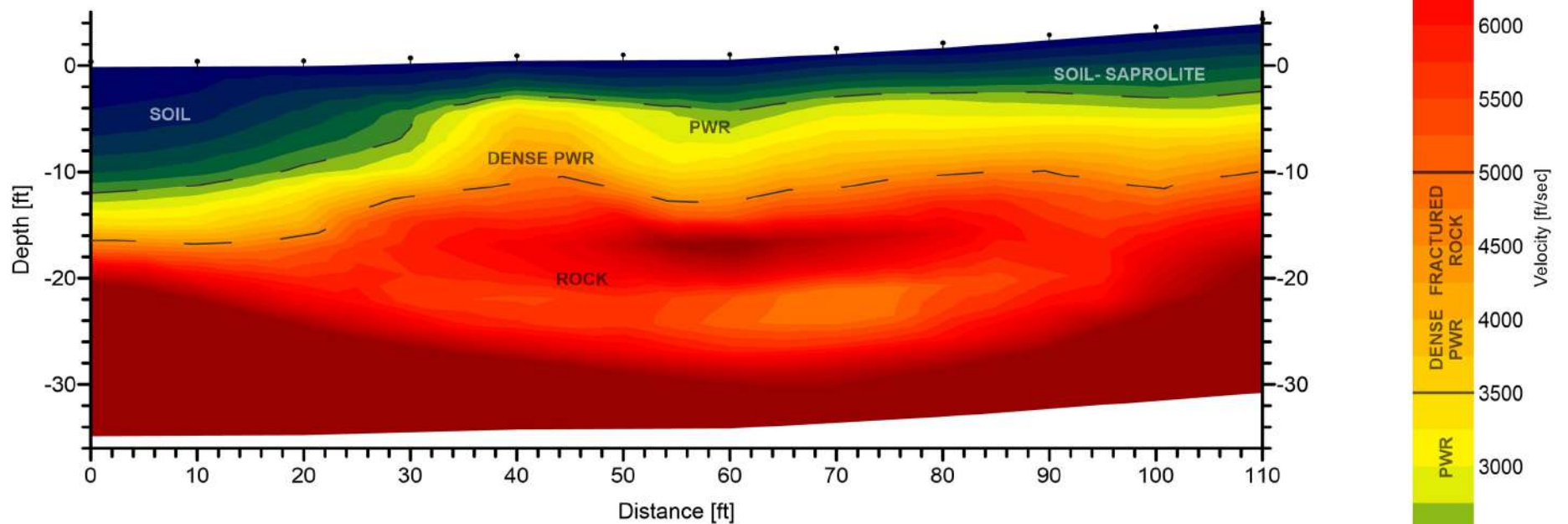
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-29

SW
N 33°58'1.55"
W 83°51'20.50"

NE
N 33°58'1.87"
W 83°51'19.23"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

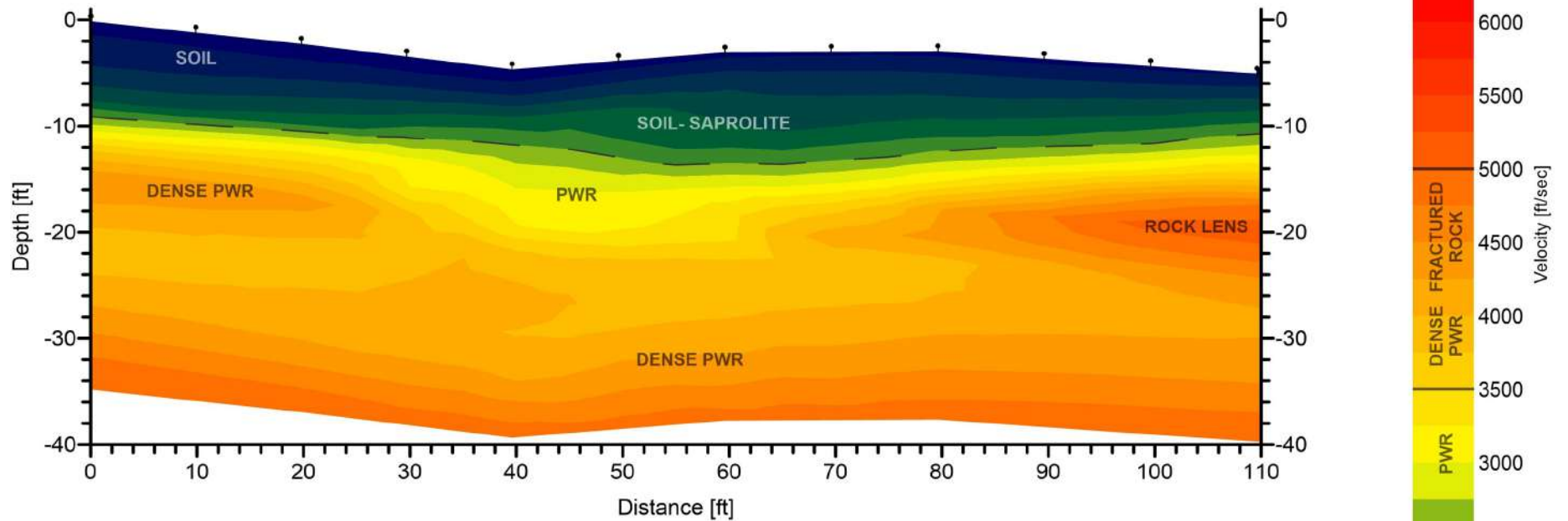
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-30A

NE
N 33°58'0.21"
W 83°51'21.77"

SW
N 33°58'1.29"
W 83°51'22.05"



**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

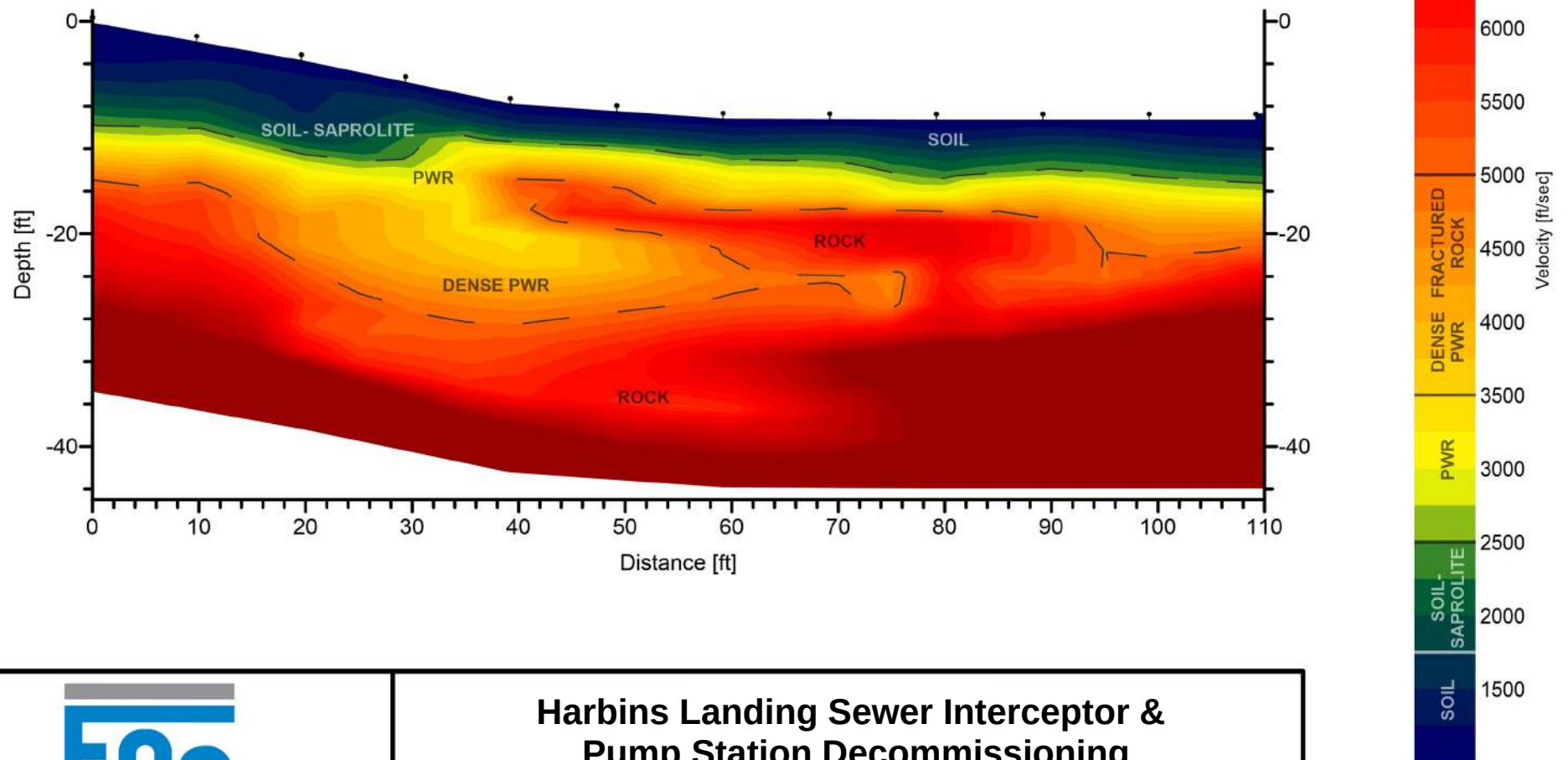
SL-30B

SW

N 33°58'1.29"
W 83°51'22.05"

NE

N 33°58'1.57"
W 83°51'20.84'



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

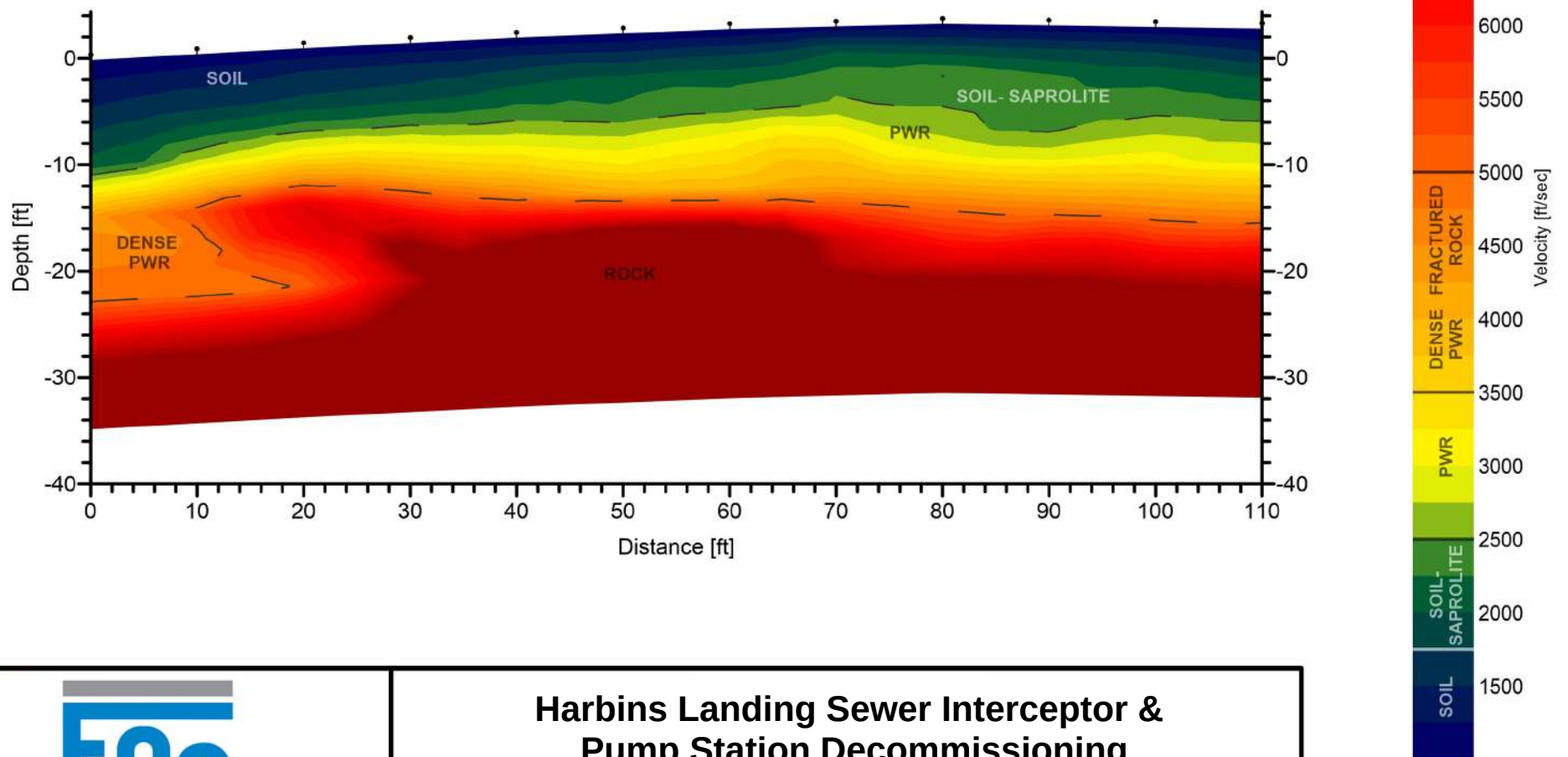
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-31

SW
N 33°57'58.43"
W 83°51'22.16"

NE
N 33°57'59.52"
W 83°51'21.67"



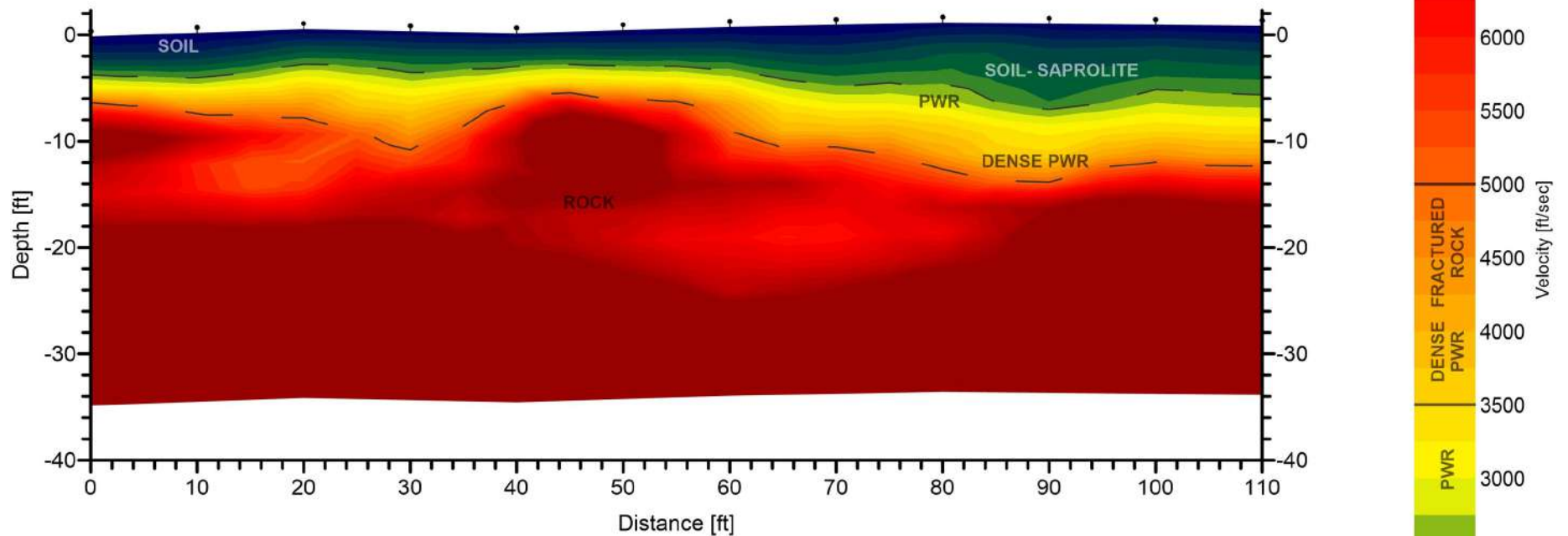
**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-32

SW
N 33°57'57.71"
W 83°51'24.35"

NE
N 33°57'58.20"
W 83°51'23.21"

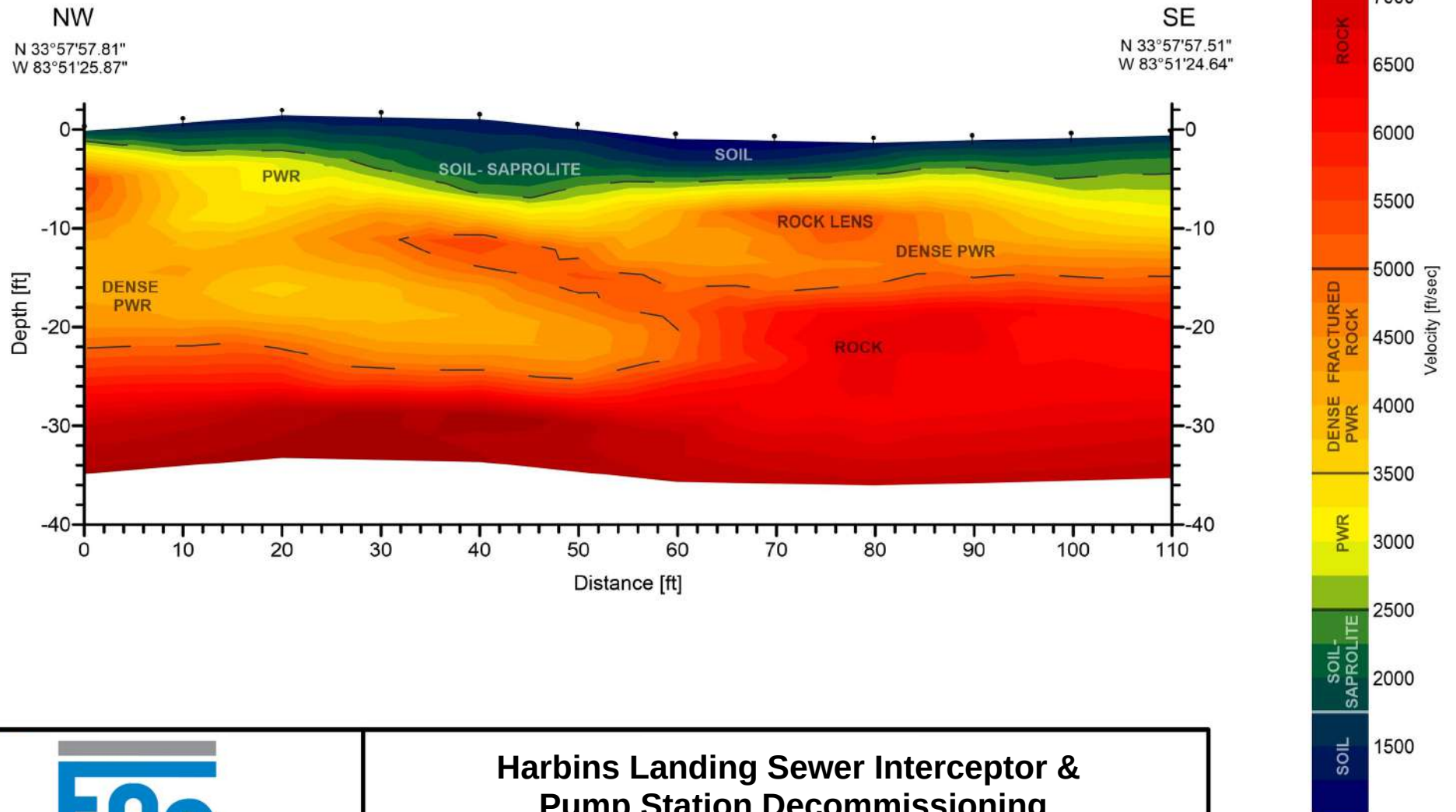


Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-33



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

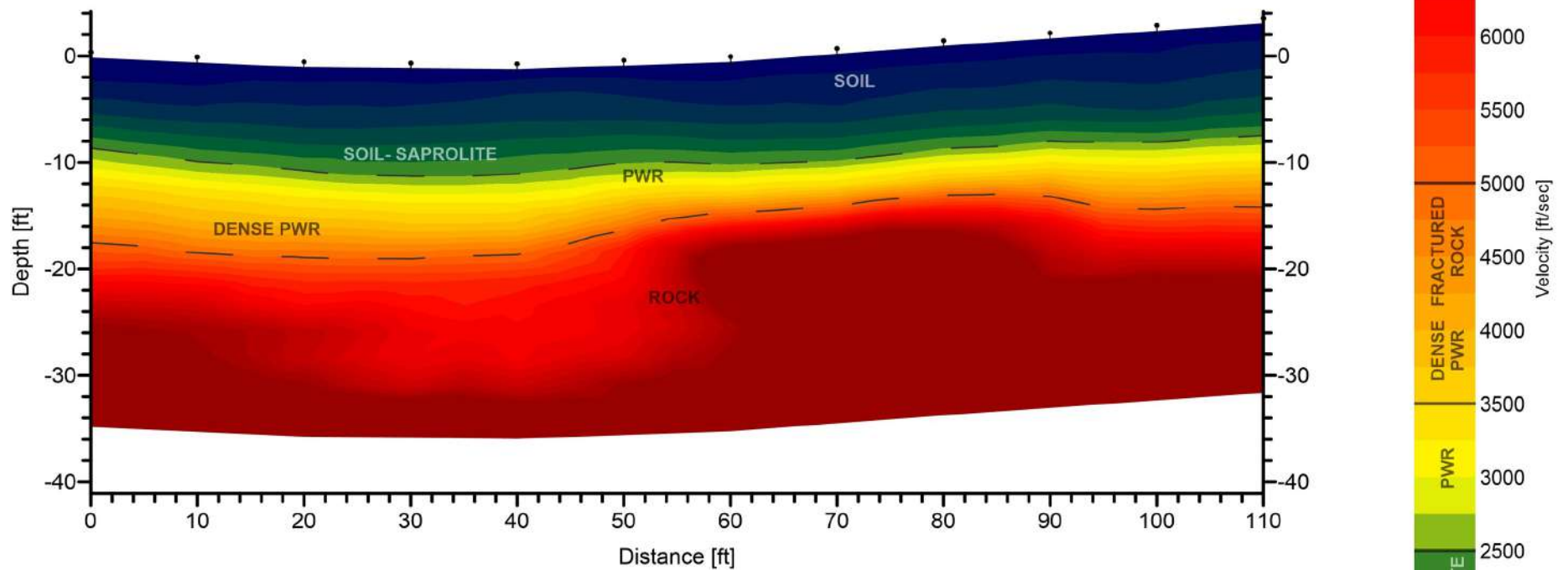
SL-34

NW

N 33°57'57.97"
W 83°51'27.48"

