Dana Wilbanks (adpce.ad)

AFIN: 03-00051
PMT#: 0249-S1-R2
Received
By Dana Wilbanks at 9:06 am, Sep 28, 2022
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TO: BS>FILE <DW

Subject: RE: Nabors for SW database

From: Travis Atwood (adpce.ad)
Sent: Tuesday, September 27, 2022 3:47 PM
To: gwreports
Subject: Nabors for SW database

Please input into the SW database.

"LRS and SCS workplan for supplemental subsurface investigation at the Nabors Landfill."

Northwest AR RSWMD					
NABORS Landfill		**Facility Class:**	1	**County:**	Baxter
Permit #:	0249-S1-R2	**Permit Status:**	Active Permit	**Engineer:**	Richard Bennett
AFIN:	03-00051	**Facility Status:**	Open	**Inspector:**	Darrell Norton

Thanks,

Travis Atwood | Geologist
Division of Environmental Quality | Office Land Resources
Assessment and Remediation | Groundwater Branch
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ARKANSAS
ENERGY & ENVIRONMENT

WORK PLAN FOR SUPPLEMENTAL SUBSURFACE INVESTIGATION AT THE NABORS LANDFILL

LAKESHORE RECYCLING SYSTEMS (LRS)

SCS ENGINEERS

27222323.00 | September 2022

11219 Richardson Drive
North Little Rock, AR 72113
501-812-4551

I

Professional Geologist Certification

I certify that I am a qualified groundwater scientist who has received a baccalaureate or postgraduate degree in the natural sciences. I have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, which enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport.

I further certify that this report was prepared by me or by a subordinate working under my direction.

09/22/2022

Dan McCullough, P.G. Date

Senior Hydrogeologist #1802

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1.0 INTRODUCTION

The NABORS Landfill originally operated under Solid Waste Disposal Permit number 0249-S, as issued to RLH, Inc. (RLH) by the Arkansas Energy & Environment Division of Environmental Quality (DEQ), formerly the Arkansas Department of Environmental Quality (ADEQ), on June 14, 1988. The solid waste permit was transferred to NABORS on August 31, 2005. The NABORS Landfill is currently under Solid Waste Disposal Permit 0249-S1-R2 issued by the DEQ on August 10, 2006. Although the permit is considered "open", the landfill is not receiving waste. The DEQ is currently managing post closure of the site

The purpose of this document is to present a scope of work to gather additional information concerning the occurrence and hydraulic conditions of groundwater. This a voluntary investigation on the part of LRS to be performed during the Due Diligence period between LRS and the Ozark Mountain Solid Waste District for the purchase of the NABORS facility. However DEQ's input will be welcome and LRS plans to keep them apprised of the results as they become available in hopes of accelerating the approval process during the permitting efforts at a future date.

2.0 SUBSURFACE INVESTIGATION DETAILS

2.1 DEPTH OF BORINGS

LRS is proposing to drill four (4) additional borings during this investigation. The four borings (EB-1, EB-2, EB-3 and EB-4) will be advanced to determine the fracture size, density, and orientation. See the attached figure for the location of these borings. The anticipated bottom of boring elevations will be 75 to 100 feet below ground surface. The plan is to advance each boring at least 10 to 20 feet below the groundwater surface identified from surrounding wells.

The location of EB-1 was selected to verify previous boring information from MW-1, BH-534D, and BH-509D, and NAB-2 which were located in the vicinity of Signature Blast Demonstration conducted in August 2008 when a noticeable drop in groundwater levels was recorded in NAB-2 after the blasting. In addition, the elevation of groundwater within these wells varies substantially with levels being deeper in BH-509D and NAB-2, when compared to MW-1, BH-534D, and BH-586-D. As will be discussed later in this plan, additional testing will done to determine the fractured and permeable zones in each boring.

The location of EB-2 is also to verify previous boring information and to be a southerly detection point for the dye test discussed later in this workplan. The same information discussed above and later in the workplan will also be collected from this boring.

The location of EB-3 is to gain more subsurface information to the north of MW-1 and MW-1R and to be a northerly detection point for the dye test discussed later in this workplan. The same information discussed above and later in the workplan will also be collected from this boring.

