DES Waste Management Division 29 Hazen Drive; PO Box 95 Concord, NH 03302-0095

October 2020 SURFACE GEOPHYSICAL RESULTS AND MW-25 WELL LOCATING MEMORANDUM COAKLEY LANDFILL SUPERFUND SITE North Hampton and Greenland New Hampshire

NHDES Site #: 198712001 Project Type: Superfund Site

Prepared For: New Hampshire Department of Environmental Services 29 Hazen Drive Concord, New Hampshire 03302-0095

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Date of Memorandum: (October 7, 2020)



Engineers • Environmental Scientists • Surveyors

MEMO

To: Mr. Peter Britz – Coakley Landfill Group

From: Christopher Buckman – CES, Inc.

Re: Surface Geophysical Results and MW-25 Well Locating Memorandum

Date: October 7, 2020

The following memorandum is a summary of results from the surface geophysical survey completed on September 22nd and 23rd, 2020 in the area located southwest of the Coakley Landfill. The electrical resistivity survey was completed to aid in the placement of a new deep bedrock well couplet near shallow bedrock monitoring well GZ-105. Well GZ-105 is an existing shallow bedrock groundwater monitoring well installed 25-ft into bedrock. This memorandum includes a recommendation for the placement of the new couplet based on interpreted geophysical response, existing bedrock photolineament information, and property access limitations. This new well couplet will be identified as MW-25. Based on discussions with the United States Environmental Protection Agency (USEPA) and the New Hampshire Department of Environmental Services (NHDES), this new bedrock well has been proposed to:

- Further evaluate the lateral and vertical extent of landfill related constituents in bedrock in the area located west and south of the Coakley Landfill. The planned well couplet is designed to provide data on groundwater quality within deep bedrock and supplement that obtained from shallow bedrock at GZ-105;
- Address a data gap associated with the southern flow path within bedrock that may not be sufficiently characterized in deep bedrock monitoring wells GZ-125 and GZ-130; and
- Provide an additional location for the monitoring of bedrock groundwater levels during the proposed deep bedrock investigation pumping test.

MW-25 is proposed to be installed within a parcel owned by the New Hampshire Department of Transportation (NHDOT). This parcel (Parcel 21-40) is located immediately north of GZ-105 and adjacent to the former railroad easement as illustrated in **Figure 1**. The geophysical method, profile locations, and data coverage were proposed in the *Deep Bedrock Investigation Work Plan Addendum* (Work Plan Addendum) as submitted to the USEPA and NHDES on July 17, 2020, and conditionally approved by the USEPA on August 4, 2020. The completed geophysical survey incorporated comments provided by the USEPA in its August 4, 2020 letter to the Coakley Landfill Group (CLG).







MW-25 will be completed approximately 250 feet into bedrock with the location to be finalized based on concurrence between the CLG, USEPA, and NHDES. Access to the parcel for the installation and monitoring of the new well couplet will be provided via an access agreement between CES and NHDOT. The access agreement has not been executed at the time of this memorandum; however, a draft agreement is currently under review by the NHDOT.

SUMMARY OF WORK COMPLETED

Geophysical surveying was completed along two profiles (Line 5 and Line 6) with the nomenclature used in identifying the geophysical transects being a continuation of that used in 2018 to "microlocate" deep bedrock borings MW-20/-21/-22 (**Figure 1**). Results from the 2018 geophysical investigation were summarized in the *Deep Bedrock Investigation Interim Report* (Interim Report) as submitted to the USEPA and NHDES on November 25, 2019. The Interim Report also included a results summary of the photolineament analysis completed during the Remedial Investigation by Weston (Weston, 1988) and used in the evaluation of geophysical results as described below.

The orientation and length of the profiles were based on site access with property owners, Site features conducive to the collection of profile data (line of sight), location of existing monitoring wells (MW-6 and GZ-105), placement of previously completed geophysical profiles (CES, 2018), and orientation of bedrock fractures as determined from photolineament and borehole geophysical data. These features have been included accordingly on **Figure 1** and on individual profiles included as **Figure 2**.