SE

N 33°57'57.73"
W 83°51'26.26'



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

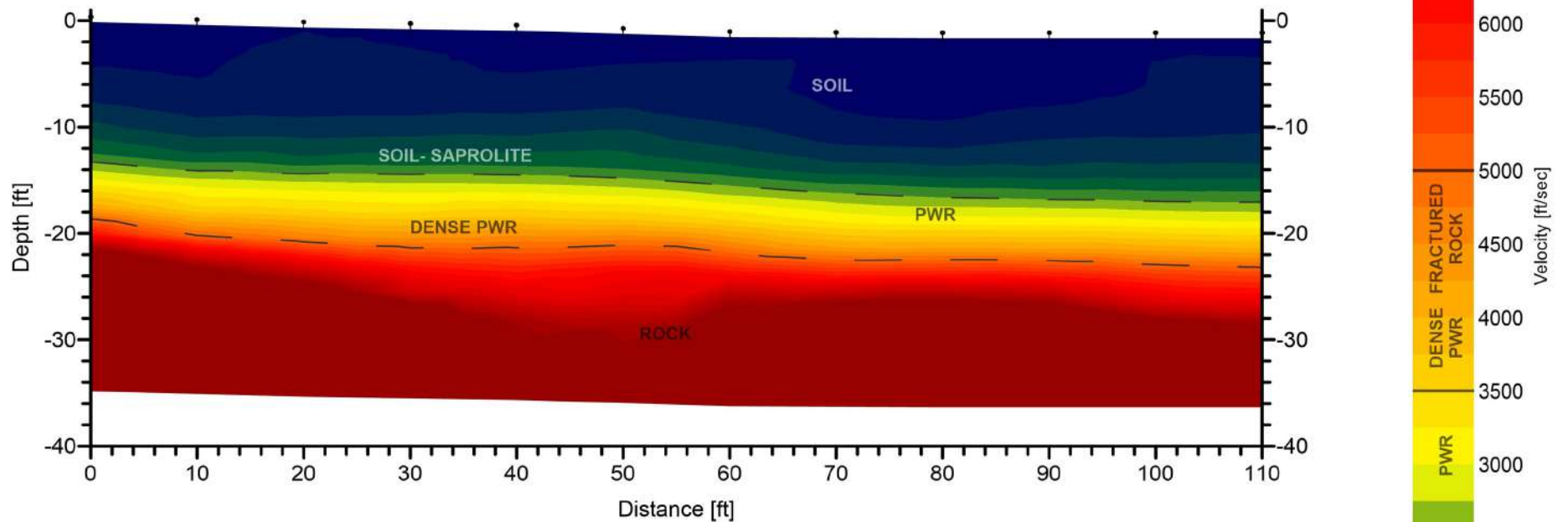
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-35

NW
N 33°57'58.49"
W 83°51'29.41"

SE
N 33°57'58.15"
W 83°51'28.19"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

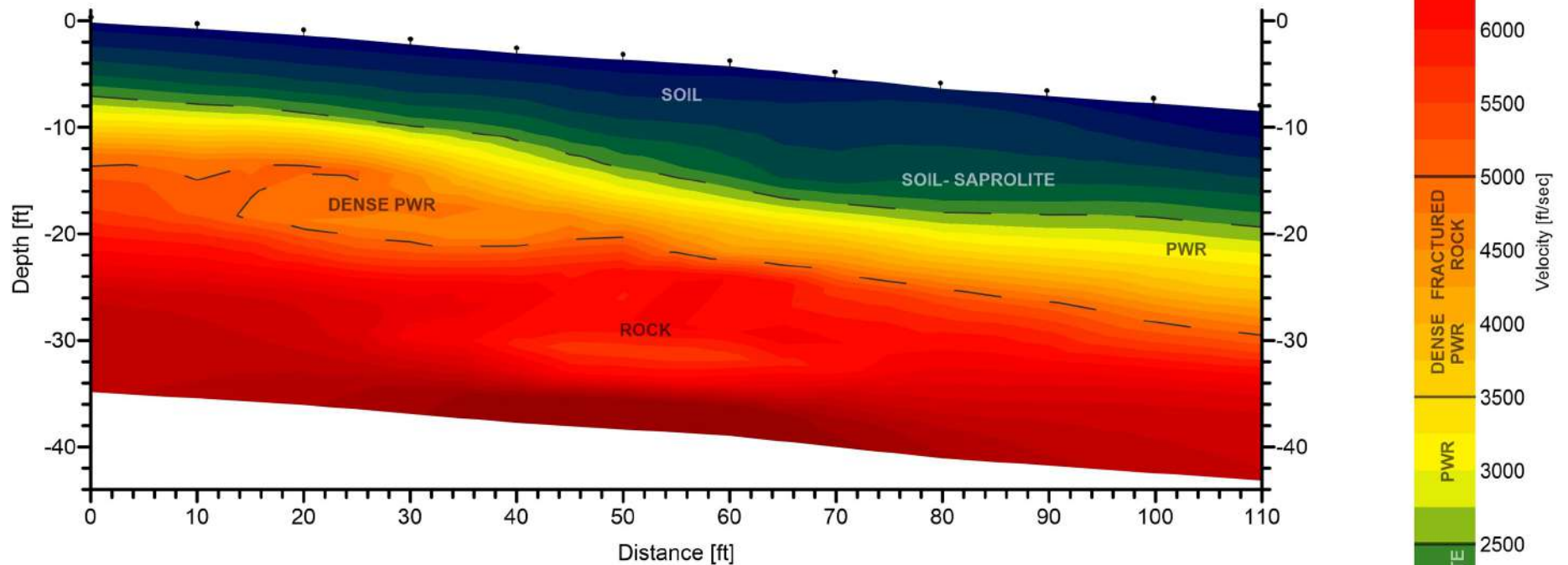
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-36

NW
N 33°57'59.00"
W 83°51'31.02"

SE
N 33°57'58.56"
W 83°51'29.80"



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

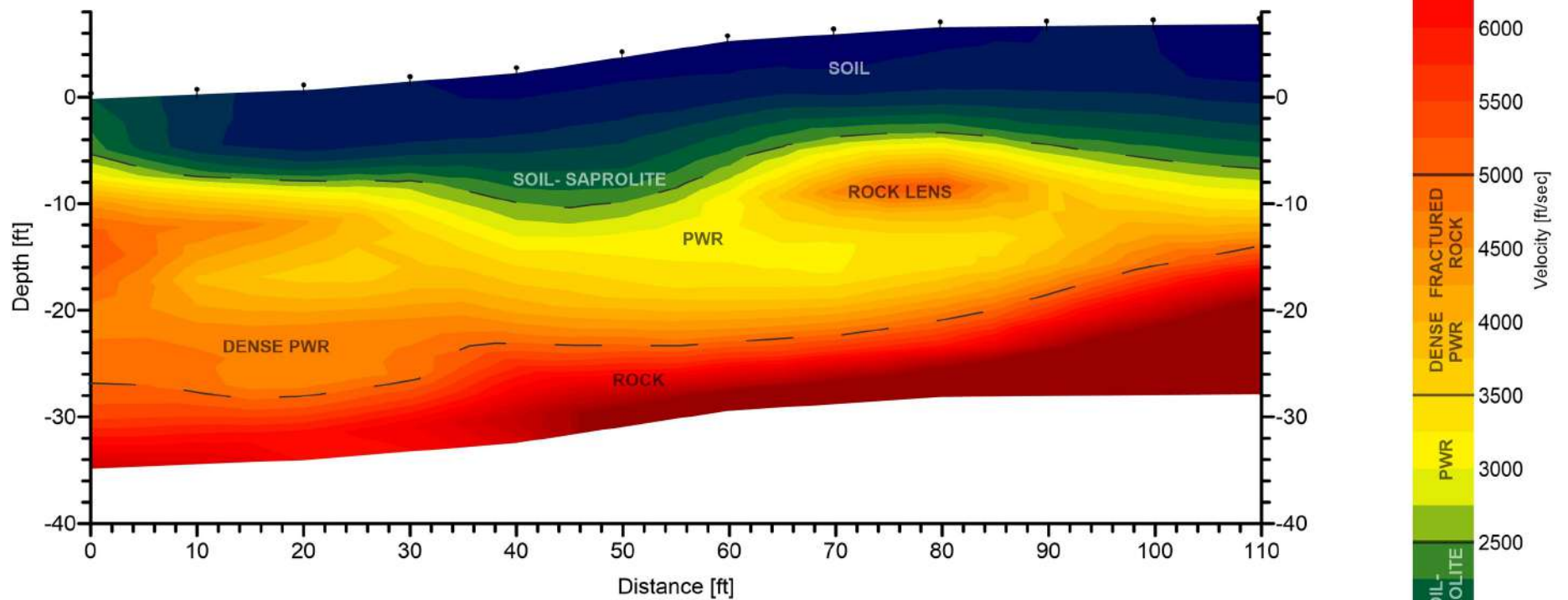
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-38

SW
N 33°57'58.73"
W 83°51'32.30"

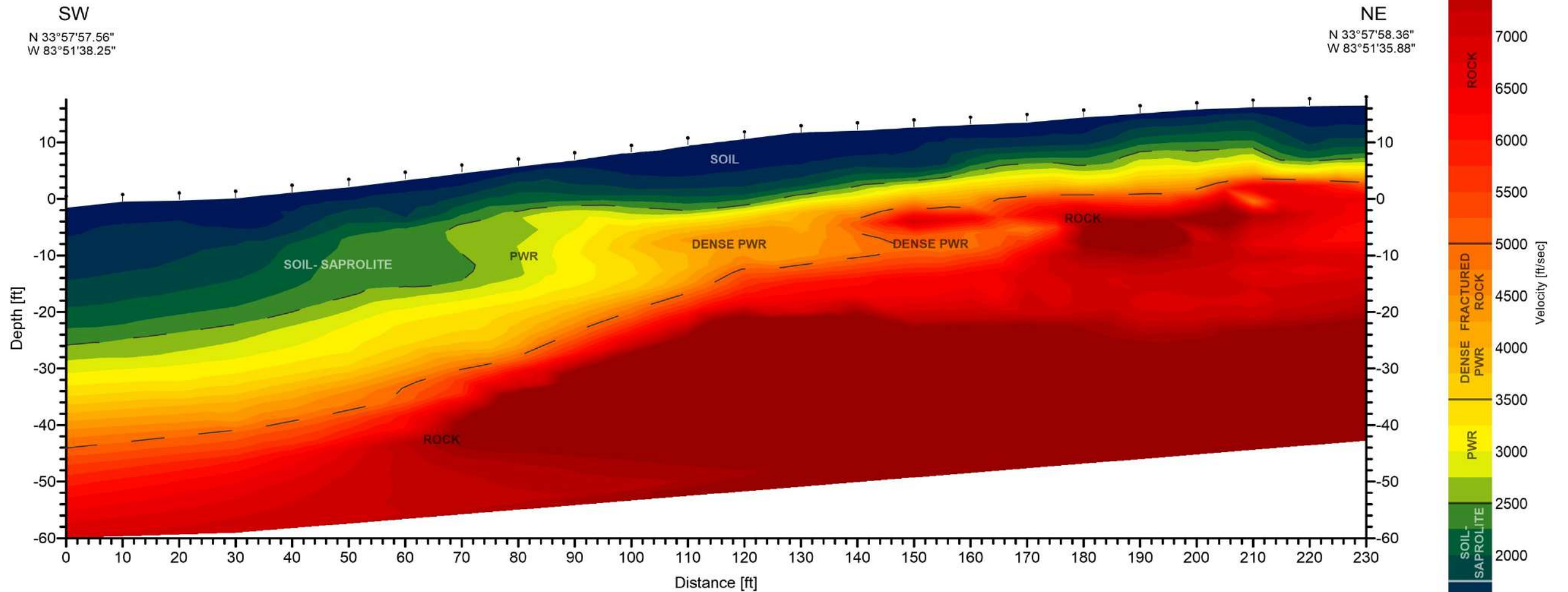
NE
N 33°57'59.00"
W 83°51'31.06"



**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-39A



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

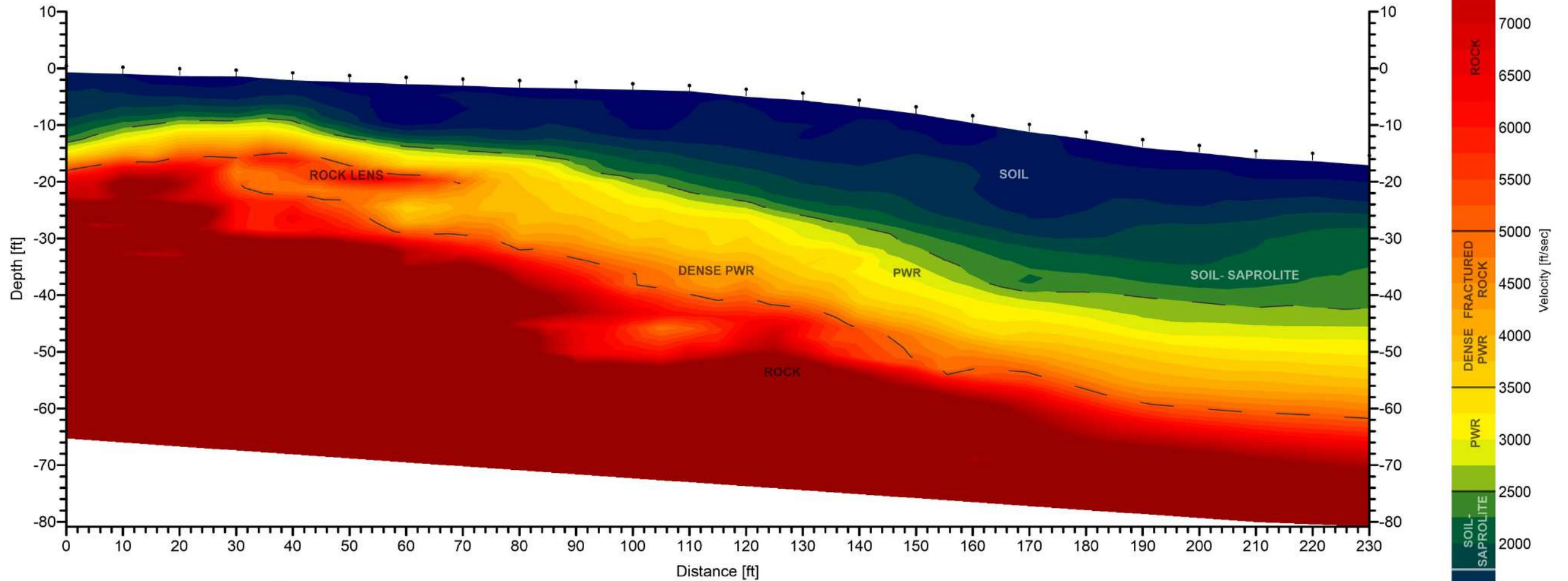
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-39B

SW
N 33°57'58.36"
W 83°51'35.88"

NE
N 33°57'58.63"
W 83°51'33.20"

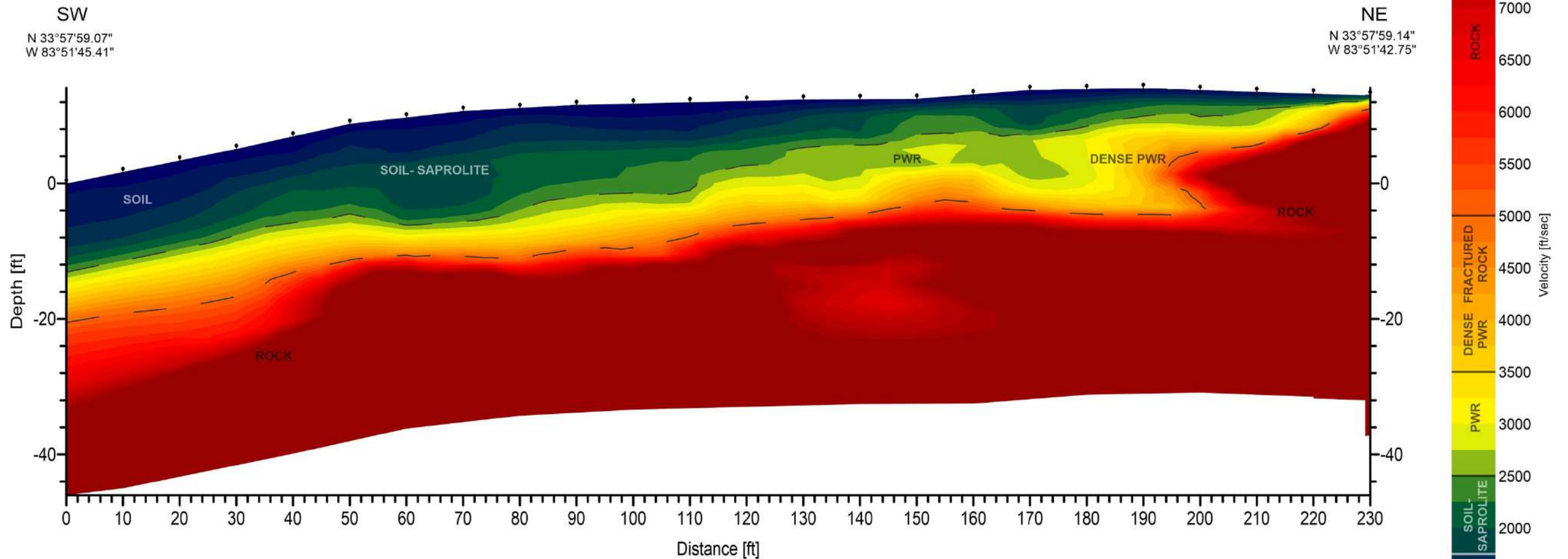


Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-40A

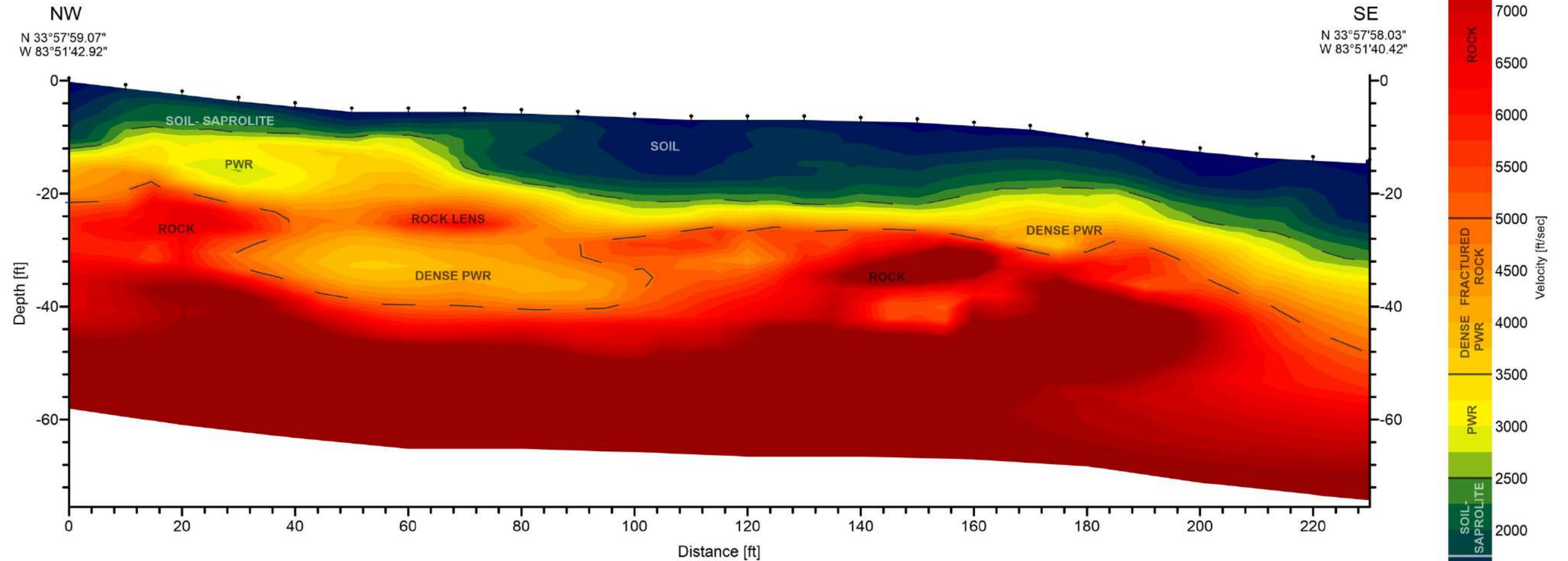


Harbins Landing Sewer Interceptor & Pump Station Decommissioning

Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-40B



Harbins Landing Sewer Interceptor & Pump Station Decommissioning

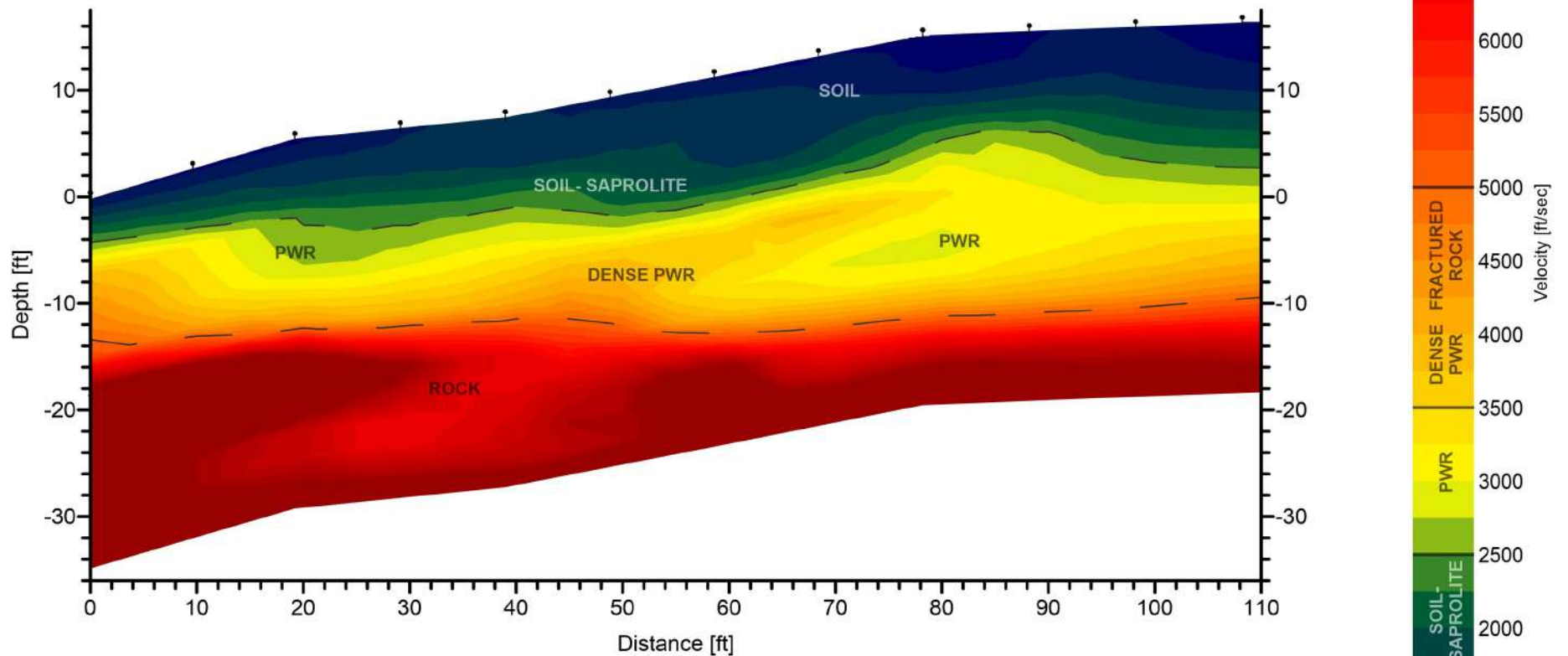
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

SL-41

NW
N 33°57'57.40"
W 83°51'49.28"

SE
N 33°57'56.50"
W 83°51'48.91"



**Harbins Landing Sewer Interceptor &
Pump Station Decommissioning**
Gwinnett County DWR
Seismic Refraction Investigation

February 2, 2026

APPENDIX C – Supplemental Report Documents

GBA Important Information About This Geotechnical-Engineering Report

Appendix B

**SUE A – Report of Subsurface
Utility Engineering Services**



March 23, 2026

Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045904

Attention: Mr. Jimmy Powell, P.E.

