Department of Energy
Office of Science
ORNL Site Office
P.O. Box 2008
Oak Ridge, Tennessee 37831-6269

November 27, 2022

Division of Water Resources
Tennessee Department of Environment and Conservation
3711 Middlebrook Pike
Knoxville, Tennessee 37921

To Whom it May Concern:

APPLICATION FOR A PUMP AND HAUL STATE OPERATION PERMIT FOR THE GLOBAL EVALUATION, ANALYSIS, RESEARCH AND SECURITY PROJECT

The Global Evaluation, Analysis, Research and Security Project is located in Melton Valley at the Oak Ridge National Laboratory (ORNL). A new metal building and gravel paved parking lot will be constructed on the southern side of the Melton Valley Haul Road, near the intersection with the DOSAR Access Road. Percolation testing was performed at two locations adjacent to the gravel parking lot, and the results indicated a septic system would not be feasible. Therefore, a Pump and Haul State Operation Permit is being pursued to allow sewage to be stored in a subsurface concrete tank and disposed offsite at a sewage treatment facility. The application is enclosed. The design of the storage tank is required to be approved by the Tennessee Department of Environment and Conservation and will be submitted to the 'MyTDEC Forms' website. Please reference submission number HPM-WJ73-YTGWB.

If there are any questions or additional information required, please contact Todd North at (865) 574-8918 or Walt Doty at DotyTW@ornl.gov.

Sincerely,

Johnny O. Moore, Manager
ORNL Site Office

Enclosure

cc w/enclosure:
Michele G. Branton, SC-OSO
T. Walt Doty IV, SC-OSO
Chad K. Huffman, SC-OSO
Herman E. Radke III, SC-OSO
Wesley D. Goddard, ORNL
Todd A. North, ORNL
Gerald L. Palau, ORNL
David D. Skipper, ORNL
Director's Files

ENCLOSURE

APPLICATION FOR STATE OPERATION PERMIT
PUMP AND HAUL

Tennessee Department of Environment and Conservation
Division of Water Resources
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102
(615) 532-0625

APPLICATION FOR A STATE OPERATION PERMIT (SOP)

Type of application: ☑ New Permit ☐ Permit Reissuance ☐ Permit Modification

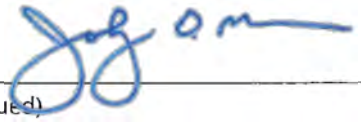
Permittee Identification: (Name of city, town, industry, corporation, individual, etc., applying, according to the provisions of Tennessee Code Annotated Section 69-3-108 and Regulations of the Tennessee Water Quality Control Board.)	
Permittee Name (applicant):	U.S. Department of Energy, Oak Ridge National Laboratory
Permittee Address:	1 Bethel Valley Rd. Oak Ridge, TN 37831-6269

Official Contact: Johnny O. Moore		Title or Position: Manager, ORNL Site Office	
Mailing Address: P.O. Box 2008		City: Oak Ridge	State: TN	Zip: 37831-6269
Phone number(s): (865) 576-3536		E-mail: moorejo@ornl.gov	

Optional Contact: Walt Doty		Title or Position: ORNL Site Office Staff	
Address: P.O. Box 2008		City: Oak Ridge	State: TN	Zip: 37831-6269
Phone number(s): (865) 576-7231		E-mail: dotytw@ornl.gov	

Application Certification (must be signed in accordance with the requirements of Rule 0400-40-05-.05)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Name and title; print or type	Signature	Date
Johnny Moore		11/27/2022

Permit Number: SOP-_____

Facility Identification:	**Existing Permit No.**
Facility Name: U.S. Dept. of Energy Oak Ridge National Laboratory	County: Roane
Facility Address or Location: 1 Bethel Valley Rd., Oak Ridge, TN	Latitude: 35.918861
	Longitude: -84.288217

Name and distance to nearest receiving waters: Melton Branch, 370 ft to the west

If any other State or Federal Water/Wastewater Permits have been obtained for this site, list their permit numbers:

NPDES Permit # TN0002941

Name of company or governmental entity that will operate the permitted system: UT-Battelle, LLC

Operator address: 1 Bethel Valley Rd, Oak Ridge, TN

Has the owner/operator filed for a Certificate of Convenience & Necessity (CCN), or an amended CCN, with the Tennessee Regulatory Authority (TRA) (may be required for collection systems and land application treatment systems)? ☐ Yes ☐ No ☑ N/A

If the applicant listed above does not yet own the facility/site or if the applicant will not be the operator, explain how and when the ownership will be transferred or describe the contractual arrangement and renewal terms of the contract for operations.