The location of EB-4 was selected to provide subsurface information in Cell 6 of Area 1-3. During previous investigations, borings were not drilled in this area (See attached Figure for location of all previous borings drilled)

As will be discussed later in this workplan, the proposed injection location for the dye test will be MW-1 or MW-1R. Depending on the results of the fracture density and location of fractures determined in the EB borings discussed above, an additional boring may be drilled in the vicinity of MW-1\MW-1R to

be utilized as an injection boring if the screened interval in these wells does not correspond to the most permeable zone,

2.2 DRILLING ACTIVITIES

The borings will be advanced using a drilling rig equipped with hollow stem augers. Once bedrock is encountered a surface casing will be grouted into bedrock and rock coring with wash rotary will be utilized to total depth. During drilling, (1.) Rock Quality Designation (RQD); (2.) Fracture density and fracture orientation; and (3.) Bit drop and sudden gains or losses in water will be recorded. The borings will be logged by a qualified geologist.

Once total depth has been reached, Downhole geophysical logs will be obtained from each of the four boreholes. The logs will include Acoustic Televiewer for fractures and nuclear density.

The Acoustic Televiewer tool takes an oriented "picture" of the borehole using high-resolution sound waves. This acoustic picture is displayed in both amplitude and travel time. This information is used to detect fractures, bedding plane orientation, and other borehole anomalies. Analysis includes fracture dip and strike determination, and classification of anomaly.

The nuclear density testing provides formation density as determined by the density of electrons in the formation. Gamma rays emitted by the source experience Compton scattering, which involved the transfer of energy from gamma rays to the electrons in the formation via elastic collision. The number of scattered gamma rays that reach the detector is directly related to the number of electrons in the formation, which in turn is related to bulk density. Density logs typically display a gradual increase with depth due to compaction.

Once the downhole geophysical logging has been completed, each open borehole will be utilized for groundwater elevation determination, dye test monitoring (discussed later) and possibly groundwater sampling.

The purpose of groundwater sampling will be to compare the water quality differences between wells with screens exposed above the groundwater elevation, and those with screens completed below the groundwater elevation. This will help to determine if observed groundwater impacts are inter-well impacts, or aquifer impacts. Should this sampling occur, PVC riser, screen, filter pack and bentonite seal will be installed.

Following the completion of field activities, a surveyor will determine the positions of all boring locations. All boring locations will be surveyed horizontally to the nearest 0.1 foot and tied to the State Plane Coordinate System. The ground surface reference elevation will be measured to the nearest 0.1 foot relative to mean sea level (MSL).

2.3 AQUIFER TESTING

Packer testing will be used for measuring the permeability of sections of boreholes. The first phase of the process will involve geophysical logging and flow profiling of the boreholes discussed in the Section 2.4 of this workplan. Detailed borehole logging is essential in visually identifying fractures and possible water producing zones. This information is then used to select isolation points for a series of packer tests.

This information helps identify the various water producing zones and correlate the geology across the site, which in turn helps to determine the necessary course of action for resolving potential groundwater issues. Monitoring water levels in nearby wells while pumping packed intervals can also identify permeable intervals within the aquifer. Information from these packer tests can be used to properly place the future location of monitoring wells and typically saves on cost over nested wells should multiple water producing intervals be identified.

2.4 DOWNHOLE GEOPHYSICAL LOGGING

Downhole geophysical logs will be obtained from each of the boreholes. The logs will include Acoustic Televiewer for fractures and nuclear density. It is anticipated that 4" PVC pipe will be placed in the borehole to the depth that bedrock is encountered, and the borehole logs will be run inside this pipe with in the overburden to avoid the borehole from bridging.

The Acoustic Televiewer tool takes an oriented "picture" of the borehole using high-resolution sound waves. This acoustic picture is displayed in both amplitude and travel time. This information is uused to detect fractures, bedding plane orientation, and other borehole anomalies. Analysis includes fracture dip and strike determination, and classification of anomaly.

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2.5 DYE TRACER TESTING

A dye test study will be conducted to approximate leakage from the proposed expansion area and the existing landfill. As such, the proposed test will involve injecting dyes in newly installed piezometers drilled within the footprint of the expansion and testing for the recovery of the dyes in the selected existing monitoring wells, springs, seeps, and other select locations in the vicinity of the proposed lateral expansion area. A positive detection of the injected dyes over background concentrations will indicate definite groundwater interconnection and movement to the trap location. It is anticipated that dye injected within the proposed footprint will be detected initially in one or more of the existing monitoring points. The following sections provide the details of dye injection, recovery, and analysis.

2.5.1 Dies and Procedures to be Utilized for Injection

The selected dye for the study will be one of the following: fluorescein, eosine, and sulphorhodamine B. The tracing agents to be injected will be based on the existing background concentrations of these dyes. Approximately ten pounds of the dye is anticipated to be used however the final amount will be based on results of testing described above.

The dye will be dissolved in ten gallons of water and then the ten-gallon mixture will be added at each injection point. Upon injection of each dye, additional water (up to 1,000 gallons or whatever volume the well will take over 8 hours) will be introduced at each location to accelerate movement of the dye from the well into the aquifer.