Reference: **Report of Subsurface Utility Engineering Services**
Drowning Creek Road WMR
Dacula, Georgia
S&ME Project No. 26800013

Dear Mr. Powell:

S&ME, Inc. (S&ME) has completed the requested Subsurface Utility Engineering (SUE) Quality Level A (QLA) services at the referenced site. Our services were performed in general accordance with our Proposal No. 26800013, dated February 18, 2026, as authorized by Purchase Order No. 232003 on February 20, 2026. This report describes our understanding of the project and the SUE QLA results.

◆ Project Information

Our understanding of the project was based on January 2026 e-mail and telephone conversations between Mr. Jimmy Powell P.E. of Gwinnett County Department of Water Resources (GCDWR) and Jamie Keown of S&ME. Appended to the emails were the following documents:

- *Drowning Creek WMR*, PDF dated December 30, 2025, prepared by GCDWR
- *Drowning Creek WMR Geotech Scope*, PDF dated December 30, 2025, prepared by GCDWR

We understand that GCDWR intends to install approximately 8,900 linear feet of water line along the east side of the Drowning Creek Road right-of-way in Dacula, Georgia, extending from Harbins Road to approximately 800 feet southeast of Georgia Highway 316.

We were requested to retain a SUE subcontractor to perform SUE Quality Level A (QLA) explorations at ten locations to expose existing utilities and record their location and depths. Nine of the test locations were identified in the WMR Geotech Scope plans, with one additional location added later at GCDWR's request.

Please have the project information and assumptions stated above reviewed by the project team. If our understanding or assumptions are not representative of the project, revisions to our report may be required.



◆ Exploration

Test Locations

Our senior engineer visited the site to generally establish the test locations in the field by using a hand-held global positioning system (GPS) device with points determined by overlaying the provided site plans with Google Earth™. We further checked each location by referencing readily identifiable site features (e.g., edges of pavement, hardscape features, etc.) as needed. Ground surface elevations at each test location were estimated to the nearest foot using the provided topographic site plan; these values should be considered approximate.

Our SUE subcontractor, NV5, then employed Quality Level B (QLB) remote sensing methods, including ground penetrating radar (GPR), to refine the approximate locations of the target utilities prior to excavation. Approximate test locations are shown on the attached SUE Test Hole Location Plans, Figure Nos. 1, 2, and 3.

Subsurface Utility Engineering

A member of our staff and our SUE subcontractor, NV5, were on site between February 27, 2026, and March 3, 2026, to perform the requested services. After navigating to the marked locations, NV5 used a compressed-air lance to loosen soils and vacuum excavation equipment to remove material. These vacuum-extraction excavations are referred to as “Test Holes,” although no actual material testing is performed during the excavation process.

Each Test Hole was enlarged to approximately 1 to 2 feet in width, with excavation depths ranging from roughly 2 ¾ feet to 5 ½ feet to allow for exposure of the utilities. Each of the requested utilities was successfully exposed and identified. The Test Hole results are summarized in the table below:

Test Hole Location	Date Performed	Utility Diameter (in)	Ground Surface Elevation* (ft)	Depth to Top of Utility (ft)
TH-01	3/2/26	26	994	4.65
TH-02	3/2/26	10	995	4.08
TH-03	3/2/26	14	996	2.98
TH-04	2/27/26	8	1002	5.36
TH-05	2/27/26	8	890	4.14
TH-06	2/27/26	4	883	5.06
TH-07	3/4/26	2.25 conduit	883	3.63
TH-08	3/4/26	8	883	5.49
TH-09	3/4/26	10	885	3.88
TH-10	3/4/26	1	884	2.74

*Elevations should be considered approximate and were based off the provided topographic site plan.



Images and details documenting each test hole are presented in the appended NV5 Test Hole Reports. Upon completion of the excavations, the utility encountered depths were recorded and the locations staked for surveying (by others). The test holes were then backfilled with the removed materials.

◆ Limitations

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The information contained in this report is based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

◆ Closure

We appreciate the opportunity to serve as the geotechnical consultant during this phase of the project. Please contact us if you have questions about this report or if we may be of further service.

Sincerely,

S&ME, Inc.

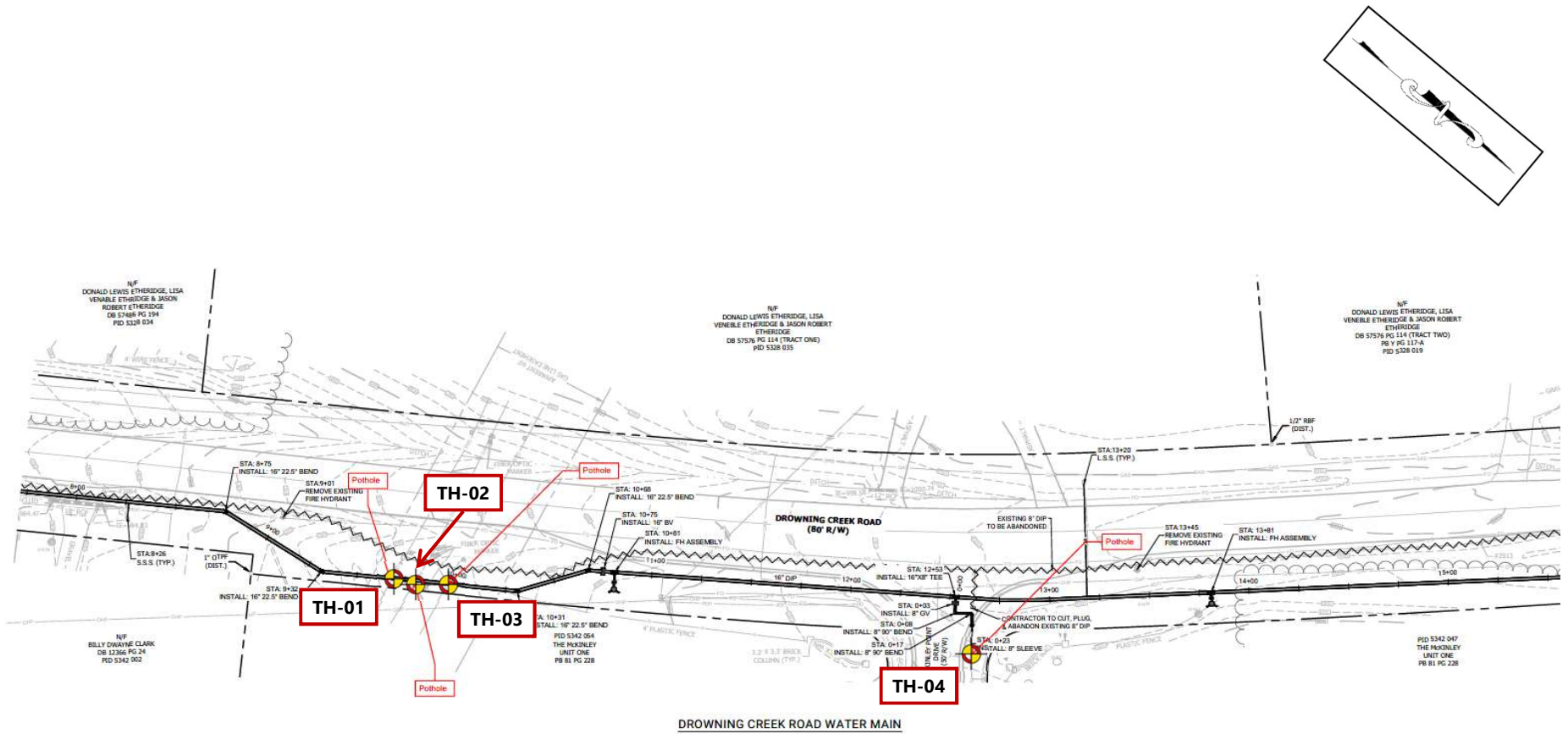
Sarah E. Ball, P.E.
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Timothy J. Mirocha, P.E.
Principal Engineer
Ga. Reg. No. 21386
tmirocha@smeinc.com
770-826-0691 (cell)



Appendix



REFERENCE:
Drowning Creek Road Water Main Improvement Sheet Number CU202, dated 12-30-2025, prepared by Gwinnett County Department of Water Resources

DRAWING FOR ILLUSTRATION PURPOSES ONLY

LEGEND:



APPROXIMATE TEST LOCATION

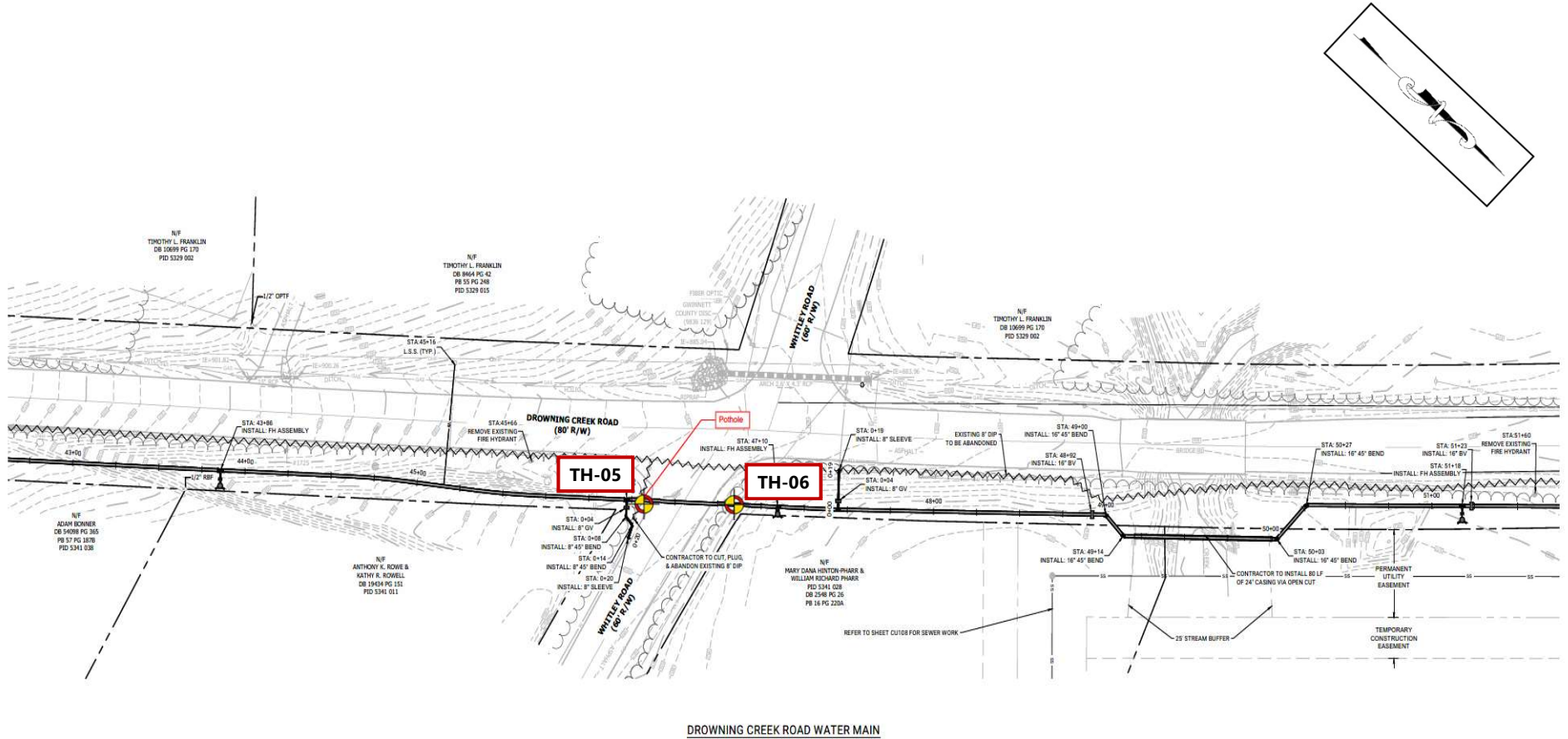
SUE TEST HOLE LOCATION PLAN

DROWNING CREEK ROAD
WATER MAIN IMPROVEMENTS
DACULA, GEORGIA

SCALE:
NOT TO SCALE
DATE:
03-23-2026
PROJECT NUMBER
26800013

FIGURE NO.

1



REFERENCE:
Drowning Creek Road Water Main Improvement Sheet Number CU206, dated 12-30-2025, prepared by Gwinnett County Department of Water Resources

DRAWING FOR ILLUSTRATION PURPOSES ONLY

LEGEND:



APPROXIMATE TEST LOCATION

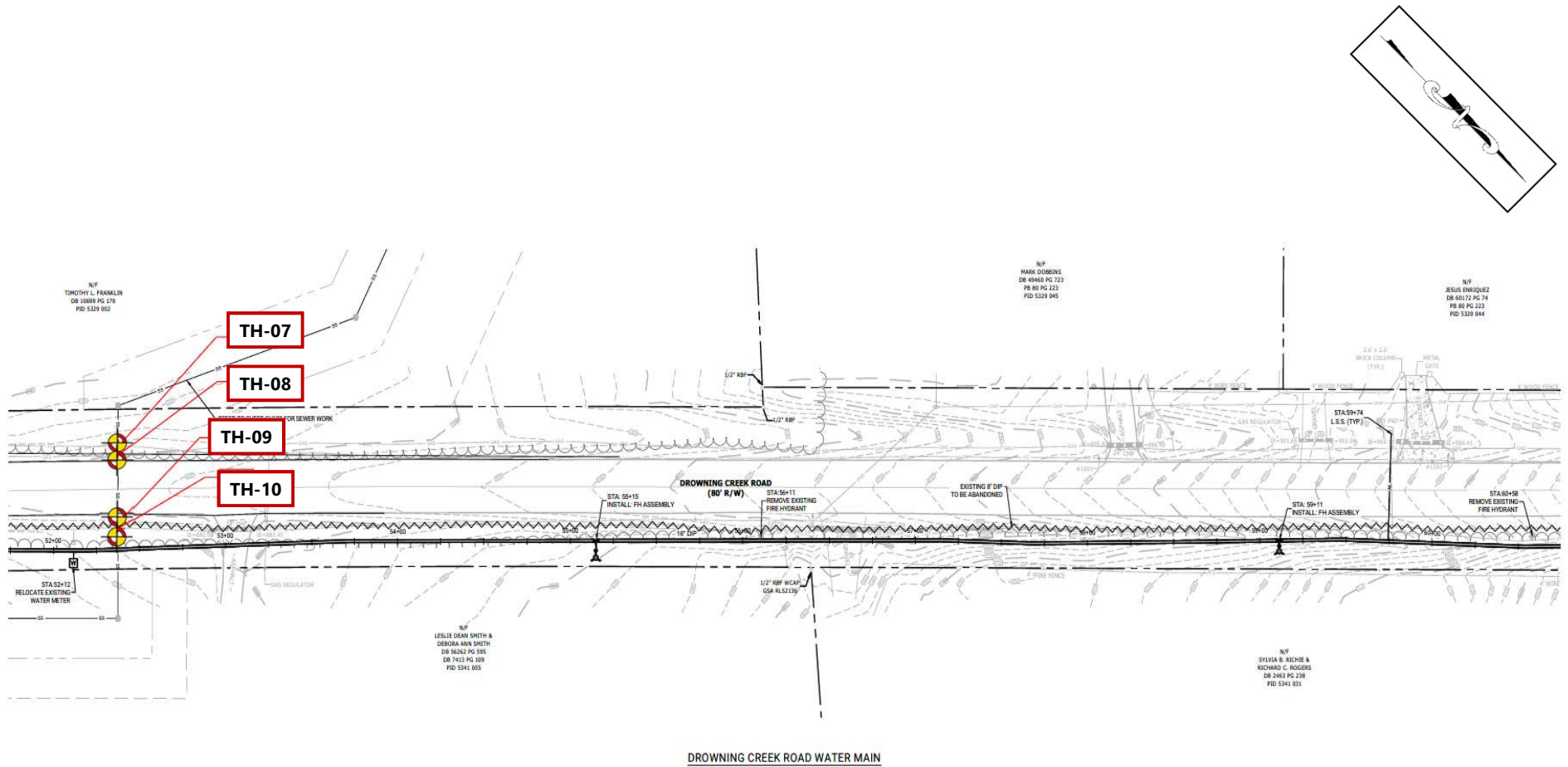
SUE TEST HOLE LOCATION PLAN

DROWNING CREEK ROAD
WATER MAIN IMPROVEMENTS
DACULA, GEORGIA

SCALE:
NOT TO SCALE
DATE:
03-23-2026
PROJECT NUMBER
26800013

FIGURE NO.

2



REFERENCE:
Drowning Creek Road Water Main Improvement Sheet Number CU207, dated 12-30-2025, prepared by Gwinnett County Department of Water Resources

DRAWING FOR ILLUSTRATION PURPOSES ONLY

LEGEND:



APPROXIMATE TEST LOCATION

SUE TEST HOLE LOCATION PLAN

DROWNING CREEK ROAD
WATER MAIN IMPROVEMENTS
DACULA, GEORGIA

SCALE:
NOT TO SCALE
DATE:
03-23-2026
PROJECT NUMBER
26800013

FIGURE NO.

3

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	1		
Requested By:	S&ME	Report Date:	03/02/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Gas	Owner:	Kinder Morgan	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/02/2026	Crew:	RJ, LE, DJ
		Report By:	RJ
Found Utility			
Type:	Gas	Size:	26"
Color:	Black	Condition:	Good
Hub A Depth:	4.56'	Dist. to Center:	2.0'
Hub B Depth:	4.73'	Dist. to Center:	2.0'

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 1 successfully located the targeted 26" steel petroleum pipeline at a depth of 4.65 feet below the top of the set hubs. It should be noted that a minimal amount of overburden soil was removed from the pipeline to preserve the pipeline's protective coating per the request of Kinder Morgan's on-site representative (Cole Spencer).

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	2		
Requested By:	S&ME	Report Date:	03/02/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Communication	Owner:	Lumen (Level 3)	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/02/2026	Crew:	RJ, LE, DJ
		Report By:	RJ
Found Utility			
Type:	Communication	Size:	10" (casing)
Color:	Black	Condition:	Good
Hub A Depth:	4.08'	Dist. to Center:	2.0'
Hub B Depth:	4.08'	Dist. to Center:	2.0'

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 2 successfully located the targeted 10" Level 3 (Lumen) steel casing pipe at 4.08 feet below the top of the set hubs . It is assumed that Level 3's fiber optic cables are contained within the steel casing pipe.

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.:	2026004.01	Test Hole No.:	3		
Requested By:	S&ME	Report Date:	03/02/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Gas	Owner:	Kinder Morgan	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/02/2026	Crew:	RJ, LE, DJ
		Report By:	RJ
Found Utility			
Type:	Gas	Size:	14"
Color:	Black	Condition:	Good
Hub A Depth:	2.91'	Dist. to Center:	2.0'
Hub B Depth:	3.05'	Dist. to Center:	2.0'

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 3 successfully located the targeted 14" steel petroleum pipeline at 2.98 feet below the top of the set hubs. It should be noted that a minimal amount of overburden soil was removed from the pipeline to preserve the pipeline's protective coating per the request of Kinder Morgan's on-site representative (Cole Spencer).