N/A

Complete the following information explaining the entity type, number of design units, and daily design wastewater flow:

Entity Type	Number of Design Units		Flow (gpd)
☐ City, town or county	No. of connections:		
☐ Subdivision	No. of homes:	Avg. No. bedrooms per home:	
☐ School	No. of students:	Size of cafeteria(s):	
		No. of showers:	
☐ Apartment	No. of units:	No. units with Washer/Dryer hookups:	
		No. units without W/D hookups:	
☐ Commercial Business	No. of employees:	Type of business:	
☐ Industry	No. of employees:	Product(s) manufactured:	
☐ Resort	No. of units:		
☐ Camp	No. of hookups:		
☐ RV Park	No. of hookups:	No. of dump stations:	
☐ Car Wash	No. of bays:		
☑ Other			

Describe the type and frequency of activities that result in wastewater generation.

Research facility (est. 6 employees), 5 days per week. Calculation is provided in Design Documents

Permit Number: SOP-_____

Engineering Report (required for collection systems and/or land application treatment systems):	☑ N/A
☐ Prepared in accordance with Rule 0400-40-05-.03 and Section 1.2 of the State of Tennessee Design Criteria for Sewage Works ☐ Attached, or ☐ Previously submitted and entitled: Approved? ☐ Yes. Date: ☐ No Operation and Maintenance Inspection Schedule Submitted: Approved? ☐ Yes. Date: ☐ No	

Wastewater Collection System:	☑ N/A
System type (i.e., gravity, low pressure, vacuum, combination, etc.):	
System Description:	
Describe methods to prevent and respond to any bypass of treatment or discharges (i.e., power failures, equipment failures, heavy rains, etc.):	
In the event of a system failure describe means of operator notification: Contact Laboratory Shift Sup.	
List the **emergency** contact(s) (name/phone):	
For low-pressure systems, who is responsible for maintenance of STEP/STEG tanks and pumps or grinder pumps (list all contact information)?	
Approximate length of sewer (excluding private service lateral):	
Number/hp of lift stations: / Number/hp of lift pumps /	
Number/volume of low pressure and or grinder pump tanks / Number/volume septic tanks /	
Attach a schematic of the collection system. ☐ Attached	
If this is a satellite sewer and you are tying in to another sewer system complete the following section, listing tie-in points to the sewer system and their location (attach additional sheets as necessary):	

Tie-in Point	Latitude (xx.xxxx°)	Longitude (xx.xxxx°)

Permit Number: SOP-_____

Land Application Treatment System:	☑ N/A
Type of Land Application Treatment System: ☐ Drip ☐ Spray ☐ Other, explain:	
Type of treatment facility preceding land application (recirculating media filters, lagoons, other, etc.):	
Attach a treatment schematic. ☐ Attached	
Describe methods to prevent and respond to any bypass of treatment or discharges (i.e., power failures, equipment failures, heavy rains, etc.):	
For New or Modified Projects: Name of Developer for the project:	
Developer address and phone number:	
For land application, list: Proposed acreage involved: Inches/week gpd/sq.ft loading rate to be applied:	
Is wastewater disinfection proposed?	
☐ Yes Describe land application area access:	
☐ No Describe how access to the land application area will be restricted:	

Attach required additional Engineering Report Information (see website for more information)

☐ Topographic map (1:24,000 scale presented at a six inch by six inch minimum size) showing the location of the project including quadrangle(s) name(s) GPS coordinates, and latitude and longitude in decimal degrees should also be included.

☐ Scaled layout of facility showing the following: lots, buildings, etc. being served, the wastewater collection system routes, the pretreatment system location, the proposed land application area(s), roads, property boundaries, and sensitive areas such as streams, lakes, springs, wells, wellhead protection areas, sinkholes and wetlands.

☐ Soils information for the proposed land disposal area in the form of a Water Resources Soils Map per Chapter 16 and 17 State of Tennessee Design Criteria for Sewage Work. The soils information should include soil depth (borings to a minimum of 4 feet or refusal) and soil profile description for each soil mapped.

☐ Topographic map of the area where the wastewater is to be land applied with no greater than ten foot contours presented at a minimum size of 24 inches by 24 inches.

☐ Describe alternative application methods based on the following priority rating: (1) connection to a municipal/public sewer system, (2) connection to a conventional subsurface disposal system as regulated by the Division of Groundwater Protection, and/or (3) land application.