2.5.2 Types of Traps to be Utilized for Dye Injection

The samplers ("traps") will consist of nylon screen mesh packets approximately one and one-half inches by four inches (1.5" x 4"). Each packet will contain approximately 10 grams of 6-14 mesh activated carbon.

Cross contamination of wells will be eliminated by not placing anything in a well that has been in any other well. All materials that are placed in a well will be new and cleaned properly. New plastic gloves will be used and replaced when handling any material that will be placed in a well. It should be noted that the sampler (trap) placement will be completed before any dye is handled. The dyes will be pre-mixed with ten gallons of potable water before transported to the site for injection.

The samplers placed in the well will be suspended with nylon cord to below the static water level of the well and weighted by a nylon mesh container filled with glass marbles.

2.5.3 Establishment of Background Conditions

Sample packets will be placed at each of the monitoring locations ten days prior to injection. Since the amount of dye absorption on the charcoal versus time is not linear, one background set will be removed after four days in the water and the other set will be removed after ten days. These different background levels will be used for subsequent comparative purposes for the detectors retrieved from similar time periods in the water after dye injection. This will help reduce the risk of false positives. The first set of background samples placed out for the four day period will be analyzed for the three dye tracing agents previously proposed. The results should finalize the determination of the tracing agents for use.

2.5.4 Method of Analysis of Traps

Laboratory analyses will be conducted by the Crawford Hydrology Laboratory in Bowling Green, Kentucky.

2.5.5 Dye Injection Locations and Procedures

The locations of the dye injection point is anticipated to be near MW-1\MW-1R however the final decision will be determined once the exploratory borings have been completed. The justification for the selection of the injection locations will be based on the boring log summary, the down hole geophysical log results, and packer test results. The selection of the Injection points will be based on the following:

1. Injection within the proposed footprint along identified fractures and lineaments.
2. Number of fractures per foot based on core sample analysis
3. The results of the borehole geophysics
4. The results of the surface geophysics
5. Packer tests results, and
6. Proximity to the waste mass

By injecting at the locations determined from the above criteria, groundwater flow and potential contaminant transport across the site should be simulated. Following injection, up to 1000 gallons of potable water will be added to each injection point assuming the well will receive this quantity of water in a reasonable amount of time (8 hours).

2.5.6 Monitoring Locations and Trap Placement Procedures

The onsite monitoring wells and springs will be utilized as monitoring locations for this dye test. This will provide coverage of both up gradient and down gradient flow pathways. In addition, both the shallow flow zone at the bedrock contact and the deeper flow zone within the bedrock will be monitored.

Approximately ten days prior to injection, traps will be installed at all monitoring and injection locations. As discussed previously, one set will be removed after four days; another set will be changed after ten days. This will provide background data to establish the levels (if any) of the tracing agents proposed for the Investigation.

Once the second set of dye detection packets is retrieved and replaced with new detectors, the dyes will be injected. The date and time of each injection will be recorded in the test log book. It should be noted that the sampler (trap) placement will be completed before any dye is handled. The powdered dyes will be pre-mixed with ten gallons water before transport to the Site for injection.

2.5.7 Trap Removal Procedures

Samplers will be individually packaged in sealable plastic bags for transport to the lab. Sample number, time, and date of collection and the name of the collector will be recorded on the sampling bag at the time of collection. Disposable gloves will be worn at all times during sample collection. A new pair of gloves will be used at each site to avoid cross contamination of samples. Samples will be stored in a cool dark place until analysis is performed.

2.5.8 Frequency and Initiation of Monitoring

Background samplers will be placed and changed at each monitoring location ten days prior to injection as described. Another set of samplers will be placed in each trap location immediately prior to dye injection. The retrieval of the dye detection packets will occur on the following approximate days following the injection: 1st, 4th, 8th, 12th, 16th, 20th, and 30th. The test will end when it is determined that a positive dye trace has been found at all anticipated locations or that enough time has passed that a positive detection is not likely in a realistic time frame. Once dye is consecutively detected twice at a location (laboratory protocol for a positive), no further monitoring will occur at that location.

It should also be noted that water samples will be collected from each of the Injection points two weeks following injection, and every two weeks thereafter. The purpose of these tests is to determine that the dyes are indeed leaving the wells.

During the dye test, it is requested that groundwater monitoring be suspended until the conclusion of the test. This will allow the monitoring wells to remain undisturbed until the conclusion of the test.