NV5 Field Test Hole Report

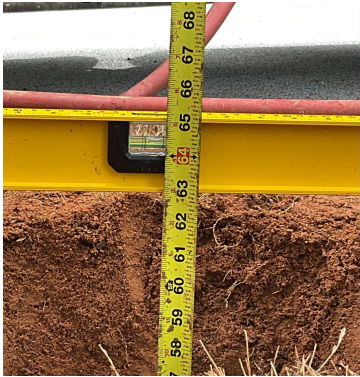
Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	4		
Requested By:	S&ME	Report Date:	02/27/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Water	Owner:	GCDWR	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	02/27/2026	Crew:	RJ, JP
		Report By:	RJ
Found Utility			
Type:	Water	Size:	8"
Color:	Black	Condition:	Good
Hub A Depth:	5.23'	Dist. to Center:	2.0'
Hub B Depth:	5.48'	Dist. to Center:	2.0'
		Material:	Ductile Iron
		Marking Tape:	N/A

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 4 successfully located the targeted 8" DIP water main at 5.36 feet below the top of the set hubs.

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.:	2026004.01	Test Hole No.:	5		
Requested By:	S&ME	Report Date:	02/27/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Water	Owner:	GCDWR	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	02/27/2026	Crew:	RJ, JP
		Report By:	RJ
Found Utility			
Type:	Water	Size:	8"
Color:	Black	Condition:	Good
Hub A Depth:	4.14'	Dist. to Center:	2.0'
Hub B Depth:	4.14'	Dist. to Center:	2.0'
		Material:	Ductile Iron
		Marking Tape:	N/A

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 5 successfully located the targeted 8" DIP water main at 4.14 feet below the top of the set hubs.

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	6		
Requested By:	S&ME	Report Date:	02/27/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Gas	Owner:	City of Buford	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	

Soil Conditions			
Material:	Soil	Condition:	Wet

Test Hole Information			
Date Dug:	02/27/2026	Crew:	RJ, JP
		Report By:	RJ
Found Utility			
Type:	Gas	Size:	4"
Color:	Black	Condition:	Good
Hub A Depth:	5.06'	Dist. to Center:	2.0'
Hub B Depth:	5.06'	Dist. to Center:	2.0'
		Material:	Steel
		Marking Tape:	N/A

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 6 successfully located the targeted 4" steel gas main at 5.06 feet below the top of the set hubs.

NV5 Field Test Hole Report

Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	7		
Requested By:	S&ME	Report Date:	03/04/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Communication	Owner:	Verizon-MCI	Size:		Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	N/A

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/04/2026	Crew:	RJ, JP, LT, DJ
		Report By:	JB
Found Utility			
Type:	Communication	Size:	2.25"
Color:	Orange	Condition:	Good
Hub A Depth:	3.63'	Dist. to Center:	2.0'
Hub B Depth:	3.63'	Dist. to Center:	2.0'

Start Overview		End Overview	
			

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 7 successfully located the targeted Verizon fiber optic in a 2.25" conduit at 3.63 feet below the top of the set hubs.

NV5 Field Test Hole Report

Project Information					
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	8
Requested By:	S&ME	Report Date:	03/04/2026	City:	Dacula
County:	Gwinnett	State:	GA		
Requested Utility					
Type:	Water	Owner:	GCDWR	Size:	
				Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	N/A

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/04/2026	Crew:	RJ, JP, LT, DJ
		Report By:	JB
Found Utility			
Type:	Water	Size:	8"
Color:	Black	Condition:	Good
Hub A Depth:	5.49'	Dist. to Center:	2.0'
Hub B Depth:	5.49'	Dist. to Center:	2.0'
		Material:	Ductile Iron
		Marking Tape:	N/A

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 8 successfully located the targeted 8" DIP water main at 5.49 feet below the top of the set hubs.

NV5 Field Test Hole Report

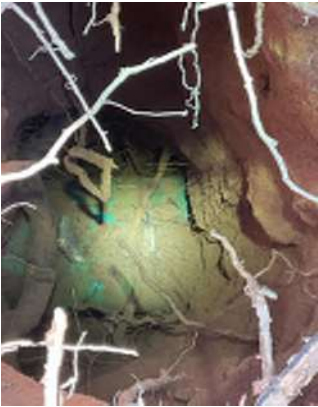
Project Information							
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	9		
Requested By:	S&ME	Report Date:	03/04/2026	City:	Dacula		
County:	Gwinnett	State:	GA				
Requested Utility							
Type:	Gas	Owner:	City of Buford	Size:		Material:	

Pavement Information					
Material:	N/A	Condition:	N/A	Depth:	N/A

Soil Conditions					
Material:	Soil	Condition:	Dry		

Test Hole Information					
Date Dug:	03/04/2026	Crew:	RJ, JP, LT, DJ	Report By:	JB
Found Utility					
Type:	Gas	Size:	10"	Material:	Steel
Color:	Green (wrap)	Condition:	Good	Marking Tape:	N/A
Hub A Depth:	3.88'	Dist. to Center:	2.0'		
Hub B Depth:	3.88'	Dist. to Center:	2.0'		

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 9 successfully located the targeted 10" steel gas main at 3.88 feet below the top of the set hubs.

NV5 Field Test Hole Report

Project Information					
Project Name:	Drowning Creek WM	Project No.	2026004.01	Test Hole No.	10
Requested By:	S&ME	Report Date:	03/04/2026	City:	Dacula
County:	Gwinnett	State:	GA		
Requested Utility					
Type:	Telephone	Owner:	AT&T	Size:	
				Material:	

Pavement Information			
Material:	N/A	Condition:	N/A
		Depth:	N/A

Soil Conditions			
Material:	Soil	Condition:	Dry

Test Hole Information			
Date Dug:	03/04/2026	Crew:	RJ, JP, LT, DJ
		Report By:	JB
Found Utility			
Type:	Telephone	Size:	1" (50 Pair)
Color:	Black	Condition:	Good
Hub A Depth:	2.74'	Dist. to Center:	2.0'
Hub B Depth:	2.74'	Dist. to Center:	2.0'

Start Overview	End Overview
	

Utility	Utility Measure	Utility Invert
		

NV5 Field Test Hole Report

Notes

Test hole TH 10 successfully located the targeted AT&T 50 Pair telephone line at 2.74 feet below the top of the set hubs.

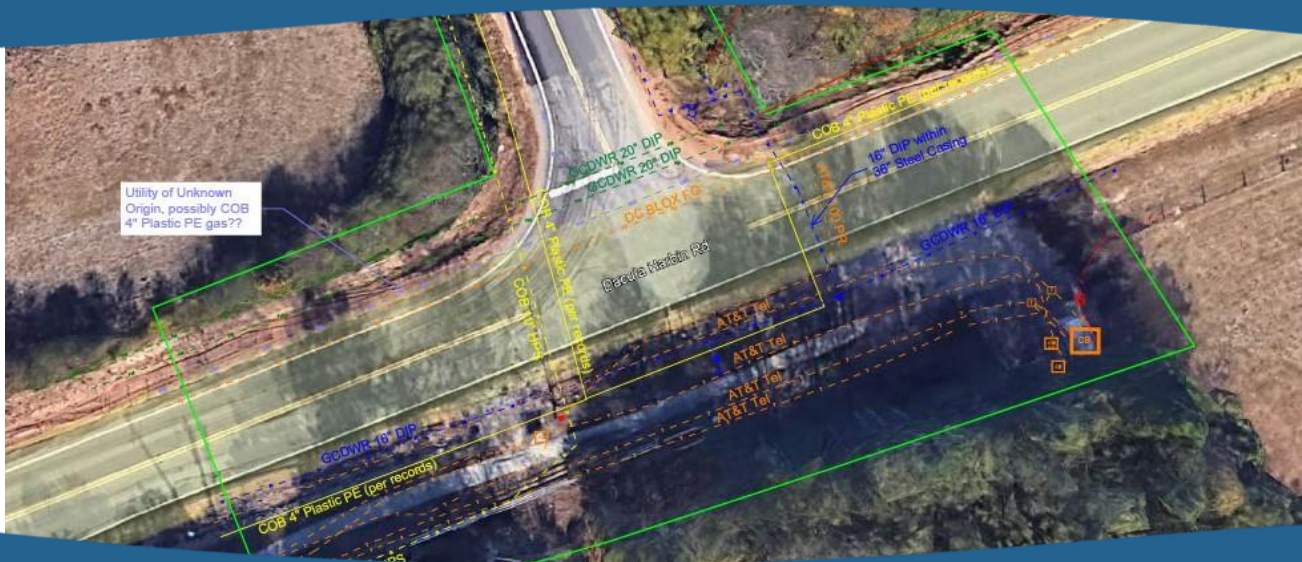
Appendix C

**SUE B – Subsurface Utility
Engineering Quality Level “B”
Survey**

Final SUE Report

Drowning Creek Water Main Replacement Project

October 24, 2025



Submitted To:
ECS Southeast, LLC
1550 North Brown Road, Suite 140
Lawrenceville, GA 30043
770.590.1971

Submitted By:
NV5
10745 Westside Way, Suite 300
Alpharet, GA 30009
678.795.3600



October 24, 2025

Mr. Jimmy Powell, P.E.
Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Via Email: rbarnes@ecslimited.com

RE: Subsurface Utility Engineering Quality Level “B” Survey
Drowning Creek Road Water Main Replacement
Dacula, Gwinnett County, Georgia
NV5 Project Number: 2020270.29
ECS Project # 10:1275

Dear Mr. Powell:

NV5 is pleased to submit this report indicating the results of our Subsurface Utility Engineering (SUE) survey at the Drowning Creek Road Water Main Replacement (WMR) project site. On May 6, 2025, Mr. Robert Barnes, P.E., P. G., with ECS Southeast LLC (ECS), Mr. Jimmy Powell, P.E. with the Gwinnett County Department of Water Resources (GCDWR), and Art Cannington, P.L.S. with Hussey Gay Bell (HGB) met with NV5 Engineers and Consultants (NV5) to request SUE Quality Level “B” (QL-B) services as part of the proposed Drowning Creek WMR project. Following the meeting, Mr. Powell provided NV5 with project site water records titled *Water As-Built - EASTERN REGIONAL INFRASTRUCTURE PROJECT.pdf* and *Water As-Built -FIRST ASSEMBLY OF GOD.tiff*. Subsequently, Mr. Powell provided a copy of the Gwinnett County GIS water and sanitary sewer mapping in the vicinity of the project site, indicating the SUE survey limits circled in red. The limits generally included the Drowning Creek Road corridor between the intersections of Harbins Road and Turkey Crossing (north of S.R. 316).

The scoping meeting requested a SUE QL-B survey to be conducted within the entirety of the project limits as described below:

- Approximately 10,900 linear feet (LF) of SUE QL-B within the existing Right-of-Way (ROW) of Drowning Creek Road from its intersection with Harbins Road to approximately 500 LF north of Turkey Crossing
- Approximately 100 LF along each intersecting side street, which consisted of Harbins Road, McKinley Point Drive, Whitley Road, S.R. 316, and Turkey Crossing

Figure 1 depicts the requested SUE QL-B limits outlined in red on the Gwinnett County GIS mapping.

SUE Utility Quality Levels

The following utility quality level descriptions are based on information gathered from the American Society of Civil Engineers (ASCE) Standard Manual ASCE/UESI/CI 38-22 titled *Standard Guideline for Investigating and Documenting Existing Utilities*. At each quality level the lower quality level(s) are included as part of the scope of that quality level (i.e. Quality Level “B” includes both Quality Level “C” and “D”).

- Quality Level “D” (QL-D)
Information derived from existing records and oral recollection. QL-D records research would include information gathered from multiple sources including but not limited to; the local DOT, county, city, utility owners including their maps and records, one-call notification center, internet or computer database searches including available GIS records, visual site inspection and landowners.
- Quality Level “C” (QL-C)
Information obtained by surveying and plotting visible above-ground utility features and appurtenances of existing subsurface utilities and by using professional judgment in correlating this information to QL-D information. Where discrepancies are identified between the QL-D records and information gathered in the QL-C survey the engineer would determine at what quality level these utilities should be depicted. Additional resolution may result from consultation with utility owners.
- Quality Level “B” (QL-B)
Information obtained through the application and interpretation of appropriate subsurface geophysical methods to determine and mark in the field the existence and approximate horizontal position of subsurface utilities. QL-B information should be reproducible by subsurface geophysics at any point of their depiction. This information is surveyed to applicable tolerances defined by the project and reduced into computer-aided design documents. This information is then correlated to the information gathered in the QL-D and QL-C surveys to identify utilities that may exist but were not able to be designated. Where discrepancies are identified between the QL-D records and information gathered in the QL-B survey the engineer would determine at what quality level these utilities should be depicted. A typical level of accuracy for QL-B is approximately ± 12 inches on both the horizontal axes.
- Quality Level “A” (QL-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. A precise horizontal and vertical location, as well as other utility attributes, is shown on plan documents. Accuracy is typically set to 0.5 inches vertical and to applicable horizontal survey and mapping accuracy as defined or expected by the projectowner. For this project, QL-B SUE services were requested as well as deliverables derived from our QL-D records research activities.

It should be noted that NV5 performed our SUE survey to substantial compliance with ASCE’s QL-B quality level description; however, HGB performed the survey of our SUE data. On September 15, 2025, NV5 received the utility drawing, titled *X_BASE.dwg* drafted by HGB. The drawing substantially portrayed the utilities designated by NV5 during our field investigation with only minor comments noted in our review of the drawings. Our comments were provided to GCDWR and HGB on September 22, 2025. A revised utility drawing titled *25021 – Drowning Creek.dwg* was sent via email from HGB to GCDWR and NV5 that appeared to address our previous comments. Copies of our comments have been attached to this report.

Drowning Creek WMR SUE QL-D

Prior to commencement of our SUE QL-B survey, NV5 conducted Quality Level D (QL-D) utility records research. As part of our QL-D efforts, NV5 submitted a Georgia 811 Design Ticket on May 21, 2025. Ticket number 250521-005243 was generated to determine the utility owners within the vicinity of the project site. Additionally, the project site was visited in an attempt to identify the utilities present and compare our visual site inspection with the utility owners listed on the provided design ticket.

Utility owners present within the project limits were AT&T (ATT), City of Buford GAS (COBG), Comcast (COM), Colonial Pipeline (CPL), DC BLOX (DCB), Georgia Power Company (GPC), Gwinnett County Department of Water Resources (GCDWR), Lumen [LUM (formerly Level 3 and CenturyLink)], Products (SE) Pipeline [PPL (formerly Plantation Pipeline)], Verizon Business [VB (formerly MCI)], and Walton EMC (WEMC) were found within or in close proximity to the site limits. Utility records and drawings provided to NV5 by the responding owners were analyzed and compared against the utilities designated during our SUE QL-B survey. Additionally, the UTLE drawing (Drawing Nos. 24-0001 through 24-0003) from the Drowning Creek Road at Drowning Creek (Project F-1479-01) was reviewed and used to compare our SUE QL-B results around the Drowning Creek crossing. Finally, NV5 compiled a Utility Owner List, which has been included in the Appendix of this report.

Drowning Creek QL-B SUE

Vivax-Metrotech VLoc2-Pro, RadioDetection 8100, and a Heath Consultants Sure-Lock All Pro cable and pipe locators (EM) were used in conjunction with a GSSI UtilityScan 350 and MALA EL Core ground penetrating radar (GPR) units by NV5 to perform our SUE QL-B survey within the referenced project limits. Most utilities were designated with EM; however, GPR was used to designate the twin GCDWR 20-inch diameter sewer force mains along Harbins Road, the water main connectivity at the northeast quadrant of the intersection of Drowning Creek Road and Harbins Road. Additionally, GPR was used to fill gaps in the EM data and perform verifications of the horizontal locates of the utility mains and services provided by the EM locating equipment particularly between Harbins Road and McKinley Point Drive. Finally, GPR was used to “sweep” the site corridor periodically for unknown utilities not encountered with our EM equipment.

The utilities designated by NV5 were represented with a line-dot-line marking style on the ground surface in an attempt to differentiate our markings from existing utility markings created by others. Appropriate colored marking paint, per the American Public Works Association (APWA) color code was used by NV5 throughout our SUE QL-B survey limits. The following utility diameters and material types reported below are based on the QL-D utility records provided to NV5. Utility mains and services field-designated to a QL-B designation standard are depicted on the associated utility sketches with broken, color-coded lines. Utilities that could not be designated to a SUE QL-B standard but shown on the gathered QL-D records have been depicted on our sketches using a solid line style.

Harbins Road at Drowning Creek Road

The requested SUE corridor included the entire ROW of Harbins Road from 100 LF to the west and east of its intersection with Drowning Creek Road.

NV5 designated several ATT telephone and fiber optic cables within the southern ROW of Harbins Road opposite the intersection with Drowning Creek Road. Additionally, an ATT 100 Pair telephone line was designated from its service pole (within the southern ROW) east crossing beneath Harbins Road to the eastern ROW of Drowning Creek Road. Within the northern ROW of Harbins Road, NV5 designated a DBC fiber optic line crossing beneath Drowning Creek Road.

A GCDWR 16-inch diameter ductile iron pipe (DIP) water main was designated by NV5 within the southern ROW of Harbins Road. Finally, a GCDWR 16-inch diameter DIP water main was designated by NV5 from its tap valve (in the southern ROW) crossing beneath Harbins Road to the northeast quadrant of the Harbins Road-Drowning Creek Road intersection. It should be noted that as-built records indicate that the 16-inch DIP water main crosses the roadway within a 36-inch diameter steel carrier casing. Once in the northeast quadrant, the 16-inch DIP water main was designated supplying two valves and a hydrant. North from the hydrant a GCDWR 8-inch diameter DIP water main was designated within the eastern ROW of Drowning Creek Road. Additionally, GPR was used to designate twin GCDWR 20-inch diameter DIP sanitary sewer force mains within the northern ROW of Harbins Road crossing beneath Drowning Creek Road.

A COBG 10-inch diameter high-pressure steel gas main was designated by NV5 within the southern ROW of Harbins Road to the west of Drowning Creek Road. The 10-inch steel gas main was then designated north crossing beneath Harbins Road within the western ROW of Drowning Creek Road. Additionally, COBG records indicate that a 4-inch diameter plastic gas main is situated within the ROW of Harbins Road and that an additional 4-inch diameter plastic gas main taps and services the western ROW of Drowning Creek Road. It should be noted that GPR data indicated a utility of unknown origin within the northern ROW of Harbins Road crossing beneath Drowning Creek Road. It is possible that this unknown is the COBG 4-inch plastic gas main. Furthermore, just north of the roadway intersection, EM and GPR indicated a separate utility of unknown origin along the west edge of asphalt of Drowning Creek Road. It is also possible that this unknown utility is the 4-inch plastic gas main that records indicate is within the western ROW of Drowning Creek Road. The approximate locations of the two (2) 4-inch plastic gas mains are depicted on our utility sketches with a “per records” notation.

Figure 2 depicts the designated utilities at the Harbins Road-Drowning Creek Road intersection portion of the SUE project limits.

McKinley Point Drive at Drowning Creek Road

The requested SUE corridor included the entire ROW of Drowning Creek Road between its intersections with Harbins Road and McKinley Point Drive. Additionally, the project limits included McKinley Point Drive from its intersection with Drowning Creek Road east 100 LF.

NV5 designated an ATT 100 Pair telephone within the eastern ROW of Drowning Creek Road between Harbins Road and McKinley Point Drive. Once the 100 Pair telephone line reaches its service pedestal just south of McKinley Point Drive, a 50 Pair telephone line was designated within the southern ROW of McKinley Point Drive. It should be noted that ATT records indicated two (2) retired-in-place (RIP) telephone lines (25 and 50 Pair) within the western ROW of Drowning Creek Road from just north of Harbins Road to opposite McKinley Point Drive. North of McKinley Point Drive, the RIP 25 Pair telephone terminates leaving only the RIP 50 Pair telephone line that NV5 designated within the western ROW. NV5 designated COM cable television (CATV) within the eastern ROW of Drowning Creek Road from north of Harbins Road to north of McKinley Point Drive.

Additionally, a COM CATV drop was designated from its service pole just south of McKinley Point Drive to the north and east within the southern ROW of McKinley Point Drive. Finally, a second COM CATV drop was designated from a service pole within the western ROW of Drowning Creek Road for a short distance until it reached its service pedestal. Additionally, LUM fiber optic was designated crossing Drowning Creek Road south of McKinley Point Drive. The LUM fiber optic was designated approximately at the centerline of the PPL gas easement.

NV5 designated 14 and 26-inch diameter gas mains within the PPL easement that crosses Drowning Creek Road south of McKinley Point Drive. It should be noted that the referenced LUM fiber optic was designated within the PPL easement at approximately mid-distance between the 14 and 26-inch gas mains.

A GCDWR 8-inch diameter DIP water main was designated by NV5 within the eastern ROW of Drowning Creek Road between Harbins Road and McKinley Point Drive. It should be noted that the 8-inch DIP water main moved further east within the ROW as it crossed the PPL gas easement. GPR data appeared to show that the 8-inch water main crosses above the PPL 14 and 26-inch diameter gas mains (within the easement). Just to the north of the easement, the 8-inch water main drifted northwest into the decel lane of McKinley Point Drive. A second GCDWR 8-inch diameter DIP water main was designated along the northern edge of McKinley Point Drive from its tap valve (off the 8-inch Drowning Creek Road water main). Finally, the 8-inch Drowning Creek water main was designated by NV5 continuing north from McKinley Point Drive.

A COBG 10-inch diameter high-pressure steel gas main was designated by NV5 within the western ROW of Drowning Creek Road between Harbins Road and McKinley Point Drive. The 10-inch steel gas main was then designated north crossing beneath Harbins Road within the western ROW of Drowning Creek Road. It should be noted that a portion of the COBG 4-inch plastic gas main was also designated in the western ROW south of the PPL gas easement. The portion(s) of the 4-inch plastic gas main that could not be designated with EM or GPR by NV5, are depicted on our utility sketches with a “per records” notation. At McKinley Point Drive, a 4-inch diameter plastic gas main was designated crossing beneath Drowning Creek Road to service the southern ROW of McKinley Point Drive.

NV5 designated WEMC, three-phase electric within the northern and southern ROW of McKinley Point Drive to the utilities reached their service poles north and south of McKinley Point Drive. Finally, WEMC secondary electric was designated within the southern ROW of McKinley Point Drive servicing a light pole situated at the southeastern quadrant of the Drowning Creek Road-McKinley Point Drive intersection.

Figures 3 and 4 depict the designated utilities along Drowning Creek Road and Drowning Creek Road’s intersection with McKinley Point Drive portion of the SUE project limits, respectively.

Whitley Road at Drowning Creek Road

The requested SUE corridor included the entire ROW of Drowning Creek Road between its intersections with McKinley Point Drive and Whitley Road. Additionally, the project limits included Whitley Road from its intersection with Drowning Creek Road east and west 100 LF.