<u>Line 5</u>

Line 5 was an east-west oriented profile located parallel to the southern boundary of Parcel 21-40 (**Figure 1**). The transect was 2,300 feet (700 meters) in length and extended from the western edge of the Groundwater Management Zone (GMZ) to 350 feet east of MW-6. The line was oriented orthogonal to interpreted photolineament bedrock features and traversed the wetland complex located west of the landfill serving as the headwaters to Little River.

Line 6

Line 6 was positioned approximately 300 feet north of and roughly parallel to Line 5. The completed profile was 1,970 feet (600 meters) in length and extended from previously completed geophysical transects Line 3 and Line 4 in the western portion of the GMZ to the eastern edge of the existing railroad easement. Line 6 could not be extended further east due to the storage of equipment and materials within the parcel located immediately south of the landfill. The extension of Line 6 to the west resulted in the profile being located approximately 130 feet south of the MW-22 couplet (**Figure 1**).

GEOPHYSICAL RESULTS AND PROPOSED WELL COUPLET LOCATION

The processed electrical resistivity profiles are included as **Figure 2**. The depth of exploration averaged 280 feet below ground surface (bgs) and correlates with the anticipated depth of the proposed MW-25 well couplet. This is based on MW-25 being advanced 250 feet into bedrock with 30 feet of overburden material as per the boring log for GZ-105. Existing Site features and





boundaries (i.e., monitoring wells, GMZ, and subject parcel) are labeled accordingly on **Figure 1** and **Figure 2**.

Several anomalous features identified from the electrical resistivity profiles correlate with information provided from boring logs at MW-6 and GZ-105 along Line 5 and FPC-8A/-8B along Line 6. The shallow depth to bedrock at MW-6 (located 140 feet south of Line 5) correlates with a section of higher resistivity material often characteristic of dry overburden materials and/or shallow bedrock. The depth to bedrock at GZ-105 (approximately 30 feet bgs) correlates with an area along Line 5 (980 feet along profile) where there is an interpreted boundary between more conductive overburden materials and resistive bedrock. Similar responses are observed at FPC-8A/-8B along Line 6 with regards to depth to bedrock/overburden thickness. The intersection of Line 6 with Line 3 (**Figure 2**), completed during the 2018 surface geophysical investigation and detailed in the Interim Report (CES, 2019), correlates well with regards to electrical resistivity response and depth to an interval of higher resistivity at 60 feet bgs.

Additional similarities in geophysical response and resulting anomaly locations, depths, and orientation are apparent between Line 5 and Line 6. For example, the location of low resistivity Anomaly A (**Figure 2**) along these two profiles are similar in electrical response (light blue to blue shading), are bordered by more resistive features to the east and west (light green to green shading), and extend west at a similar depth (approximately 130 feet bgs). These low resistivity features are characteristic of those typically associated with fluid filled fractures as electrical current is more readily transmitted through water in open fractures than through the electrically more resistive bedrock. The location of Anomaly A along each profile has been provided on **Figure 1**. The extension of a line between these two anomalies results in a trend parallel to the predominant fracture trend/strike for the Site (**Figure 1**). Due to the correlation of the geophysical results with existing Site geologic information, proximity to GZ-105, and access within parcel 21-40, CES recommends the MW-25 well couplet be placed approximately 50 feet east of GZ-105 and along Line 5 as illustrated on **Figure 1** and **Figure 2**.

SCHEDULE

The current proposed schedule is for drilling to commence following the execution of an access agreement between CES and the NHDOT. Additional tasks are anticipated prior to driller mobilization and include an on-site meeting between the CLG, USEPA, NHDES, and CES to identify the proposed well location and clearing of driller access from the former railroad easement west to the proposed MW-25 location.





FIGURE 1

COMPLETED SURFACE GEOPHYSICAL PROFILE LOCATIONS AND PROPOSED WELL COUPLET LOCATION





FIGURE 2

LINE 5 AND LINE 6 MODELED APPARENT ELECTRICAL RESISTIVITY PROFILES