Permit Number: SOP-_____

For Drip Dispersal Systems Only: Unless otherwise determined by the Department, sewage treatment effluent wells, i.e, large capacity treatment/drip dispersal systems after approval of the SOP Application, will be issued an UIC tracking number and will be authorized as Permit by Rule per UIC Rule 0400-45-06-.14(2) and upon issue of a State Operating Permit and Sewage System Construction Approval by the Department. Describe the following:	☑ N/A
The area of review (AOR) for each Drip Dispersal System shall, unless otherwise specified by the Department, consist of the area lying within a one mile radius or an area defined by using calculations under 0400-45-06-.09 of the Drip Dispersal System site or facility, and shall include, but not be limited to general surface geographic features, general subsurface geology, and general demographic and cultural features within the area. Attach to this part of the application a general characterization of the AOR, including the following: (This can be in narrative form)	
☐ A general description of all past and present groundwater uses as well as the general groundwater flow direction and general water quality.	
☐ A general description of the population and cultural development within the AOR (i.e. agricultural, commercial, residential or mixed)	
☐ Nature of injected fluid to include physical, chemical, biological or radiological characteristics.	
☐ If groundwater is used for drinking water within the area of review, then identify and locate on a topographic map all groundwater withdrawal points within the AOR, which supply public or private drinking water systems. Or supply map showing general location of publicly supplied water for the area (this can be obtained from the water provider)	
☐ If the proposed system is located within a wellhead protection area or source water protection area designated by Rule 0400-45-01-.34, show the boundary of the protection area on the facility site plan.	
☐ Description of system, Volume of injected fluid in gallons per day based upon design flow, including any monitoring wells	
☐ Nature and type of system, including installed dimensions of wells and construction materials	

Pump and Haul:	☐ N/A
Reason system cannot be served by public sewer: Sewer/potable water utilities not available	
Distance to the nearest manhole where public sewer service is available: 6,800 ft	
When sewer service will be available: Not planned for these temporary research facilities	
Volume of holding tank: 1,000 gal.	
Tennessee licensed septage hauler (attach copy of agreement): See attachment	
Facility accepting the septage (attach copy of acceptance letter): See attachment	
Latitude and Longitude (in decimal degrees) of approved manhole for discharge of septage: See attachment	
Describe methods to prevent and respond to any bypass of treatment or discharges (i.e., power failures, equipment failures, heavy rains, etc.): See attachment	

Permit Number: SOP-_____

Holding Ponds (for non-domestic wastewater only):	☑ N/A
Pond use: ☐ Recirculation ☐ Sedimentation ☐ Cooling ☐ Other (describe): Describe pond use and operation: If the pond(s) are existing pond(s), what was the previous use? Have you prepared a plan to dispose of rainfall in excess of evaporation? ☐ Yes ☐ No If so, describe disposal plan: Is the pond ever dewatered? ☐ Yes ☐ No If so, describe the purpose for dewatering and procedures for disposal of wastewater and/or sludge: Is(are) the pond(s) aerated? ☐ Yes ☐ No Volume of pond(s): gal. Dimensions:	
Is the pond lined (Note if this is a new pond system it must be lined for SOP coverage. Otherwise, you must apply for an Underground Injection Control permit.)? ☐ Yes ☐ No Describe the liner material (if soil liner is used give the compaction specifications): Is there an emergency overflow structure? ☐ Yes ☐ No *If so, provide a design drawing of structure.* Are monitoring wells or lysimeters installed near or around the pond(s)? ☐ Yes ☐ No *If so, provide location information and describe monitoring protocols (attach additional sheets as necessary):*	

Mobile Wash Operations: ☑ N/A

☐ Individual Operator ☐ Fleet Operation Operator

Indicate the type of equipment, vehicle, or structure to be washed during normal operations (check all that apply):

☐ Cars
☐ Trucks
☐ Trailers (Interior washing of dump-trailers, or tanks, is prohibited.)
☐ Other (describe):
☐ Parking Lot(s): sq. ft.
☐ Windows: sq. ft.
☐ Structures (describe):

Wash operations take place at (check all that apply):

☐ Car sales lot(s)
☐ Private industry lot(s)
☐ County(ies), list:
☐ Public parking lot(s)
☐ Private property(ies)
☐ Statewide

Wash equipment description:

☐ Truck mounted
☐ Rinse tank size(s) (gal.):
☐ Collection tank size(s) (gal.):
☐ Trailer mounted
☐ Mixed tanks size(s) (gal.):
Number of tanks per vehicle:

Pressure washer: psi (rated) gpm (rated)
☐ gas powered ☐ electric

Vacuum system manufacturer/model: Vacuum system capacity: inches Hg

Describe any other method or system used to contain and collect wastewater:

List the public sewer system where you are permitted or have written permission to discharge waste wash water (include a copy of the permit or permission letter):

Are chemicals pre-mixed, prior to arriving at wash location? ☐ Yes ☐ No

Describe all soaps, detergents, or other chemicals used in the wash operation (attach additional sheets as necessary):

Chemical name:	Manufacturer:	Primary CAS No. or Product No.

APPLICATION FOR A STATE OPERATION PERMIT (SOP)
INSTRUCTIONS

Purpose of this form A completed SOP application must be submitted to obtain SOP coverage. This permit is required to operate a sewage, industrial waste or other waste collection and/or treatment system that does not have a point source discharge to any surface or subsurface waters. This form must be submitted at least 180 days before starting any new activity, before an existing permit expires, or when renewing a permit.

Complete the form Type or print clearly, using black or blue ink; not markers or pencil. Answer each item or enter "N/A," for not applicable. If you need additional space, attach a separate piece of paper to the SOP application. Applicants may be required to submit engineering reports, plans and specifications. Contact the division for the applicable items, or refer to Appendix 1-D of the state Design Criteria for Sewage Works for more information. **The application will be considered incomplete without supplying all of the required information, Engineering Reports, and an original signature.**

Permittee Identification/Facility Identification Describe and locate the project, use the legal or official name of the facility or site. Provide the latitude and longitude (expressed in decimal degrees) of the center of the site, which can be located on USGS quadrangle maps. The quadrangle maps can be obtained at 1-800-USA-MAPS, or at the Census Bureau world wide web site: http://www.census.gov/cgi-bin/gazetteer. Attach a copy of a portion of a 7.5 minute quad map, showing location of site, with boundaries at least one mile outside the site boundaries. If business is mobile give the owner of operations' home, or business office address, and list all current areas of operation by city and county.

Wastewater Collection System These types of systems require engineering reports, refer to Appendix 1-D of the state Design Criteria for Sewage Works for more information.

Land Application Treatment System These types of systems require engineering reports, refer to Appendix 1-D of the state Design Criteria for Sewage Works for more information. Public access to the treatment area must be restricted, if disinfection is not part of the treatment. Applicants completing this section of the application must also complete the Wastewater Collection System section.

Pump and Haul These types of systems may require engineering reports, refer to Appendix 1-D of the state Design Criteria for Sewage Works for more information.

Holding Ponds Given that annual rainfall onto open ponds exceeds annual evaporation (in Tennessee), the permittee must develop a written plan (to be retained on site and be available to the division upon request) that addresses how excess rainfall will be disposed of in compliance with the no discharge requirement of this permit. Treatment ponds are not to be used for stormwater treatment or storage. All new and existing point source industrial stormwater discharges associated with industrial activity require coverage under the

Tennessee industrial stormwater multi-sector general permit TMSP, refer to the website for more information. Describe the system for re-routing surface runoff away from ponds in the rainfall disposal plan.

Mobile Wash Operations Indicate whether the operation is run by an individual or a corporation with a fleet of vehicles equipped to wash and collect waste waters. If a corporation, indicate the home office as the "Official Contact". Indicate if operations take place at specific sites and list those counties that apply. Note that this permit covers operations for all of Tennessee. Operations indicated as "statewide" generally apply as a fleet type operation and each office location shall be individually permitted. Equipment may be truck or trailer-mounted, or both, indicate all that applies. Soaps, detergents, and other chemicals used should be non-toxic and biodegradable. All "chemically enhanced" (soaps, detergents, and other chemicals) waste-wash waters must be collected for proper disposal. If no chemically enhanced washwaters are used, clear-wash waters may travel by sheet flow to a gravel or grassy area where there is no opportunity to enter waters of the state. There should be no discharge to a storm water inlet, ditch, conveyance, stream, etc. If you are unsure of your wash area drainage, contact the area Environmental Field Office (EFO) prior to setting up your wash operation.

Fees Refer to the TDEC-DWR Environmental Protection Fund Fee Rule 0400-40-11-.02. Links to publications are available on Department of Environment and Conservation, Division of Water Resources webpage and the webpage for the Tennessee Secretary of State.