NV5 designated a RIP ATT 50 Pair telephone line within the western ROW of Drowning Creek Road between McKinley Point Drive and south of Whitley Road. It should be noted that an RIP 25 Pair telephone line is indicated on ATT records within the eastern ROW of Drowning Creek Road between McKinley Point Drive until it terminates to the south of Whitley Road. Just north of Whitley Road, an active ATT 100 Pair telephone line was designated by NV5 from its service pole situated within the western ROW of Drowning Creek Road crossing beneath Drowning Creek Road to the eastern ROW. The 100 Pair telephone line was then designated south and west within the northern ROW of Whitley

Road and east outside the project limits. NV5 designated twin COM CATV lines within the eastern ROW of Drowning Creek Road from their service pedestal and pad-mount Alpha box north of McKinley Point Drive until reaching the CATV doghouse approximately mid-distance between McKinley Point Drive and Whitley Road. From the doghouse, one (1) COM CATV line was designated continuing north within the eastern ROW of Drowning Creek Road to a termination point just south of Whitley Road. At Whitley Road, NV5 designated an empty VB telecommunications duct run within the southern ROW of Whitley Road west of Drowning Creek Road. The VB duct bank was designated crossing beneath Drowning Creek Road's intersection with Whitley Road to its handhole situated in the northeast quadrant of the intersection. The VB duct bank was then designated north within the eastern ROW of Drowning Creek Road.

A GCDWR 8-inch diameter DIP water main was designated by NV5 within the eastern ROW of Drowning Creek Road between McKinley Point Drive and Whitley Road. A second GCDWR 8-inch diameter DIP water main was designated along the southern edge of Whitley Road to the east from its tap valve (off the 8-inch Drowning Creek Road water main). Additionally, a GCDWR 8-inch DIP water main was designated from its tee just north of Whitley Road crossing beneath Drowning Creek Road to a shut off valve situated within the western ROW of Drowning Creek Road. The water was then designated through its valve across the western segment of Whitley Road until reaching its southern ROW where it was then designated west outside the project limits.

A COBG 10-inch diameter high-pressure steel gas main was designated by NV5 within the western ROW of Drowning Creek Road between McKinley Point Drive and Whitley Road. At Whitley Road, a 4-inch diameter steel gas main was designated from its tap valve just north of Whitley Road crossing beneath Drowning Creek Road until reaching the northern ROW of Whitley Road where it was designated east outside the project limits. It should be noted that the 4-inch plastic gas main that was indicated in the western ROW of Drowning Creek Road terminates between McKinley Point Drive and Whitley Road according to COBG's records. This 4-inch plastic gas main could not be designated with EM or GPR by NV5 between the two referenced roadway intersections. The 4-inch plastic gas main is depicted on our utility sketches with a "per records" notation.

NV5 designated WEMC, electric drops for the residences within the eastern and western ROW of Drowning Creek Road from their service poles between McKinley Point Drive and to the south of Whitley Road.

Figures 5 through 8 depict the designated utilities along Drowning Creek Road between McKinley Point Drive and Whitley Road and Figure 9 depicts the utilities designated within the vicinity of the Drowning Creek Road-Whitley Road intersection.

S.R. 316 at Drowning Creek Road

The requested SUE corridor included the entire ROW of Drowning Creek Road between its intersections with Whitley Road and S.R.316. Additionally, the project limits included the southern and northern ROW of S.R. 316 from its intersection with Drowning Creek Road east and west 100 LF.

NV5 designated an active ATT 50 Pair telephone line within the western ROW of Drowning Creek Road from its service pole drop situated just north of Drowning Creek through a series of service pedestals until its termination at the first residence south of S.R. 316. NV5 designated an empty VB conduit run within the eastern ROW of Drowning Creek Road from its handhole at Whitley Road north through a series of handholes until it reached its apparent termination hand hole approximately opposite of the Grace Pointe Community Church. The VB records indicated that the conduit run continued north from this hand hole across S.R. 316; however, NV5 did not observe the conduits exiting this hand hole further north (towards S.R. 316). It is possible that this section of VB conduit is proposed to unite the empty conduit run with the newly installed VB facilities to support the Rowan development. Along the northern ROW of S.R. 316, NV5 designated a trio of Gwinnett County Department of Transportation

(GCDOT) fiber optic cables crossing beneath Drowning Creek Road between their associated hand holes, which are situated to the east and west of Drowning Creek Road.

A GCDWR 8-inch diameter DIP water main was designated by NV5 within the eastern ROW of Drowning Creek Road between Whitley Road and S.R. 316. The 8-inch water main was designated drifting northeast as it approached Drowning Creek and then was designated turning north crossing the creek before it was designated drifting northeast until reaching its route within the eastern ROW north leaving the area of Drowning Creek. The 8-inch DIP water main was then designated until reaching its termination opposite the Grace Pointe Community Church. It should be noted, at its termination point, a 1-inch diameter water service was designated to supply the final residential water meter (along the east side of Drowning Creek Road) south of S.R. 316. It is believed that the residences along the west side of Drowning Creek Road situated between the church and S.R. 316 are supplied by wells.

A COBG 10-inch diameter high-pressure steel gas main was designated by NV5 within the western ROW of Drowning Creek Road between Whitley Road and S.R. 316. At S.R. 316, the gas main was marked on the southern and northern edge of pavement. No markings were painted between these two points due to safety considerations.

NV5 designated WEMC three phase electric within the western ROW of Drowning Creek Road for the Grace Pointe Community Church. The electric was designated from its service pole south (within the western ROW) until reaching the northern shoulder of its entrance driveway where it turned west towards the church.

Figures 10 through 18 depict the designated utilities along Drowning Creek Road between Whitley Road and S.R. 316.

Turkey Crossing/New Roundabout at Drowning Creek Road

The requested SUE corridor included the entire ROW of Drowning Creek Road between its intersections with S.R.316 to the north of Turkey Crossing. Our SUE limits were extended to include the reconstruction of Drowning Creek Road to near its newly constructed roundabout (that supports the proposed Rowan development).

NV5 designated recently installed VB fiber optic facilities within the eastern and western ROW of Drowning Creek Road through series' of handholes from their termination points just north of S.R. 316 to the vicinity of the new roundabout.

A GCDWR 16-inch diameter DIP water main was designated by NV5 from its southern termination point within the western ROW of Drowning Creek Road around the southern ROW of the roundabout. An additional GCDWR 16-inch DIP water main was designated from its tap valve tee with the referenced 16-inch water main generally towards the center of the roundabout and outside the eastern survey limits.

A COBG 10-inch diameter high-pressure steel gas main was designated by NV5 within the western ROW of Drowning Creek Road between S.R. 316 and the former Turkey Crossing. At this point, the RIP section of 10-inch steel gas main was designated northwest, and a recently relocated portion of COBG 10-inch steel gas was designated east then north within the western ROW of reconstructed Drowning Creek Road. Approaching the roundabout, the 10-inch steel gas main was designated to turn northwest where it crossed beneath the newly constructed Drowning Creek Road just west of the new roundabout. Once it crossed Drowning Creek Road, the gas main was designated until it reached its termination tee with the gas main along the southern ROW of Lawrence Road. The gas main along the southern ROW of Lawrence Road was also designated approximately 100 LF to the east and west of the gas tee.

NV5 designated CPL 36 and 40-inch diameter high-pressure steel gas transmission mains within the CPL easement. The easement (and pipelines) cross Drowning Creek Road just to the south of Turkey Crossing.

GPC was actively installing roadway lighting for the newly constructed Drowning Creek Road. NV5 designated two (2) GPC secondary electric lines associated with the lighting just to the southeast of Turkey Crossing. NV5 anticipates additional electric will be installed following our SUE survey.

Figures 19 through 21 depict the designated utilities along Drowning Creek Road between S.R. 316 and Drowning Creek Road's newly constructed roundabout to the north of Turkey Creek.

NV5 created the referenced, digital utility sketches in the field using tablets. Our draft sketch sheets were provided via email to HGB and ECS in batches. Our finalized sketch sheets were provided on August 25, 2025, to HGB and GCDWR. Please note that HGB performed the survey of the data collected during our QL-B SUE survey and created the utility drawing on behalf of GCDWR. The utility drawing was reviewed by NV5, and our resulting comments were sent to HGB and GCDWR on September 22, 2025, with a revised utility drawing sent to GCDWR by HGB later that same day.

It has been a pleasure working with you on this project. If you have any questions, or if we can be of further assistance, please feel free to contact us at your convenience.

Sincerely,
NV5



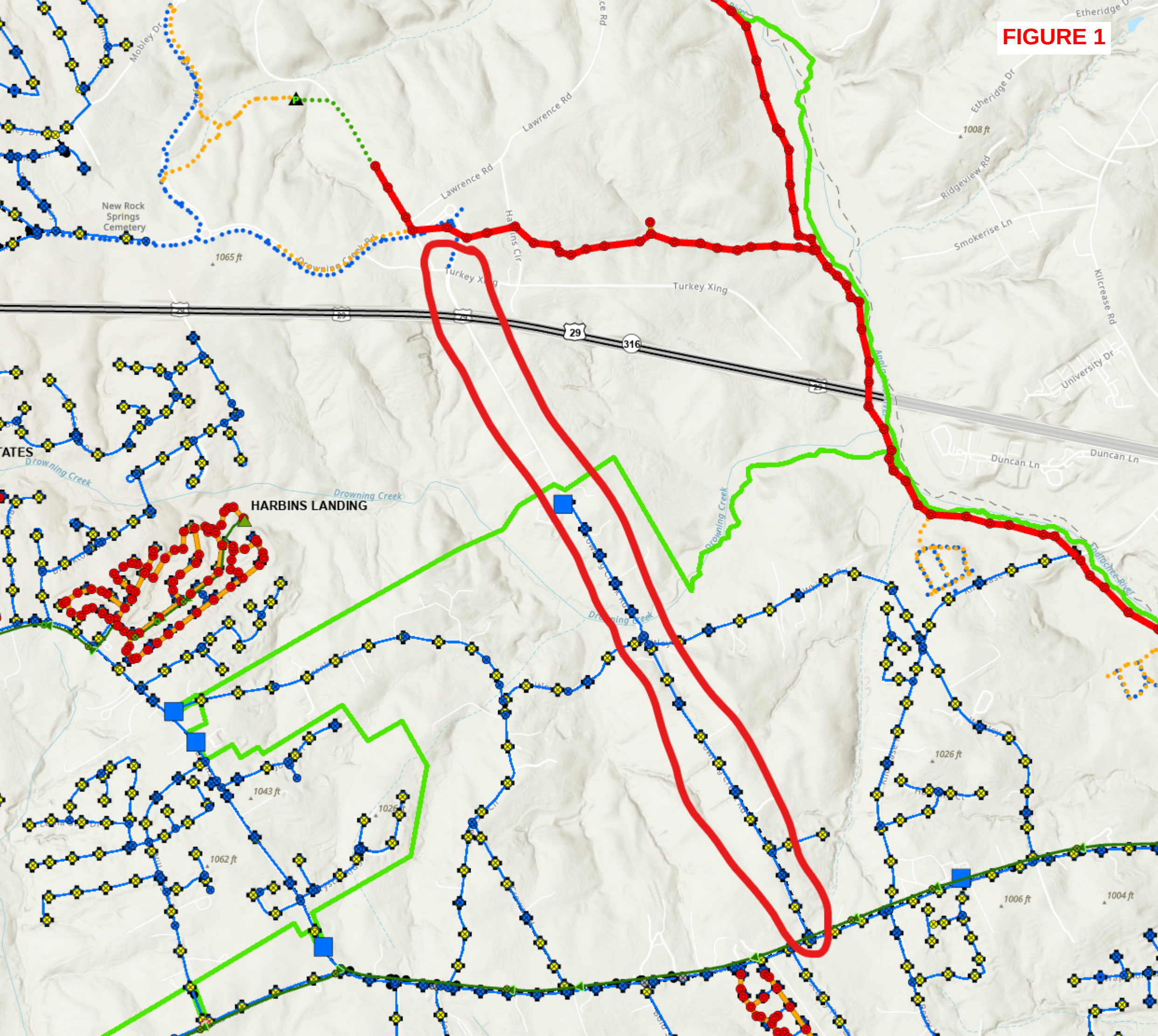
Jonathan Pera, PG
Utility Services Group Manager