2.5.9 Determination of a Positive Result

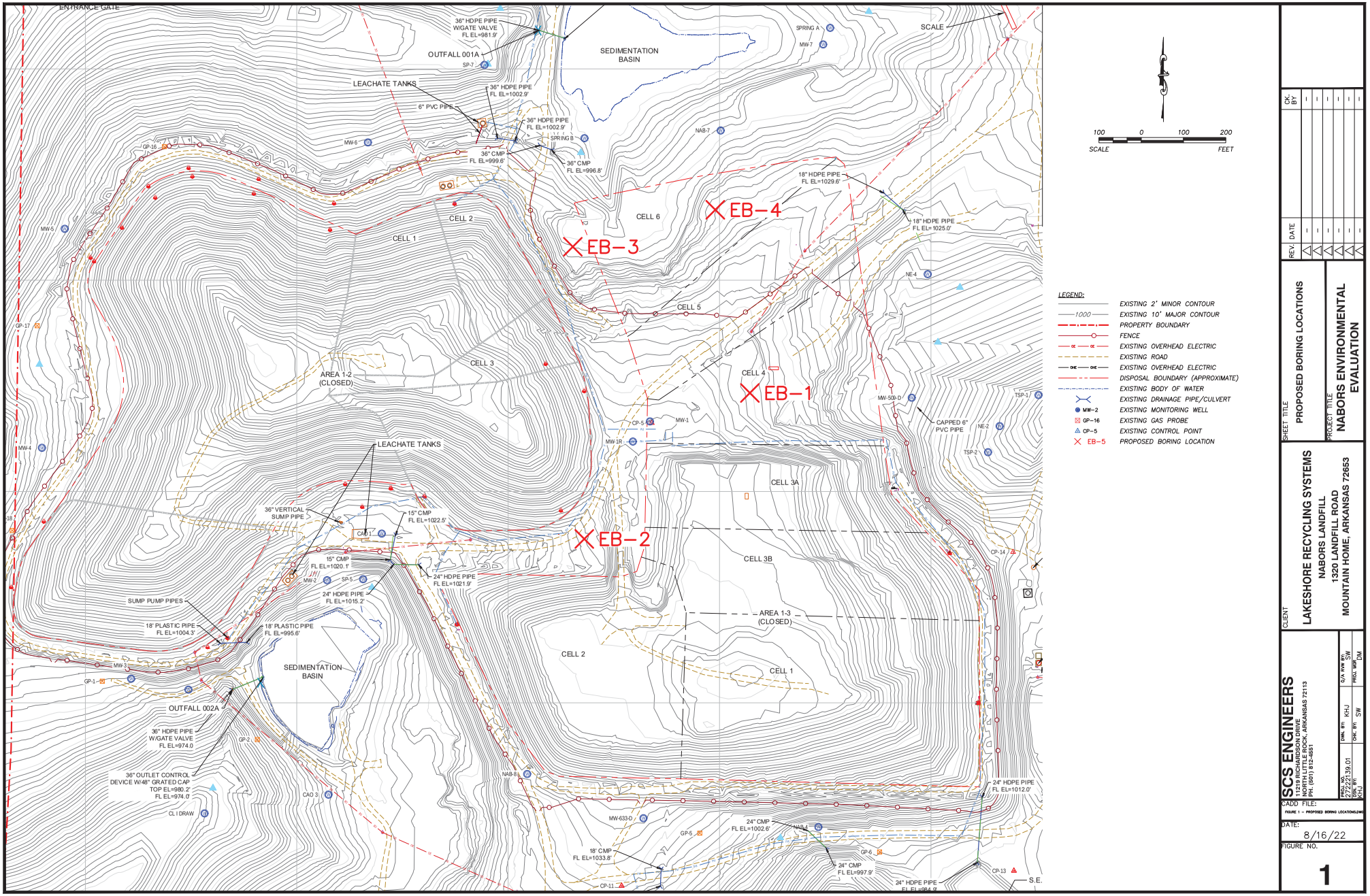
Laboratory protocol states that a positive detection of dye is indicated when 10 times background concentration is found at a site two consecutive times. This protocol will be followed. The four day background results will be used for comparison of the results for the four day sampling intervals

after dye injection. The 10 day background results will be utilized for comparison to the 10 monitoring results.

3.0 RESULTS

This a voluntary investigation on the part of LRS to be performed during the Due Diligence period between LRS and the Ozark Mountain Solid Waste District for the purchase of the NABORS facility. However DEQ's input will be welcome and LRS plans to keep them apprised of the results as they become available in hopes of accelerating the approval process during the permitting efforts at a further date.