Submitting the form and obtaining more information Note that this form must be signed by the chief executive officer, owner, or highest ranking elected official. For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC). Submit a complete application electronically to water.permits@tn.gov (preferred) or to the appropriate EFO for the county(ies) where the facility is located, addressed to **Attention: DWR, Permit Section.** Please keep a copy for your records.

EFO	Street Address	Zip Code	EFO	Street Address	Zip Code
Memphis	8383 Wolf Lake Drive, Bartlett	38133	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Dr	38305-4316	Chattanooga	1301 Riverfront Parkway Suite 206	37402
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601

APPLICATION FOR A STATE OPERATION PERMIT (SOP)
INSTRUCTIONS - CONTINUED

Upon receipt of the required items, the division conducts a review of the material, and the applicant is notified of any deficiencies. When all the deficiencies have been corrected, the division makes a determination of whether to publish a draft permit. When a draft permit is generated, a public notice is issued and published in a local newspaper. The draft permit is then reviewed by the applicant, and division field staff. The general public also has an opportunity to review the permit. Based on public response, a public hearing may be held. After considering public comments and a final review, the permit may be issued. The entire process normally takes from five (5) to nine (9) months. Permits are normally valid for five (5) years, except those for pump and haul systems, which are generally valid for one (1) year.

The division has the right to inspect a facility when deemed necessary. In addition, the division has the right to revoke or suspend any permit for violation of permit conditions or any other provisions of the Tennessee Water Quality Control Act and other water pollution control rules.

The division is responsible for regulating any activity, which involves a potential discharge in order to protect waters of the State from pollution and to maintain the highest possible standards in water quality.

Oak Ridge National Laboratory (ORNL)
Supplemental Information

This project is a temporary (estimated 3-5 year duration) research facility. Development consists of a metal frame/side building with a gravel parking/storage areas. Due to the temporary nature of the facility, there is no intention to install sanitary sewer to this location. Since water will be supplied to this facility via a service lateral, evaluation of subsurface disposal was evaluated by an independent Geotechnical Consulting Firm. Percolation tests were performed at two locations adjacent to the site and both locations failed (Refer to the attached Geotechnical Report). This location is not within a 100-yr floodplain.

The following information can be reviewed in the design documents (submitted in the MyTDEC Forms website):

1. The tank to be installed (a typical septic system tank) has a 1,000-gal capacity, which will support the 6 personnel for 8 days before the high level alarm activates at 75% of the tank capacity.
2. A level monitoring sensor will be installed, as required.
3. The tank will be installed below ground, but a riser will be installed to facilitate pumping. The coordinates of the manhole are 35.918861, -84.288217
4. Gravel will be installed to allow access to the tank at any time.
5. Two access manhole lids with small openings will provide necessary venting.
6. Since Oak Ridge National Laboratory is a secured facility, no fencing or added security is necessary.

ORNL/UT-Battelle, LLC currently has a contractor with Fusion Site Services (DBA East Tennessee Portables, LLC) to supply and maintain portable chemical toilets at ORNL. This vendor will be utilized to remove septage from this tank, as needed. The following information is attached for Fusion Site Services:

1) A copy of the existing contact with Fusion Site Services and ORNL/UT-Battelle, LLC, and
2) Letter from wastewater facility (Knoxville Utility Board) accepting Fusion Site Services septage.

Geotechnical Report

Containing Perc Test Results

GEOServices, LLC, Geotechnical and Materials Engineers

July 6, 2022

Cannon & Cannon, Inc.
8550 Kingston Pike
Knoxville, Tennessee 37919

ATTENTION: Mr. Alan Grissom
agrissom@cannon-cannon.com

Subject: **REPORT OF GEOTECHNICAL EXPLORATION**
GEARS Facility
Oak Ridge National Laboratory
Oak Ridge, Tennessee
GEOServices Project No. 21-22875

Dear Mr. Grissom:

We are submitting the results of the geotechnical exploration performed for the subject project. The geotechnical exploration was performed, in accordance with our Proposal No. 11-22418, dated May 24, 2022. The following report presents our findings and recommendations for the proposed project. Should you have any questions regarding this report, or if we can be of any further assistance, please contact us at your convenience.