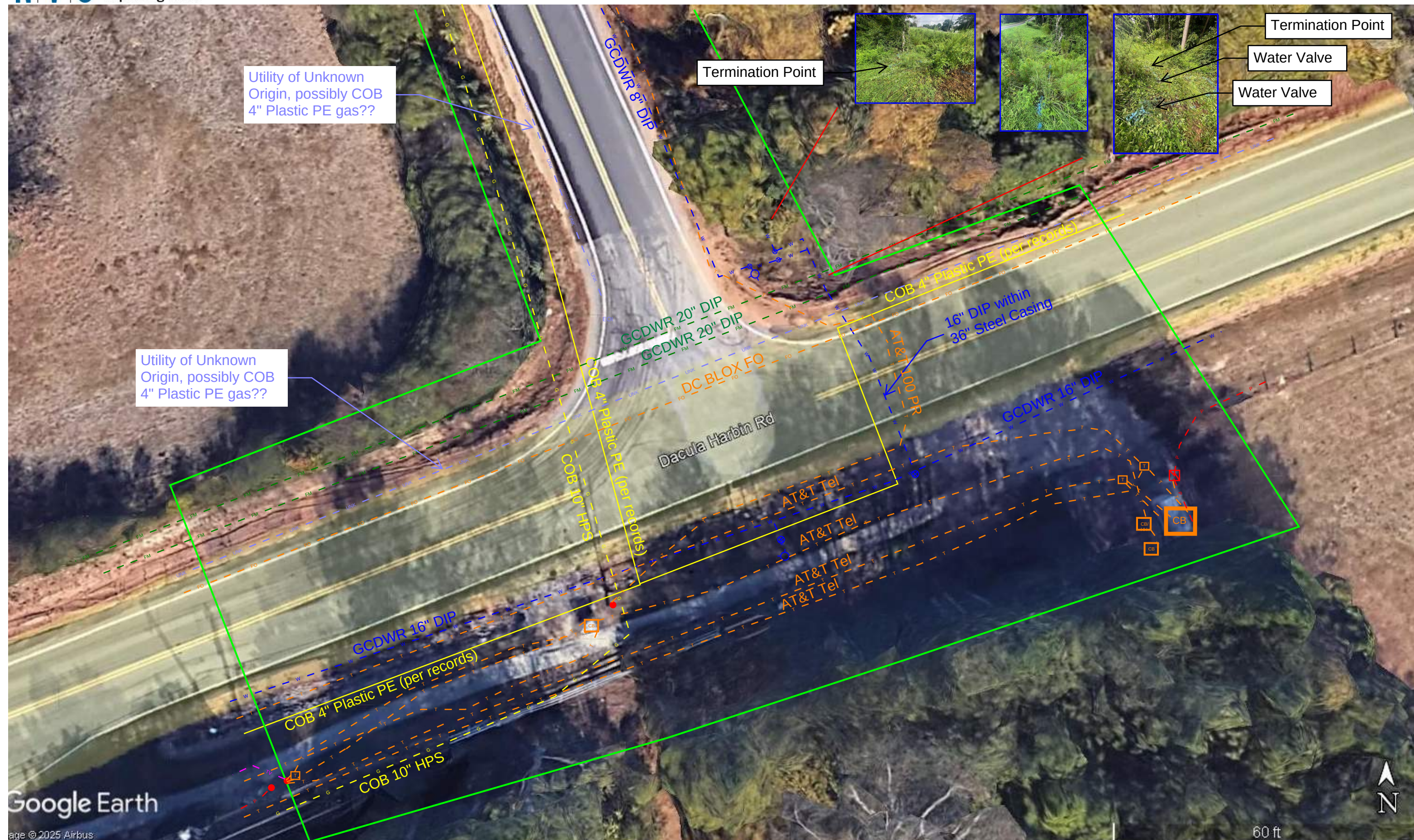


Dan Adkins
Utility Services Program Manager

APPENDIX

FIGURE 1



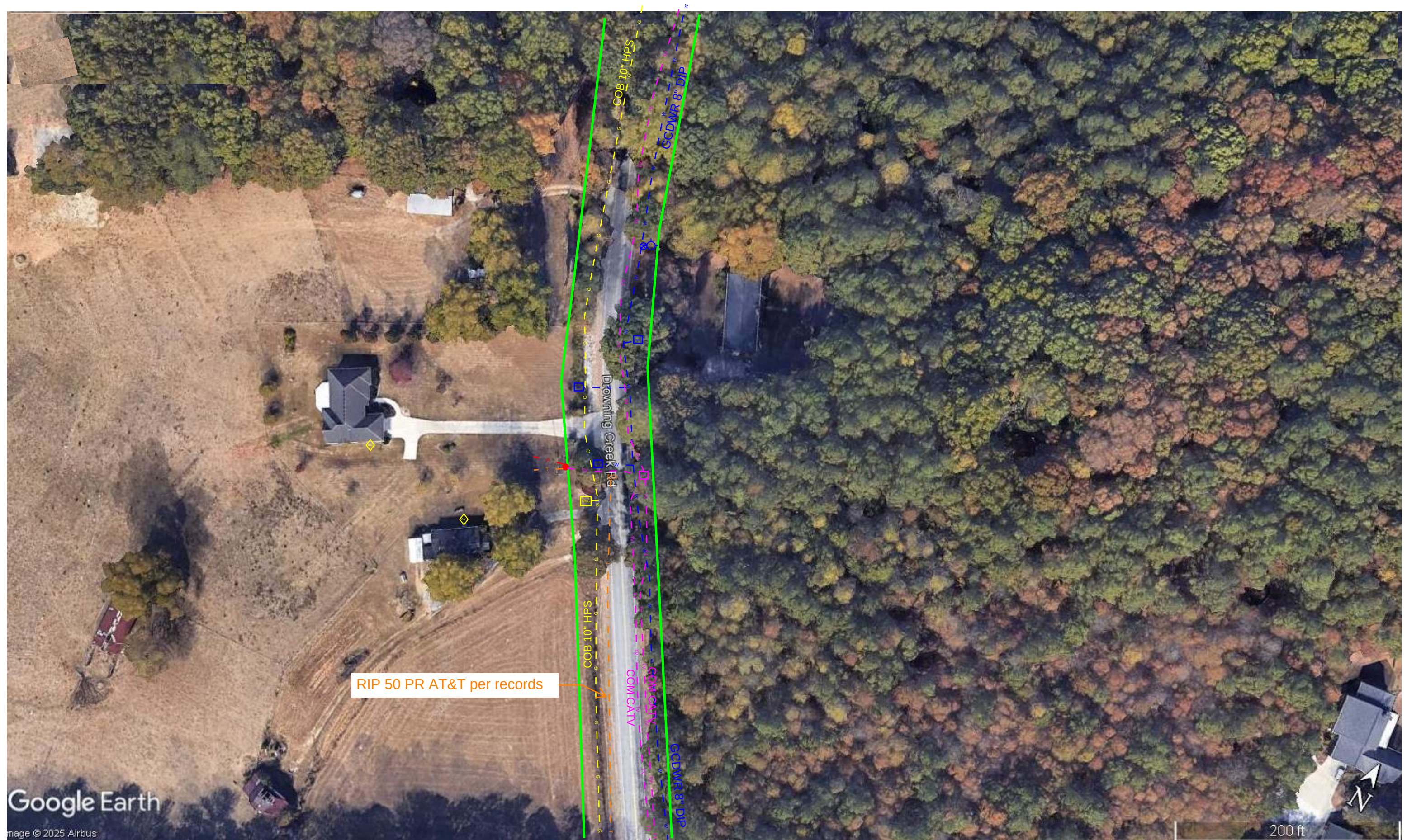


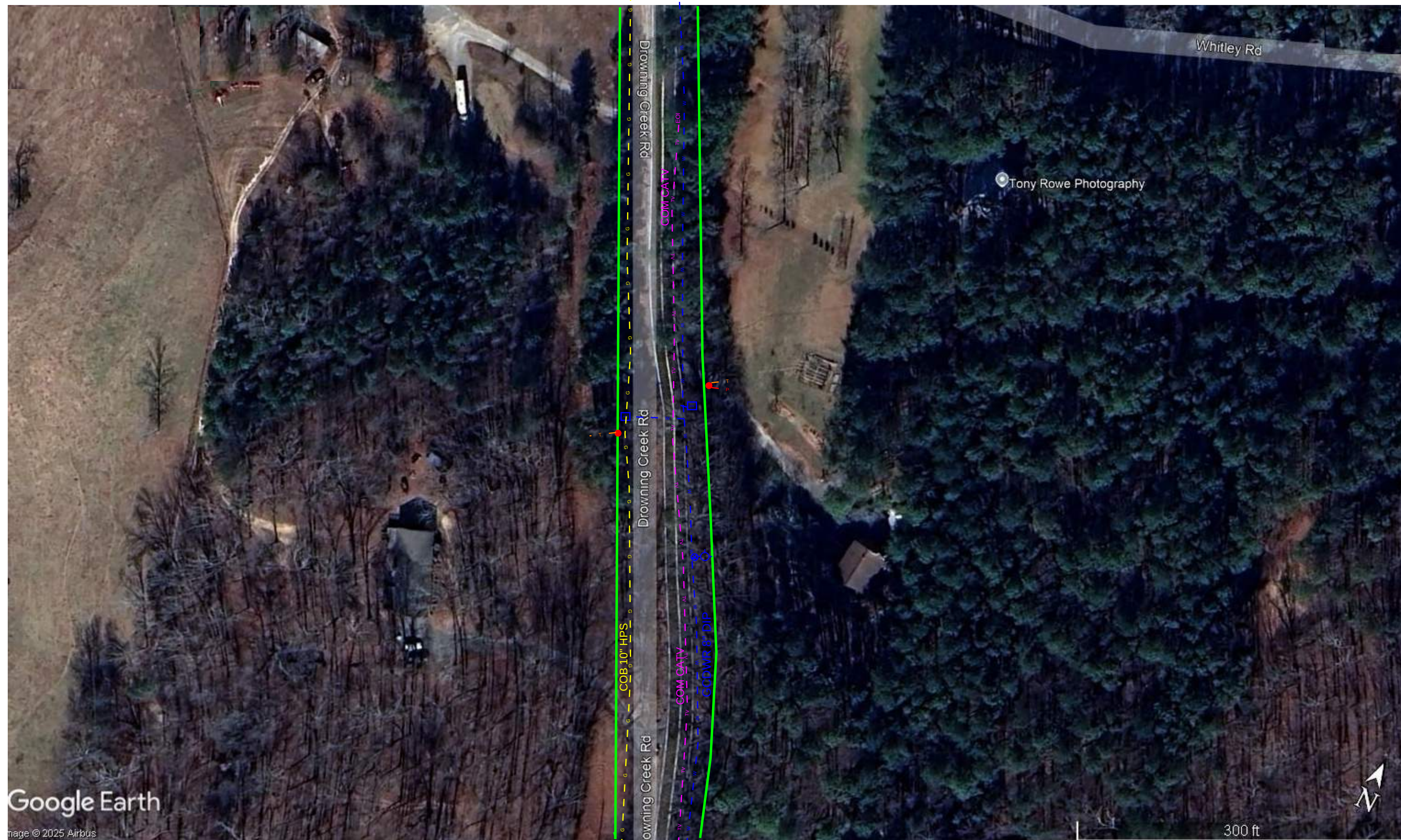




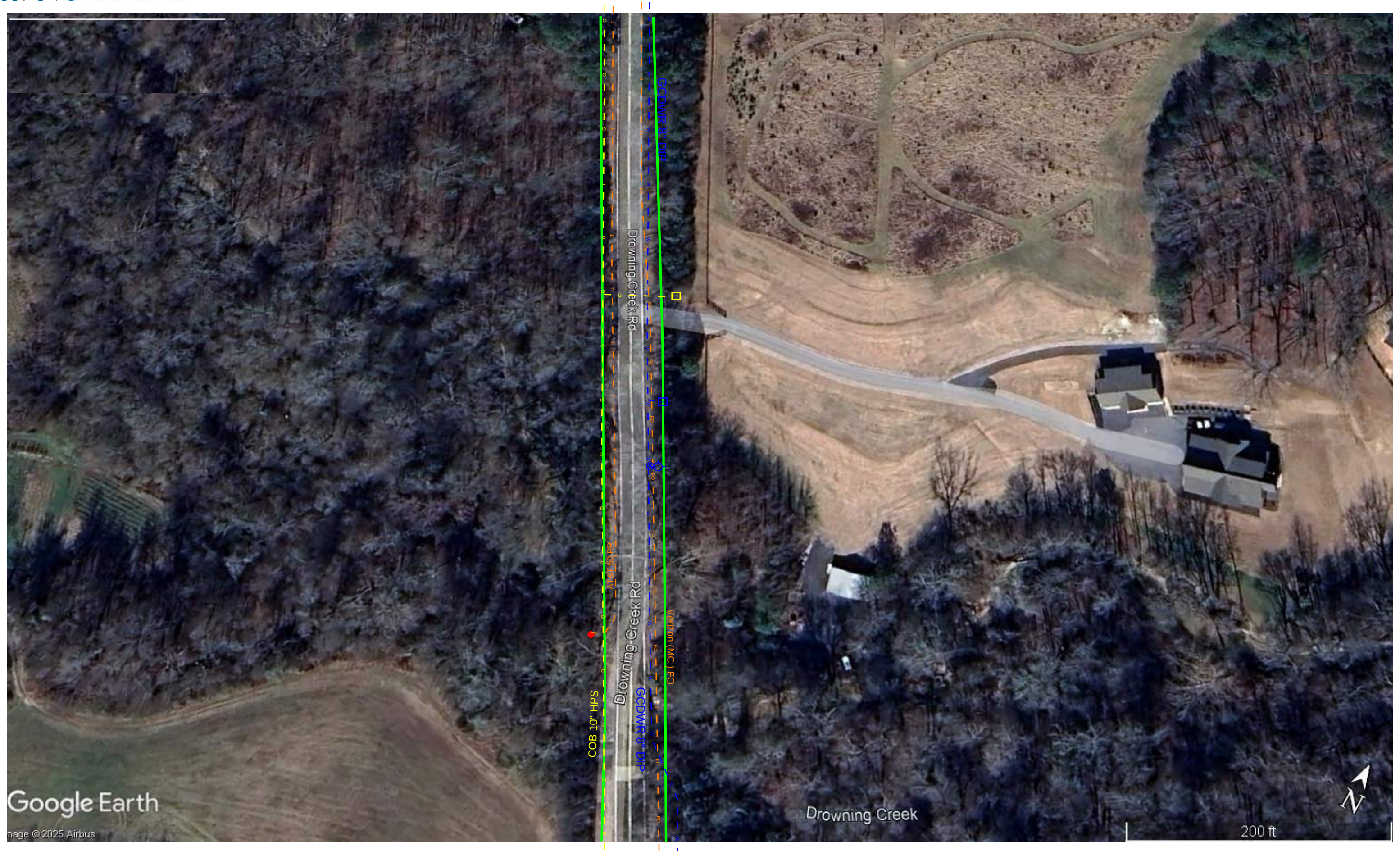


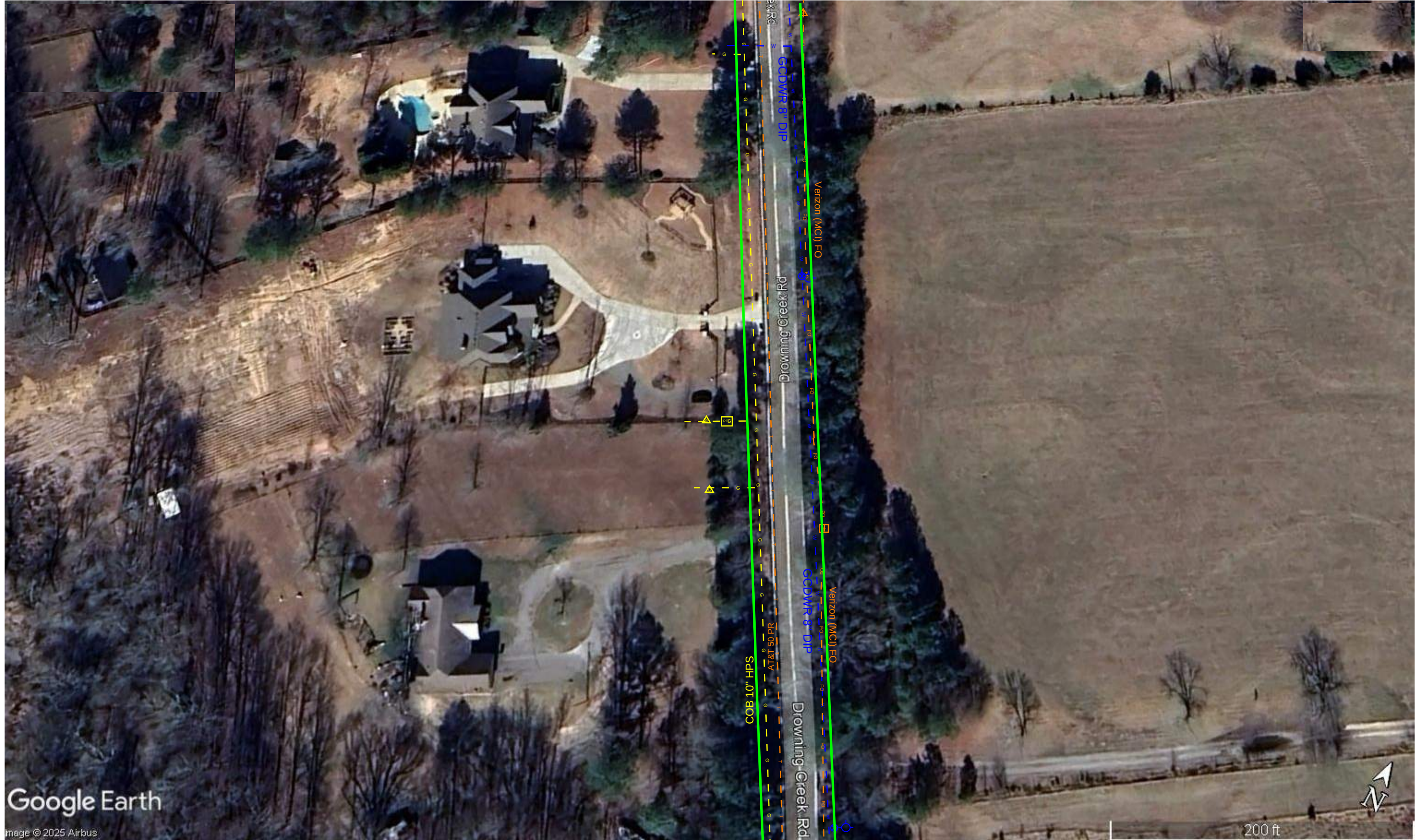






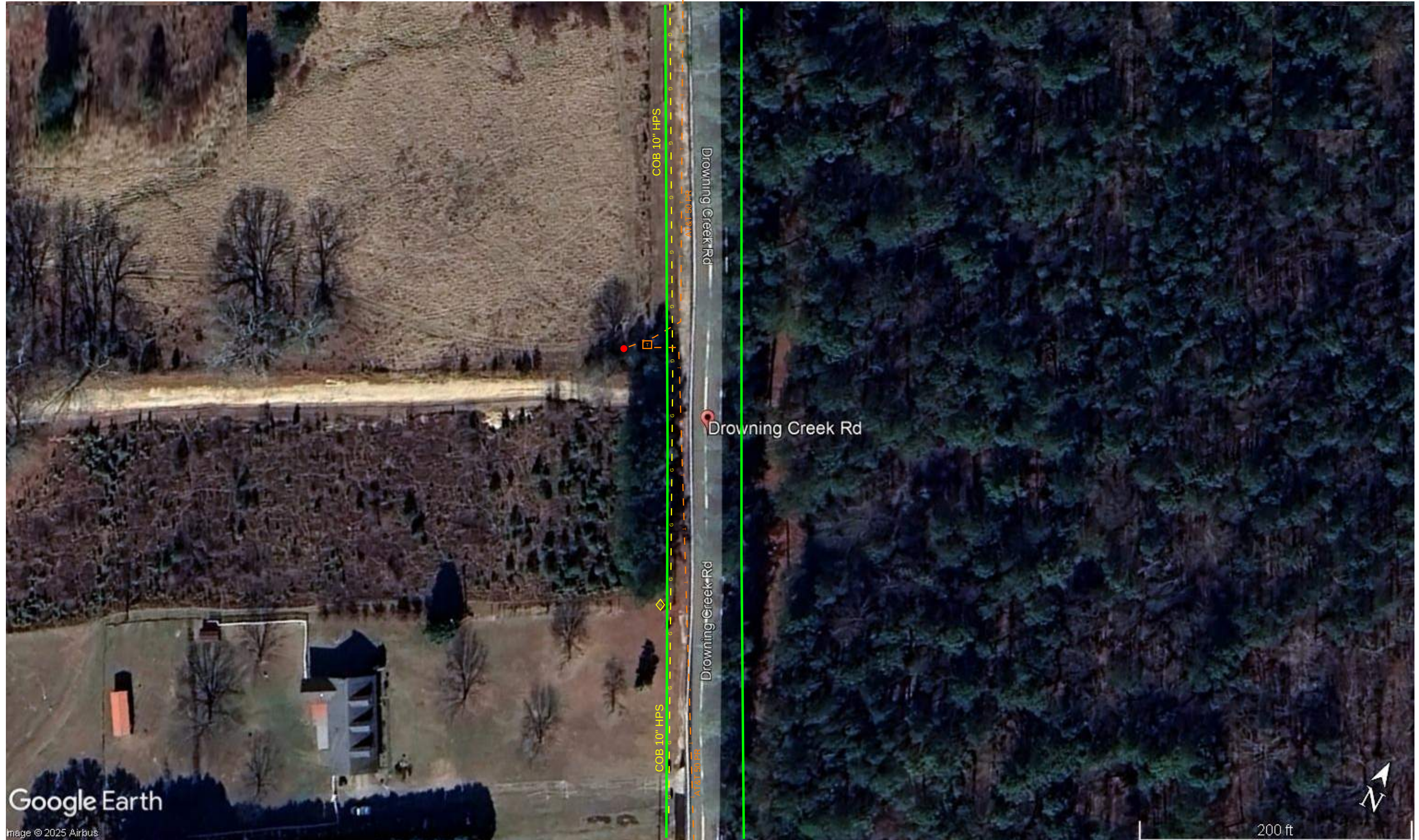






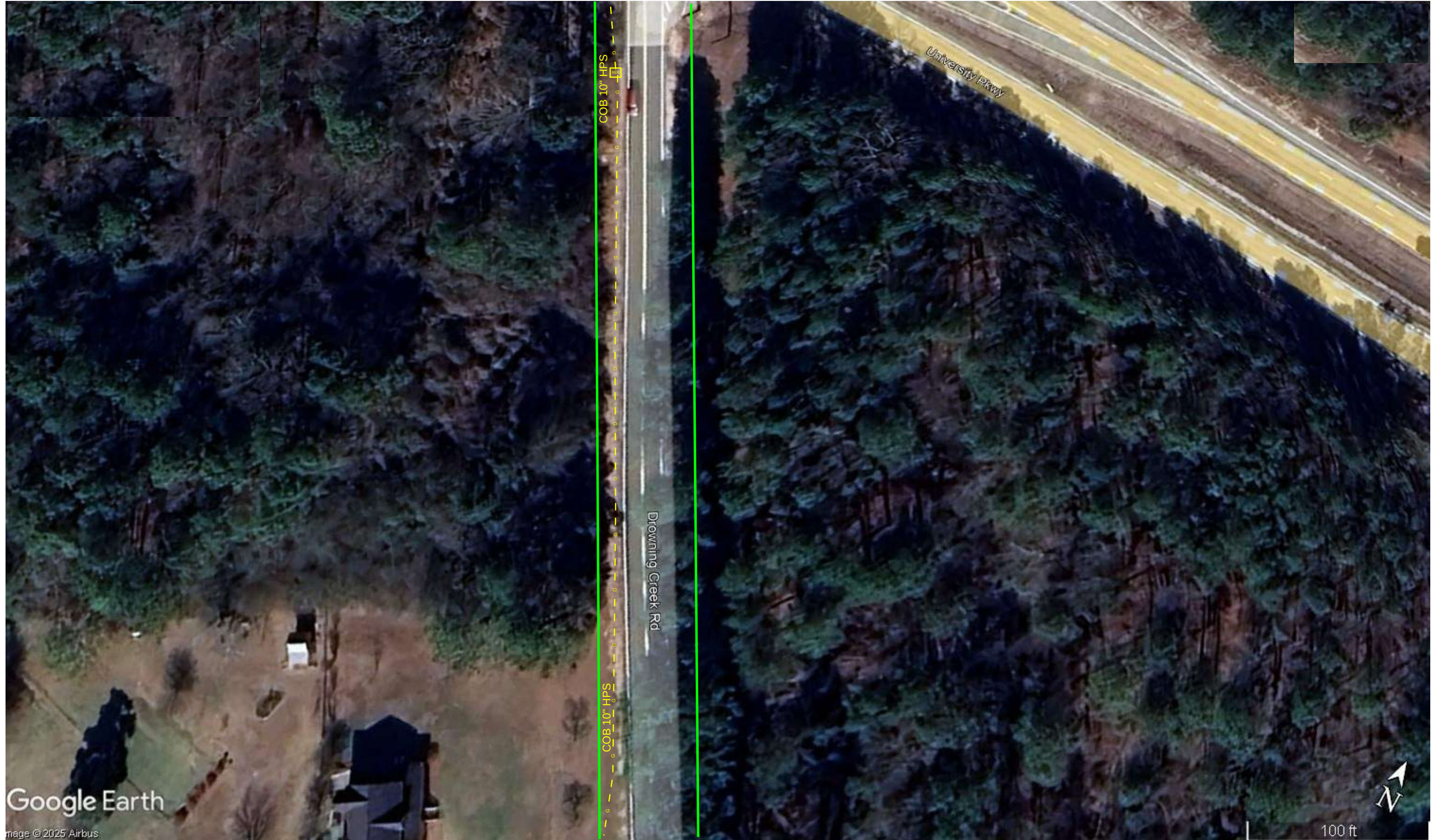


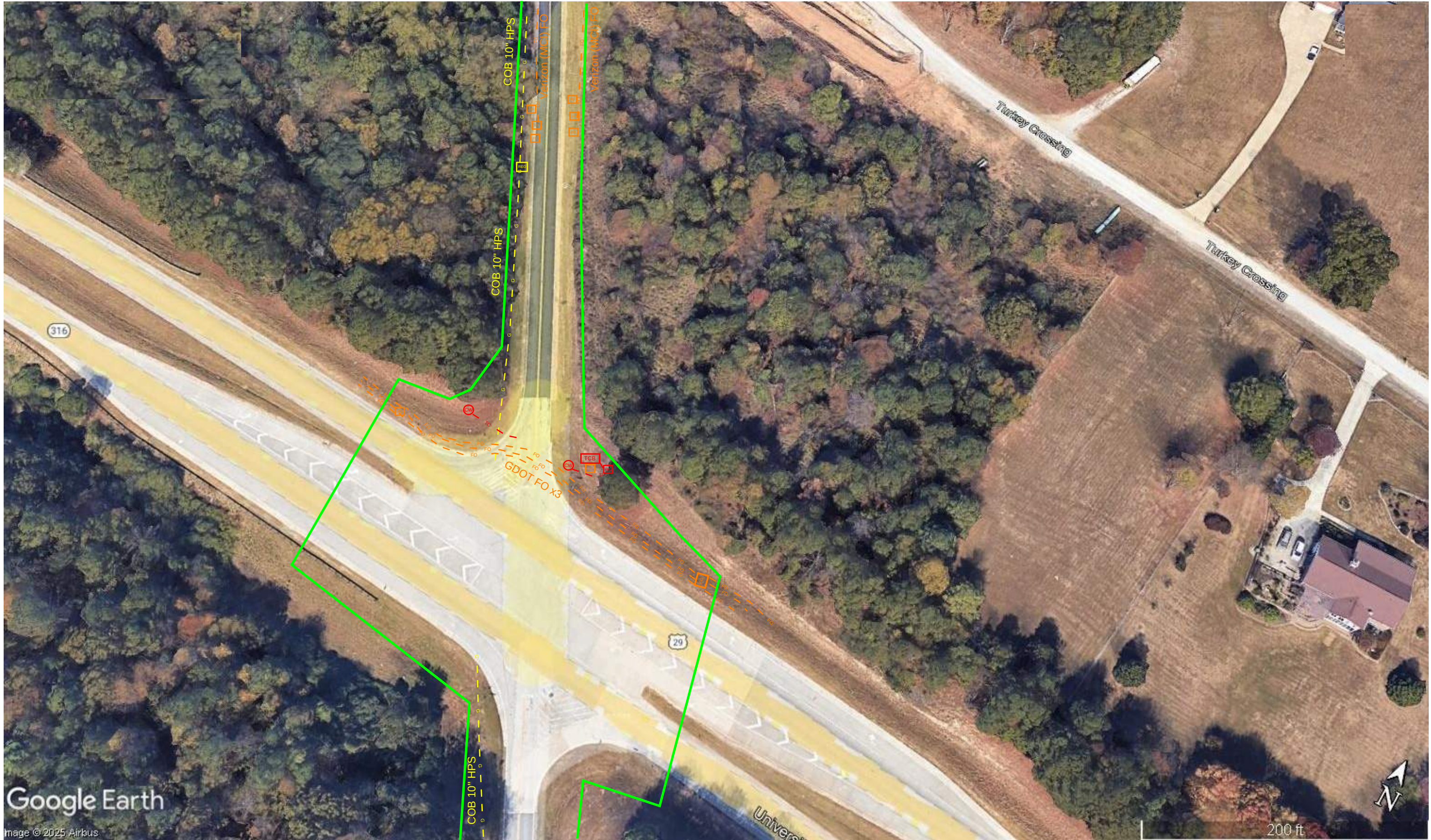


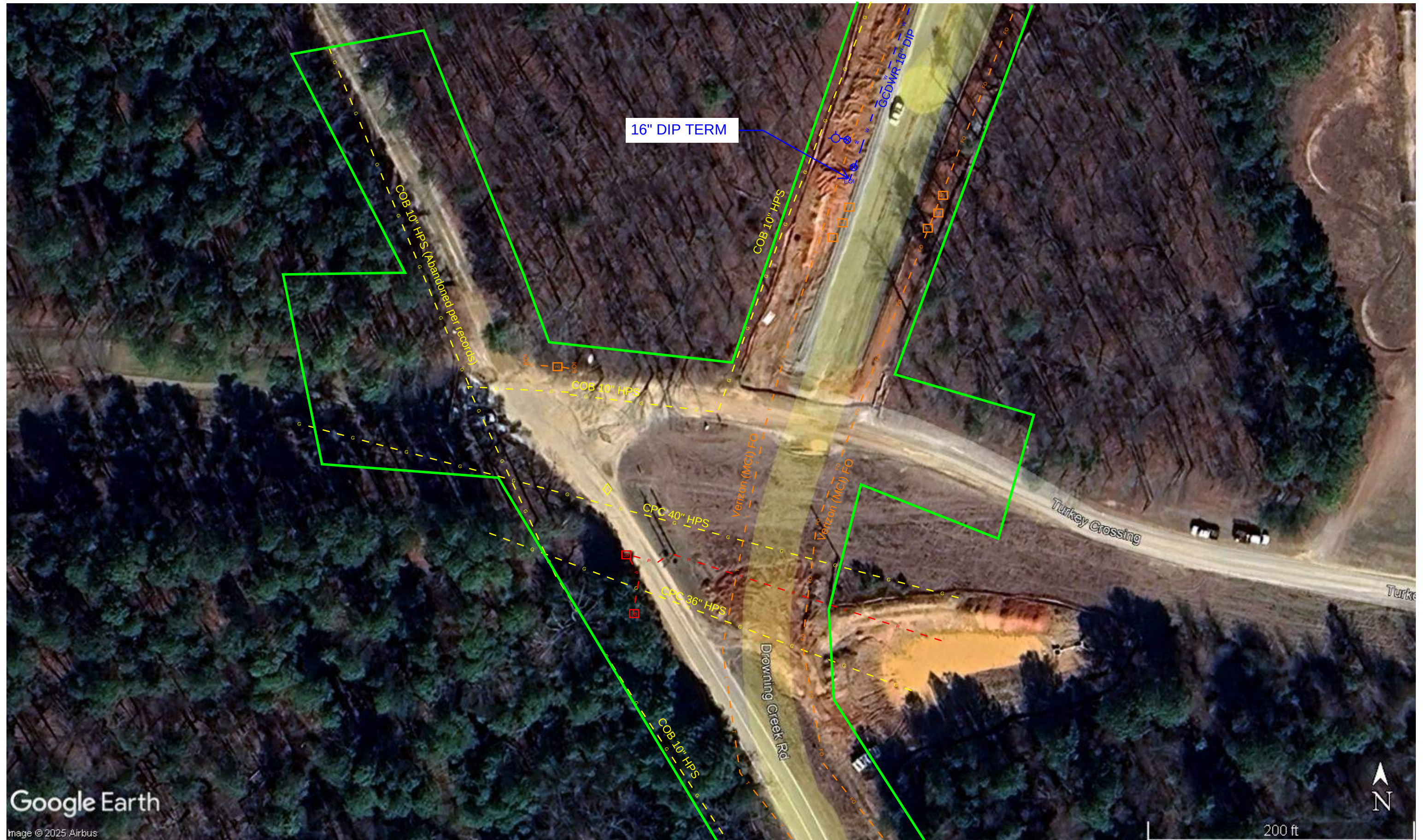


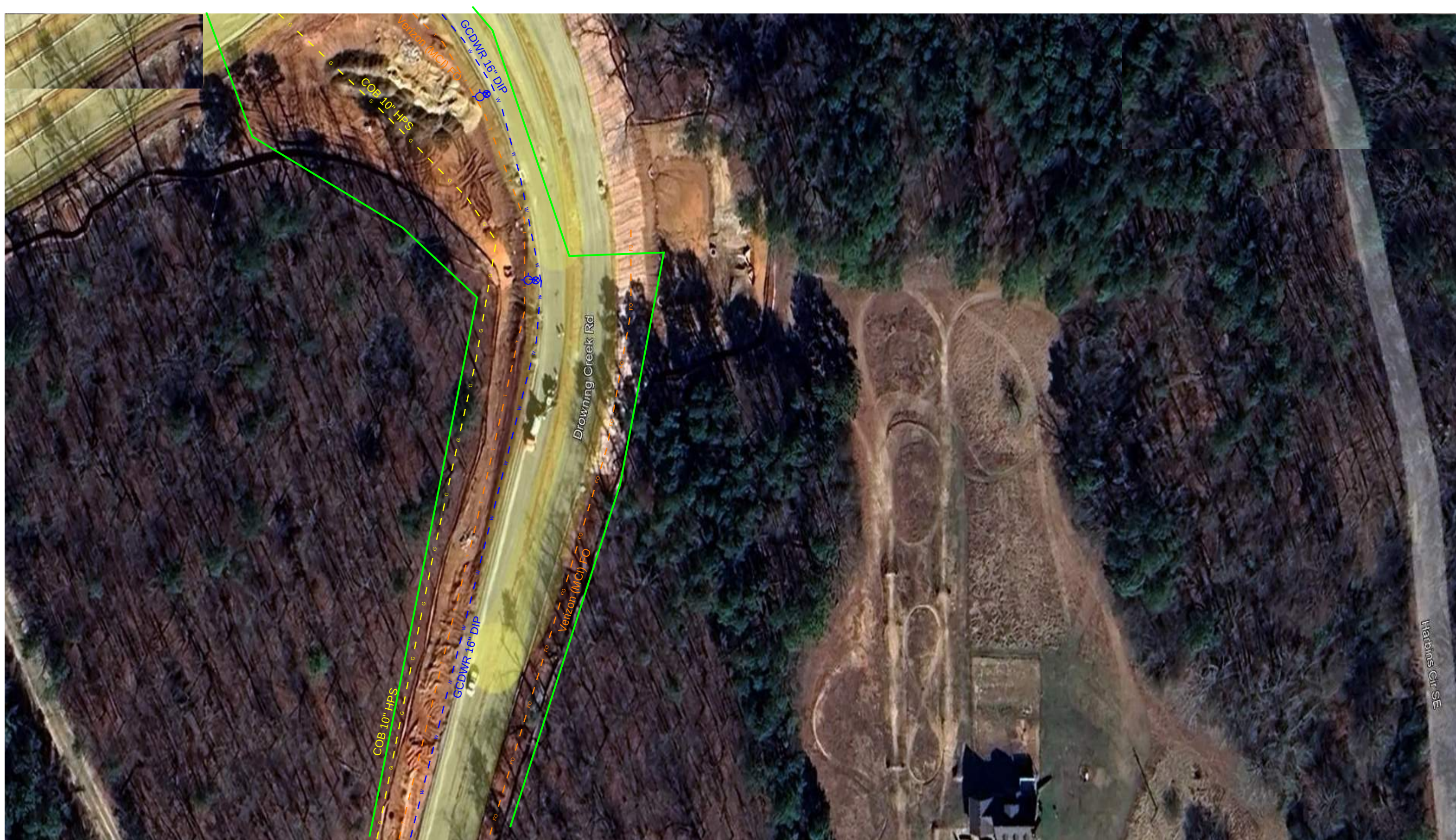


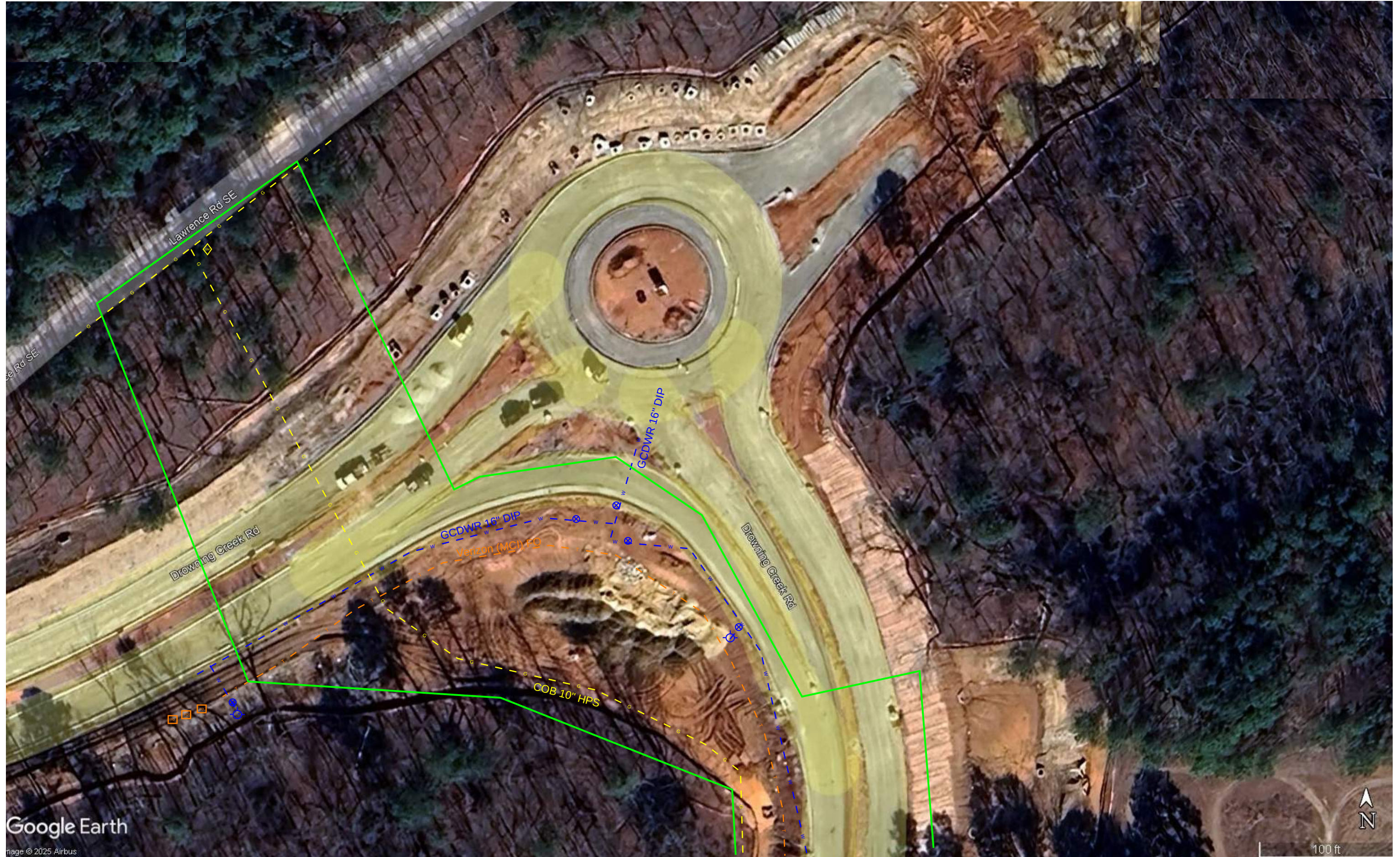












Drowning Creek WMR Project

Utility Owner List 9/22/2025

Georgia 811 Design Ticket No. 250521-005243

Gas

City of Buford Gas (COBG)

Jason Higgins

Tel. No.: 770.932.7981

Email: jhiggins@cityofbuford.com

Note: Utility Owner was contacted and verified that there are COBG gas facilities serving the length of the Drowning Creek Road corridor. All natural gas distribution is COBG unless otherwise noted.

Colonial Pipeline (CPL)

Jerrold Dewberry, Right of Way Inspector

3120 Parrot Avenue NW

Atlanta, GA 30318

Tel. No.: 470.989.1184

Email: jdewberry@colpipe.com

Note: The Utility Owner's Asset Map was reviewed, and CPL maintains a gas easement containing 36 and 40-inch diameter transmission gas mains, crossing the Drowning Creek Road corridor north of S.R. 316.

Products (SE) Pipeline (PPL)

Blair Northern, P.E.

Tel. No.: 770.330.1696

Email: blair_northern@kindermorgan.com

Note: A representative with Kinder Morgan discussed their assets verbally with NV5 but could not provide a drawing. The representative informed NV5 that PPL maintains a gas easement with 14 and 26-inch diameter gas transmission mains that crosses the Drowning Creek Road corridor between McKinley Point Drive and Harbins Road. Furthermore, he informed NV5 that a Lumen (LUM) fiber optic cable crosses Drowning Creek Road between the two PPL gas mains.

Telecommunications

AT&T (ATT)

Access - Construction and Engineering

David Feeney, Sr. Specialist OSP Engineer Design

7264 Industrial Boulevard

Covington, GA 30014

Tel. No.: 404.823.8076

Email: df5867@att.com

Note: Utility Owner was contacted and verified that there are aerial and underground ATT facilities serving the length of the Drowning Creek corridor. All telephone is ATT unless otherwise noted.

Comcast (COM)

Joseph Brown, Jr.

1707 Lewis Way

Stone Mountain, GA 30083

Tel. No.: 770.559.6511

Email: joseph_brownjr@comcast.com

Note: Utility Owner was contacted and verified that there are aerial and underground COM facilities serving the Drowning Creek Road corridor. All CATV is COM unless otherwise noted.

DC BLOX (DCB)

1040 Crown Pointe Parkway, Suite 800

Atlanta, GA 30338

Tel. No.: 877.590.1684