Figures



REV.	DATE	CK BY

SHEET TITLE
PROPOSED BORING LOCATIONS

PROJECT TITLE
NABORS ENVIRONMENTAL EVALUATION

CLIENT
LAKESHORE RECYCLING SYSTEMS
NABORS LANDFILL
1320 LANDFILL ROAD
MOUNTAIN HOME, ARKANSAS 72653

SCS ENGINEERS
11219 RICHARDSON DRIVE
NORTH LITTLE ROCK, ARKANSAS 72113
PH. (501) 812-4851

PROJ. NO. 27213139.01
DSN. BY: KHJ
DWN. BY: KHJ
CHK. BY: SW
QA/QC BY: SW
PROJ. MGR: DM

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FIGURE 1 – PROPOSED BORING LOCATIONS.DWG

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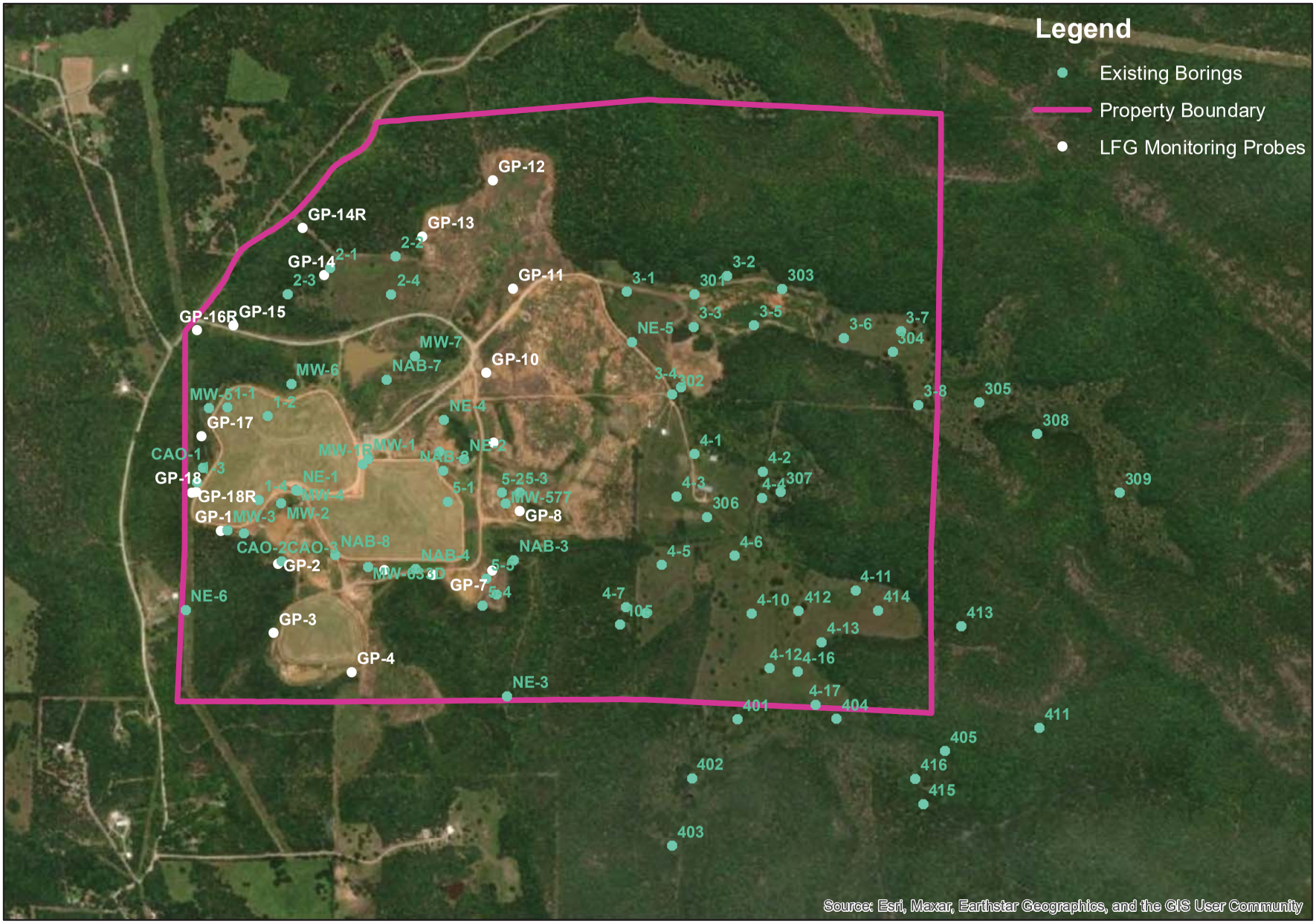
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