Sincerely,

GEOServices, LLC

Matthew B. Haston, P.E.
Senior Geotechnical Engineer
TN 109,269

T. Brian Williamson, P.E.
Geotechnical Department Manager

MBH/TBW:mbh

REPORT OF

GEOTECHNICAL EXPLORATION

GEARS Facility
Oak Ridge National Laboratory
Oak Ridge, Tennessee

GEOServices Project No. 21-22875

Submitted to:

Cannon & Cannon, Inc.
8550 Kingston Pike
Knoxville, Tennessee 37919

Submitted by:

GEOServices, LLC
2561 Willow Point Way
Knoxville, TN 37931

Phone (865) 539-8242
Fax (865) 539-8252

GEOServices, LLC, Geotechnical and Materials Engineers

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APPENDIX A – Figures and Test Boring Records

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of our geotechnical exploration was to explore the subsurface conditions for the proposed GEARS Facility and provide geotechnical recommendations for site preparation and grading and for design and construction of the foundation system. Additionally, recommendations for light and heavy-duty pavements are included.

1.2 PROJECT INFORMATION AND SITE DESCRIPTION

Project information was provided in email correspondence from you dating from May 23, 2022. We were provided a narrative of the proposed construction as well as site topographic survey.

The project will include the development of the site located on the campus of the Oak Ridge National Laboratory (ORNL) for the GEARS Facility. Based on the provided information, we understand the development will include a new 4,000 square feet pre-engineered metal building and associated pavement areas. The building will be supported using a system of conventional shallow foundations with a concrete slab-on-grade. For purposes of this proposal, we have assumed that maximum column and continuous foundation loads will be on the order of 75 kips and 2 to 3 kips per linear foot, respectively.

Existing Surface elevations within the proposed construction area reportedly range from approximately 865 feet Mean Sea Level (MSL) to 857 feet MSL, generally sloping downwards from southeast to northwest. As the site has been previously graded, we anticipate minimal additional earthwork grading will be required.

The majority of the existing site consists as a relatively level graded building pad which has been covered by crushed aggregate. Areas away from the building pad consists of forest with some underbrush. The site is bounded to the north by Melton Valley Haul Road.

1.3 SCOPE OF STUDY

This geotechnical exploration involved a site reconnaissance, field drilling, geophysical testing, laboratory testing, and engineering analysis. The following sections of this report present discussions of the field exploration, site conditions, and conclusions and recommendations. Following the text of this report, Appendix A presents figures and test boring records.

The scope of our geotechnical engineering services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on, or below, or around this site. Statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

2.0 EXPLORATION AND TESTING PROGRAMS

2.1 FIELD EXPLORATION

The site subsurface conditions were explored by drilling six (6) soil test borings. The borings were located in the field by GEOServices personnel using the provided site plan and a hand-held GPS unit.

The soil test borings were drilled on June 27, 2022 using 3¼-inch hollow stem augers and a Geoprobe 6620 track mounted drill rig. The approximate locations of the soil test borings are shown on Figure 2 of Appendix A of this report. Detailed logs for soil test borings can also be found in Appendix A. The depths referenced in this report were those that existed at the time of the exploration. The elevations shown on the logs and referenced in this report were obtained by interpolation using the provided topographic drawing and should be considered approximate.

Within each boring, Standard Penetration Testing (SPT) and split-spoon sampling were performed on 2½-foot intervals in the upper 10 feet and on 5-foot centers thereafter. SPT and split-spoon sampling were performed in accordance with ASTM D 1586.

In split-spoon sampling, a standard 2-inch O.D. split-spoon sampler is driven into the soil at the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the last 12 inches of the standard 18 inches of total penetration (or second and third 6-inch increments when sampling 24 inches) is recorded as the SPT resistance (N-value). These N-values are indicated on the boring logs at the test depth and provide an indication of the consistency or relative density of the soil.

The samples recovered from the borings were visually-manually classified in the field in general accordance with the Unified Soil Classification System (USCS – ASTM D 2487) by a GEOServices geotechnical professional.

2.2 LABORATORY TEST PROGRAM

After completion of the field drilling and sampling phase of this project, the soil samples were returned to our laboratory. Select samples were then tested for moisture content (ASTM D 2216) and Atterberg limits (ASTM D 4318). The laboratory testing was ongoing as of this report and the results will be provided under transmittal cover letter once completed.

2.3 PERCOLOATION TESTING

Preliminary percolation testing was performed in two areas at the site which were identified as potential locations for on-site septic systems. The locations were identified in the field by GEOServices personnel using the provided drawing and a handheld GPS unit. The approximate test locations are shown on Figure 2 in Appendix A.