Note: NV5 does not maintain a contact for DCB; however, their fiber optic map was provided from our submitted GA 811 Design Ticket. Mapping indicates that DCB maintains a dark fiber optic cable within the north ROW of Harbins Road.

Lumen (LUM)

Lumen Intake Team

Email: relocations@lumen.com

Note: Utility Owner was contacted by NV5 via the provided relocations@lumen.com address, but no response has been provided as of 9/22/25. However, a drawing was received from our submitted GA 811 Design Ticket. The drawing and our conversation with PPL's representative indicated that LUM fiber optic crosses the Drowning Creek Road corridor between PPL's 14 and 16-inch gas pipelines within PPI's easement. LUM mapping does not indicate additional LUM fiber optic within the project limits.

Verizon [VB (formerly MCI)]

Ash Belavadi, Sr. Engineering Specialist, OSP

Tel. No.: 678.259.5284

Email: ash.belavadi@verizon.com

Email: investigations@verizon.com

Note: Utility Owner was contacted by NV5, but no response has been provided from the investigations@verizon.com address. A previous contact, Ash Belavadi, will be the VB contact for this project. A VB drawing was received from our submitted GA 811 Design Ticket. The mapping indicates that VB maintains fiber optic along Whitely Road and then north along Drowning Creek Road. It should be noted that recent VB equipment and fiber optic is being installed north of S.R. 316 associated with the Rowan development.

Water and Sewer

Gwinnett County Department of Water Resources (GCDWR)

Jimmy Powell

684 Winder Highway

Lawrenceville, GA 30045

Tel. No.: 678.376.7159

Email: jimmy.powell@gwinnettcountry.com

Note: Utility Owner is the GCDWR project manager and provided initial GIS and available as-built mapping to ECS for this project. All water and sewer is GCDWR unless otherwise noted.

Power

Georgia Power Company-Distribution (GPC)

Sara Sullivan

GIS Technician, Sr.

Centralized Engineering Services

Email: sasull@southernco.com

Note: Utility Owner was contacted and verified that there are aerial and underground GPC facilities serving the Drowning Creek corridor from approximately mid-distance between Drowning Creek and S.R. 316 (where WEMC's service area begins) through the north extent of the project limits.

Walton EMC (WEMC)

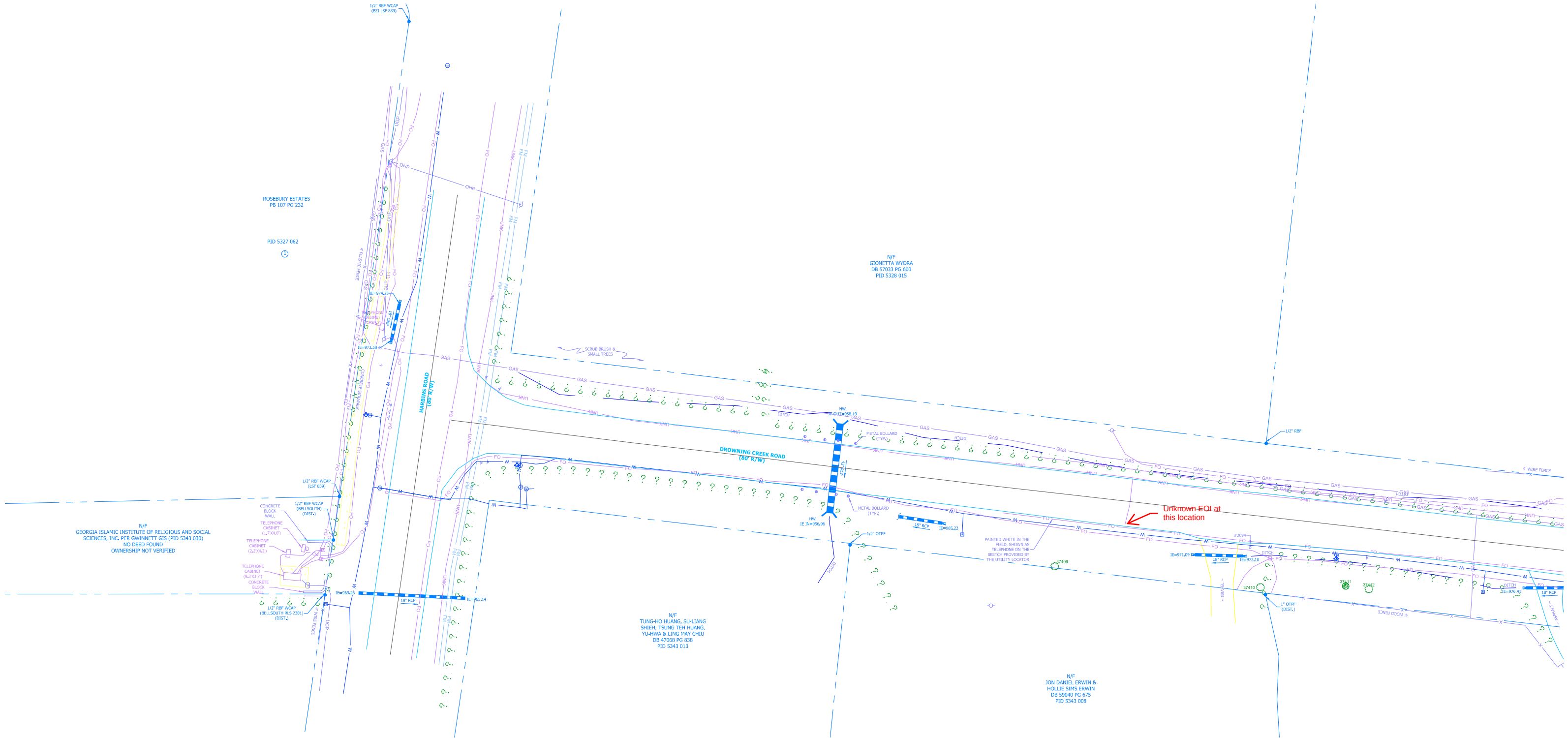
Sean Stapp, GIS Coordinator

Walton EMC Mapping

Tel. No.: 770.266.2527, Ext. 2527

Email: sstapp@waltonemc.com

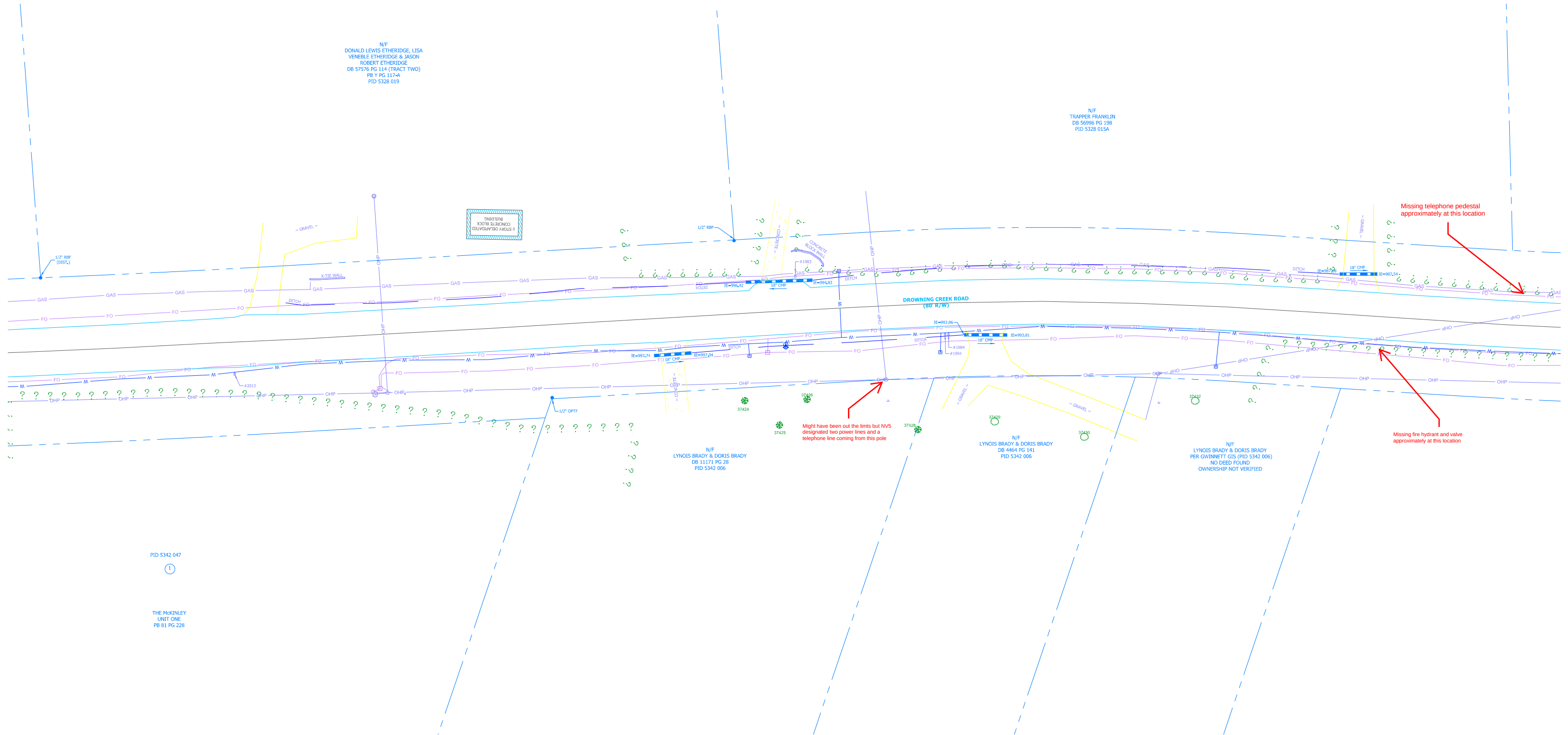
Note: Utility Owner was contacted and verified that there are aerial and underground WEMC facilities serving the Drowning Creek corridor between Harbins Road and approximately mid-distance between Drowning Creek and S.R. 316 where GPC's service area begins. It should be noted that recent GPC equipment and light poles were installed north of S.R. 316 associated with the Rowan development.