The percolation tests were performed by first auguring a total of four holes, approximately 6 inches in diameter, to a depth of about 4 feet below the existing ground surface. Each hole was measured for depth and soil samples were retrieved for lab testing. Measures were taken to prepare each hole for the percolation testing. After this, they were then filled with approximately 2 inches of fine gravel and filled with one foot of water. This water was required to soak the testing hole for 24 hours and saturate the soil. The following day GEOServices personnel went back into the field to prepare each hole for the measurement recordings. The tested holes are required to have six inches of water to begin recording percolation readings, so each hole was cleaned out from any settled debris and refilled with six inches of water.

Once readings begin, the depth of water is recorded every 30 minutes for a 4-hour time period. This was performed for every hole other than P-2. This hole was omitted due to collapsing during the 24-hour soaking period. Once all readings were recorded, the holes were then backfilled using soil cuttings. The data for these results were analyzed and percolation calculations were preformed to determine the rates of the test holes. As a general standard, the ideal passing rate on a percolation test ranges from 3 to 60 minutes per inch (mpi). The lower in value the rate is, the faster water percolates through the given soil. The higher in value the rate is, the slower the water percolates through the given soil. From our testing, we determined the average percolation rates for the two areas tested ranged from 200 mpi to 508 mpi. This would indicate that water does not soak and percolate through the soil at a rate fast enough to support a typical septic system.

3.0 SUBSURFACE CONDITIONS

3.1 GEOLOGIC CONDITIONS

The project site, as most of East Tennessee, lies in the Appalachian Valley and Ridge Physiographic Province. The Province is characterized by elongated, northeasterly-trending ridges formed on highly resistant sandstones and shales. Between ridges, broad valleys and rolling hills are formed primarily on less resistant limestones, dolomites and shales.

Published geologic information indicates that the site is underlain by bedrock from the Nolichucky Shale Formation of the Conasauga Group. This formation is primarily composed of thin-bedded shale and calcareous siltstone with minor amounts of limestone. The Nolichucky Shale Formation typically weathers to produce a reddish-brown or faintly green shaly soil containing red clay from limestone units.

The boundary between soil and rock is not sharply defined in this geologic setting and there often is a transitional zone, termed "weathered rock" overlying competent bedrock. Weathering is facilitated by fractures, joints, and the presence of less resistant rock types. Consequently, the profile of the weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and boulders of hard rock and/or zones of weathered rock within the soil mantle well above the general bedrock level.

Since the site is underlain by carbonate bedrock, the site is susceptible to the typical carbonate hazards

of irregular weathering, cave and cavern conditions, and overburden sinkholes. Carbonate rock, while appearing very hard and resistant, is soluble in slightly acidic water. This characteristic, plus differential weathering of the bedrock mass is responsible for these hazards. Of these hazards, the occurrence of sinkholes is potentially the most damaging to overlying soil-supported structures. Sinkholes occur primarily due to differential weathering of the bedrock mass and flushing of overburden soil into the cavities within the bedrock. This loss of solids creates a cavity, or dome, within the overburden. Growth of the cavity over time, or excavation over the dome, can create a condition in which rapid subsidence, or collapse, of the roof of the dome occurs. Such a feature is termed a sinkhole.

A certain degree of risk with respect to sinkhole formation and subsidence should be considered at any site located within geologic settings containing carbonate rock. A rigorous effort to assess the potential for sinkhole development at this site was beyond our scope of services; however, no indications of sinkhole formation were observed along the ground surface nor obvious indications of karst activity encountered in the borings. No closed depressions, which are indicative of past sinkhole activity, were observed on the United States Geological Survey (USGS – Bethel Valley Quadrangle, TN) topographic map in the immediate vicinity of this site.

It is our opinion that the risk of sinkhole development at this site is no greater than at other sites located within similar geologic settings which have been developed successfully. However, the owner must be willing to accept the low risk of sinkhole development at this site. The risk of sinkhole development can be somewhat reduced by following the recommendations provided in the *Sinkhole Corrective Actions* section of this report.

3.2 SOIL STRATIGRAPHY

The following subsurface description is of a generalized nature to highlight the subsurface stratification features and material characteristics at the boring locations. The boring logs included in Appendix A of this report should be reviewed for specific information at each boring location. Information on actual subsurface conditions exists only at the specific boring locations and is relevant only to the time that this exploration was performed. Variations may occur and should be expected at the site.

Surficial

The borings typically encountered 12 inches of crushed aggregate (gravel) at the ground surface.