N/F
DONALD LEWIS ETHERIDGE, LISA
VENEABLE ETHERIDGE & JASON
ROBERT ETHERIDGE
DB 57576 PG 114 (TRACT ONE)
PID 5328 035

N/F
BILLY DWAYNE CLARK
DB 12366 PG 24
PID 5342 002

THE MCKINLEY
UNIT ONE
PB 81 PG 228



N/F
DONALD LEWIS ETHERIDGE, LISA
VENABLE ETHERIDGE & JASON
ROBERT ETHERIDGE
DB 57576 PG 114 (TRACT TWO)
PB Y PG 117A
PID 5328 019

N/F
TRAPPER FRANKLIN
DB 56996 PG 198
PID 5328 015A

1-STORY DEGRADED
CONCRETE BLOCK
BUILDING

DROWNING CREEK ROAD
(80' R/W)

N/F
LYNOS BRADY & DORIS BRADY
DB 11171 PG 28
PID 5342 006

N/F
LYNOS BRADY & DORIS BRADY
DB 4464 PG 141
PID 5342 006

N/F
LYNOS BRADY & DORIS BRADY
PER GWINNETT GIS (PID 5342 006)
NO DEED FOUND
OWNERSHIP NOT VERIFIED

PID 5342 047

1

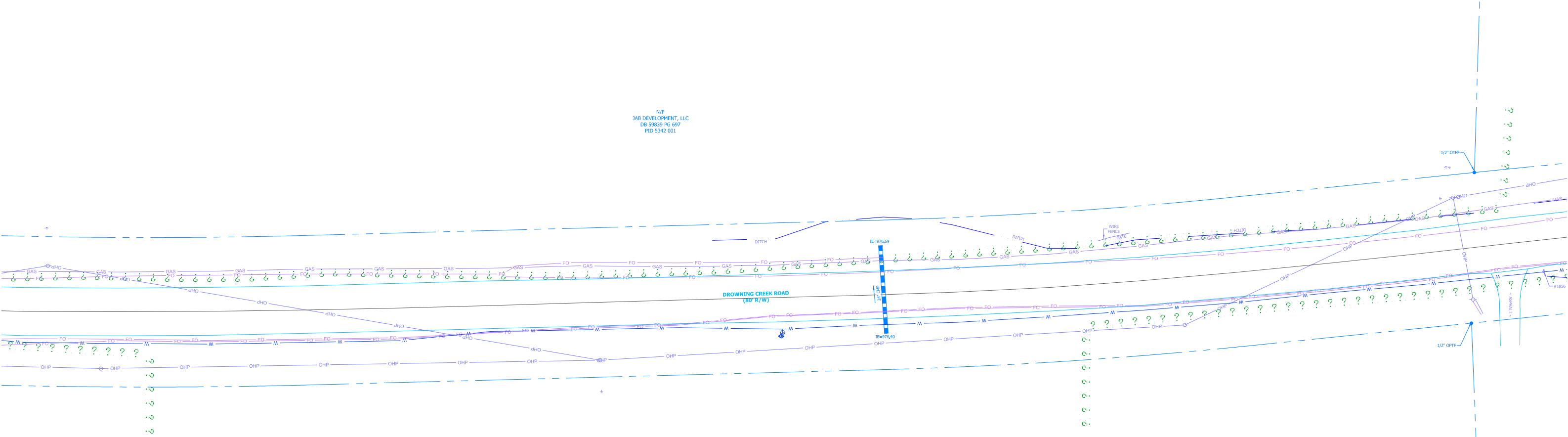
THE MCKINLEY
UNIT ONE
PB 81 PG 228

Missing telephone pedestal
approximately at this location

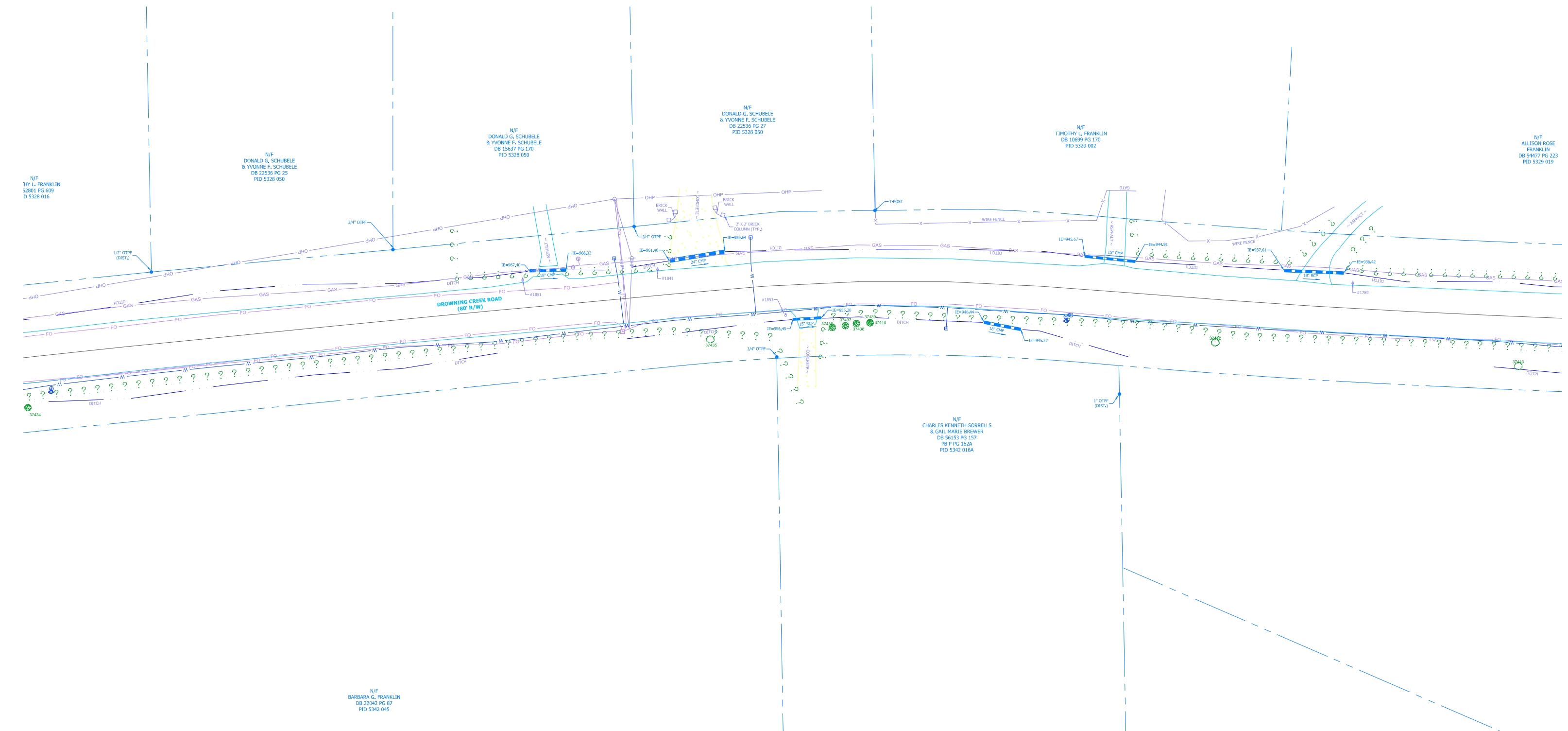
Missing fire hydrant and valve
approximately at this location

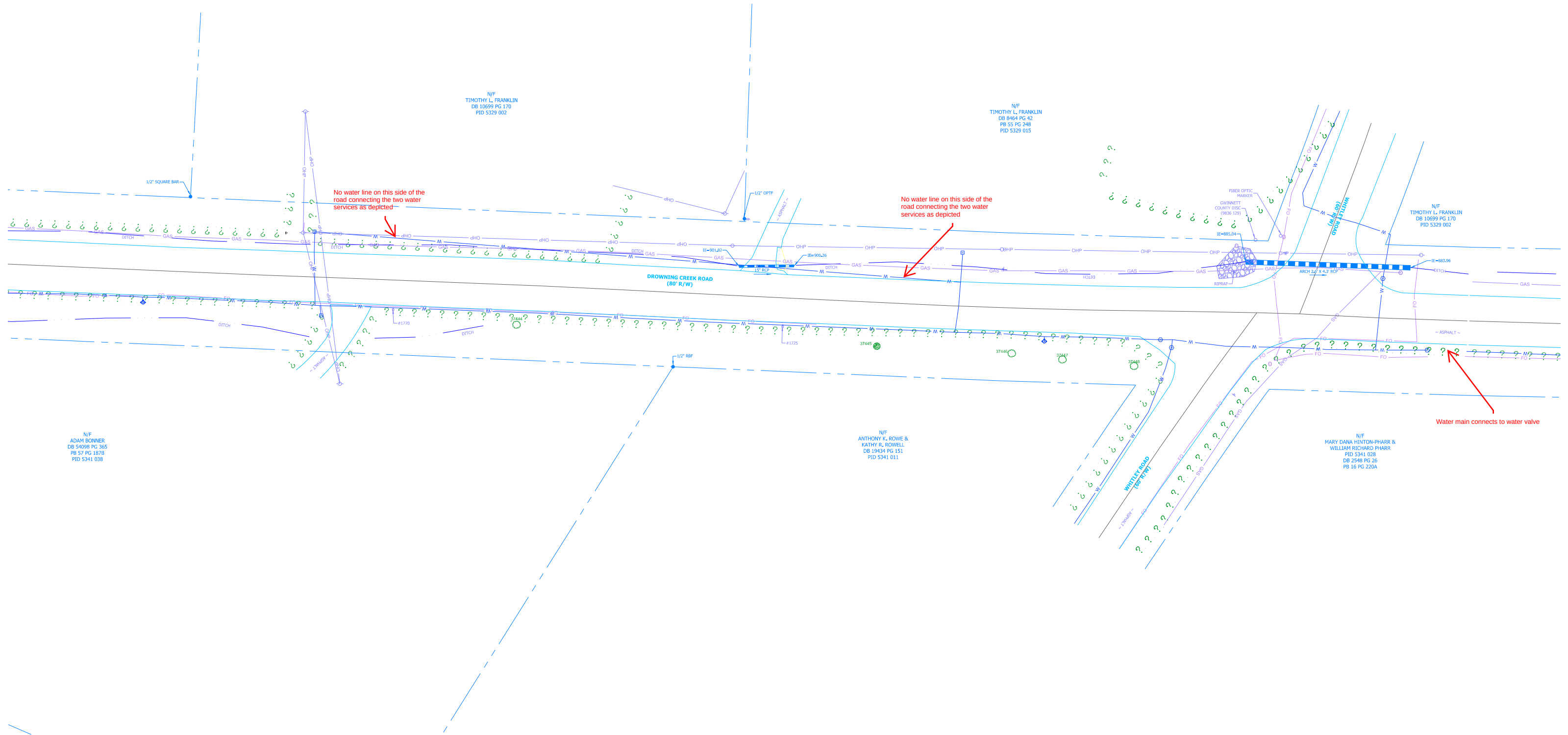
Might have been out the limits but NVS
designated two power lines and a
telephone line coming from this pole

N/F
JAB DEVELOPMENT, LLC
DB 59839 PG 697
PID 5342 001



N/F
JAB DEVELOPMENT, LLC
DB 59839 PG 697
PID 5342 001





N/F
MARK DOBBINS
DB 49460 PG 723
PB 80 PG 223
PID 5329 045

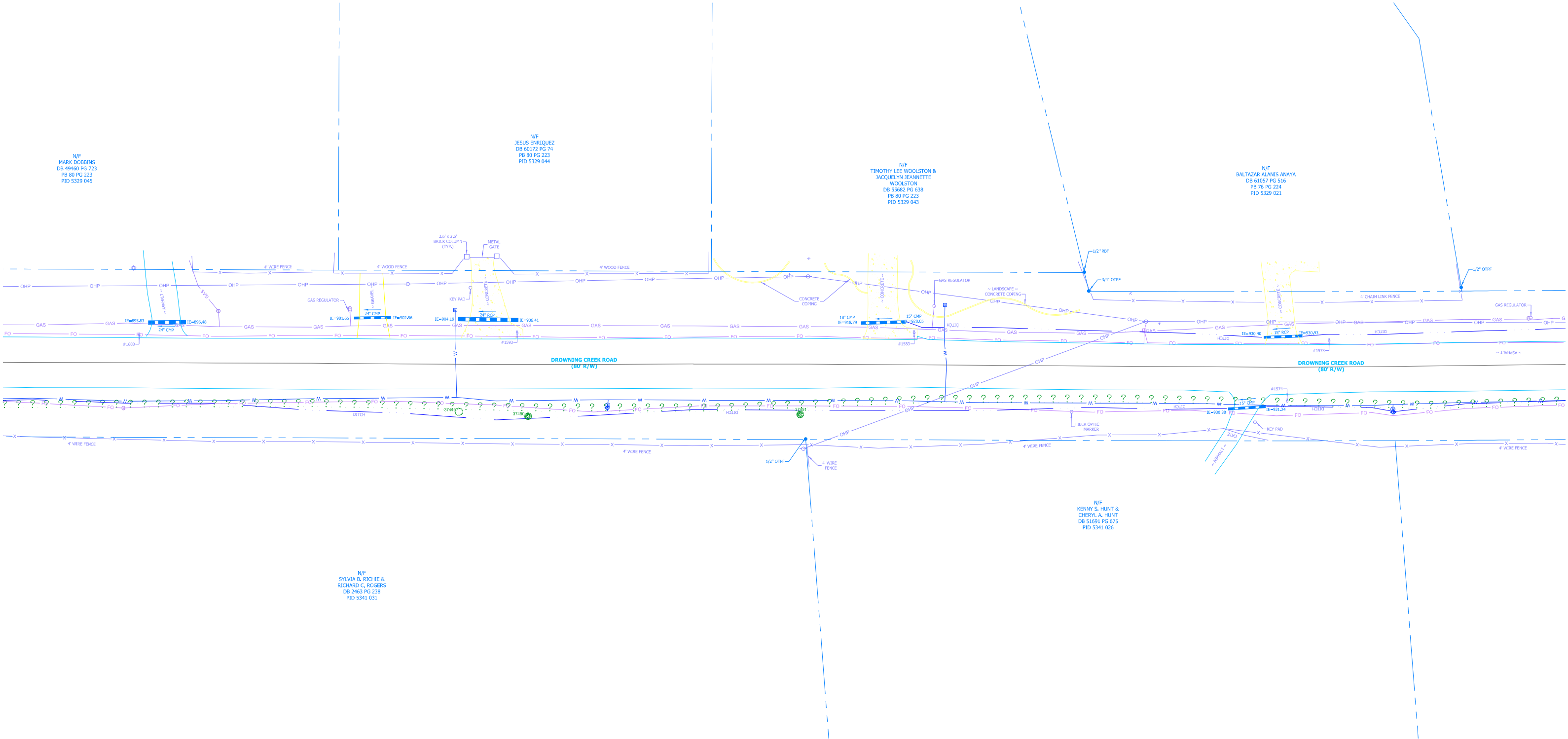
N/F
JESUS ENRIQUEZ
DB 60172 PG 74
PB 80 PG 223
PID 5329 044

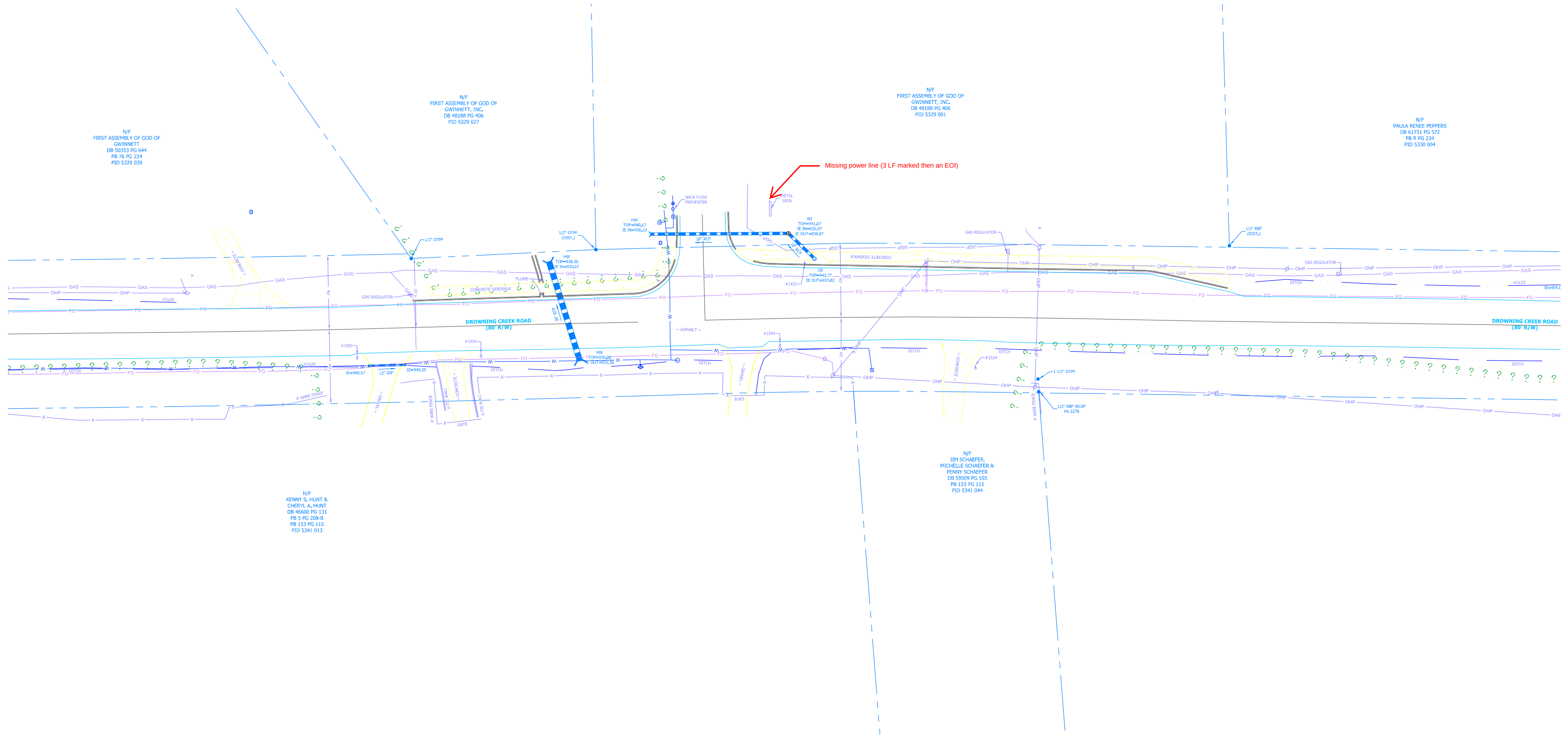
N/F
TIMOTHY LEE WOOLSTON &
JACQUELYN JEANNETTE
WOOLSTON
DB 55682 PG 638
PB 80 PG 223
PID 5329 043

N/F
BALTAZAR ALANIS ANAYA
DB 61057 PG 516
PB 76 PG 224
PID 5329 021

N/F
KENNY S. HUNT &
CHERYL A. HUNT
DB 51691 PG 675
PID 5341 026

N/F
SYLVIA B. RICHIE &
RICHARD C. ROGERS
DB 2463 PG 238
PID 5341 031





N/F
FIRST ASSEMBLY OF GOD OF
GWINNETT
DB 50353 PG 644
PB 76 PG 224
PID 5329 039

N/F
FIRST ASSEMBLY OF GOD OF
GWINNETT, INC.
DB 48188 PG 406
PID 5329 027

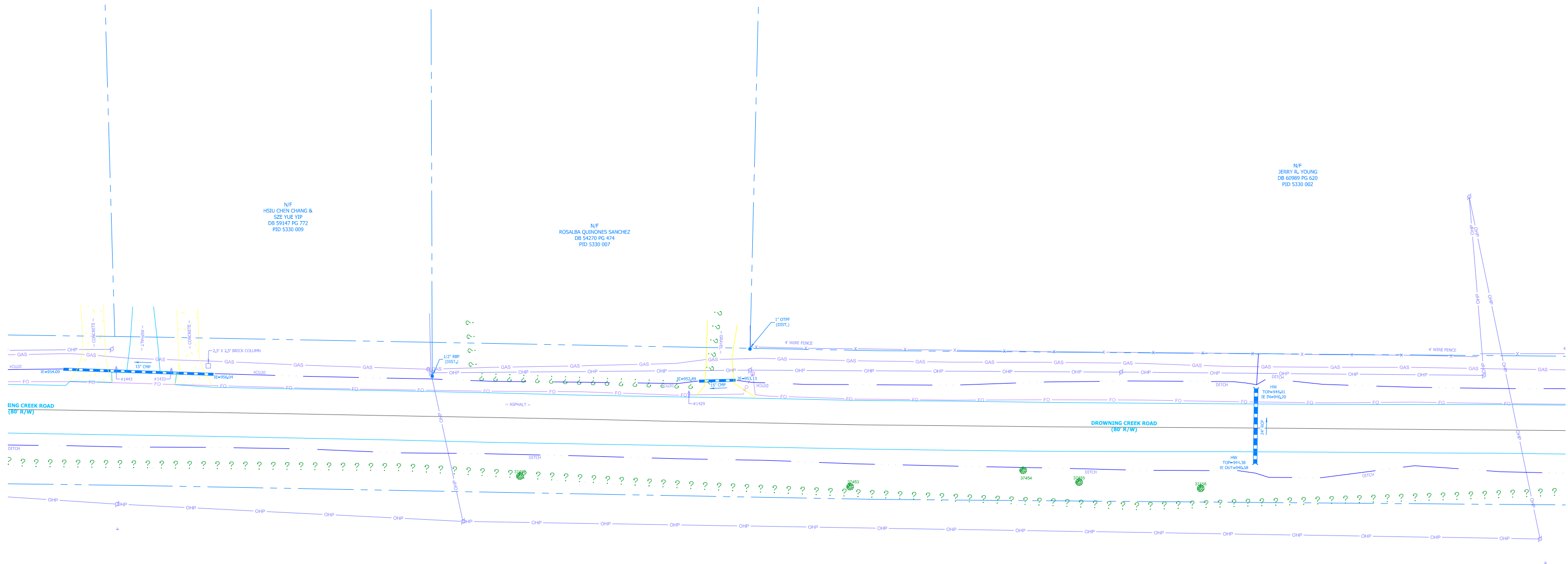
N/F
FIRST ASSEMBLY OF GOD OF
GWINNETT, INC.
DB 48188 PG 406
PID 5329 001

N/F
PAULA RENEE PEPPERS
DB 61731 PG 572
PB R PG 234
PID 5330 004

Missing power line (3 LF marked then an EOI)

N/F
KENNY S. HUNT &
CHERYL A. HUNT
DB 46600 PG 131
PB 5 PG 208-B
PB 153 PG 115
PID 5341 013

N/F
JIM SCHAEFER,
MICHELLE SCHAEFER &
PENNY SCHAEFER
DB 59509 PG 555
PB 153 PG 115
PID 5341 044



N/F
HSIU CHEN CHANG &
SZE YUE YIP
DB 59147 PG 772
PID 5330 009

N/F
ROSALBA QUINONES SANCHEZ
DB 54270 PG 474
PID 5330 007

N/F
JERRY R. YOUNG
DB 60589 PG 620
PID 5330 002