Existing Fill Soil

Fill soils were encountered to depths of approximately 3 feet below the existing ground surface in borings B-1 through B-3. Fill is a material which has been transported and placed by man and machine. The fill samples recovered were manually classified as brown, black, yellowish brown and reddish brown lean (lower plasticity) clay soils. The fill contained some gravel, sand and trace organics.

The SPT N-values within the fill ranged from 5 to 8 blows per foot (bpf). These N-vales correspond to soil consistencies of firm.

Residual Soil

Residual soils were encountered underlying the fill in the aforementioned borings and surficial gravel in boring B-5. Residual soils are formed from the in-place weathering of the parent bedrock. The residual soils were manually classified as brown, black and yellowish brown lean clays. The residual soils possessed the relict bedding pattern of the parent shale bedrock.

The SPT N-values within the residual soil ranged from 8 to 20 bpf, indicating a consistency of firm to very stiff.

Weathered Rock

Weathered rock was encountered in each of the borings of this exploration. The weathered rock was encountered at depths ranging from 1 to 9.5 feet below the existing ground surface (elevation 851 to 862.5 feet MSL). The weathered rock was sampled as varying shades of brown and gray shale fragments with zones of lean clay. Thin lenses of limestone were also occasionally noted within the weathered rock interval.

The SPT N-values within the weathered rock ranged from 4 bpf to 50 blows for 1 inch of penetration (50/1"). The soft zone was encountered from about 8 to 12 feet below the existing ground surface in boring B-5.

Auger Refusal

Materials sufficiently hard to cause refusal to the power auger were encountered in each of the borings at depths ranging from 10.3 to 14.1 feet below the existing ground surface. These depths correspond to elevations of 846.5 to 853.2 feet MSL. Table 1 provides the depth to auger refusal at each of the boring locations. Refusal at this site could indicate rock pinnacles, ledges or boulders or the upper surface of bedrock.

Ground Water

Groundwater was not encountered in the borings at the time of drilling. We note that stabilized water levels can sometimes be difficult to obtain as the encountered soils are known to be relatively impermeable. In addition, each boring was backfilled upon completion in consideration of safety so delayed water levels were not recorded.

It is possible for groundwater to exist within the depths explored during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the overburden materials or at the soil to rock or weathered rock interface. The groundwater information presented in this report is the information that was collected at the time of our field activities.

Table 1 – Boring Summary Information

Boring	Ground Surface Elevation	Existing Fill Depth	Weathered Rock Depth	Weathered Rock Elevation	Auger Refusal Depth	Auger Refusal Elevation
B-1	859	3	8	851	12.5	846.5
B-2	861	3	8	853	12	849
B-3	862	3	9.5	852.5	12.3	849.7
B-4	862.5	NE	1	861.5	12.2	850.3
B-5	863	NE	3	860	14.1	848.9
B-6	863.5	NE	1	862.5	10.3	853.2

Note: Depths in feet below ground surface and elevations in Mean Sea Level. Elevations interpolated from the provided topographic drawing and should be considered approximate. NE – Not Encountered

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 SITE ASSESSMENT

Based on the results of our geotechnical exploration, it is our opinion that the site is generally adaptable for the proposed construction. However, certain geotechnical related challenges are present which will affect development of the site. These challenges include the presence of existing fill and the potential for excavation difficulty.

4.1.1 Existing Fill

Existing fill soils were encountered to depths of approximately 3 feet below the existing ground surface in borings B-1 through B-3. The fill soils were relatively free of deleterious materials and, where sampled, of firm consistency. Given the presence of the existing fill, we recommend careful observation and testing at the time of construction. Testing of the soils exposed in shallow foundation excavations as well as proofrolling of the soils at the subgrade elevation is discussed in this report. Undercutting and replacement to correct foundation and subgrade support conditions will be required where soft or otherwise unsuitable fill soils are encountered.

4.1.2 Difficult Excavation

Weathered rock was encountered in each of the borings of this exploration. The weathered rock was encountered at depths ranging from 1 to 9.5 feet below the existing ground surface (elevation 851 to 862.5 feet MSL). Materials sufficiently hard to cause refusal to the power auger were encountered in each of the borings at depths ranging from 10.3 to 14.1 feet below the existing ground surface. These depths correspond to elevations of 846.5 to 853.2 feet MSL. Based on our understanding of the project, it appears the depths where the auger refusal materials were encountered will generally be below proposed finished grades; however, deeper confined excavations such as for utilities could encounter weathered rock or refusal materials.

Where excavations extend to depths where auger refusal was encountered in the borings, then excavation difficulty should be anticipated. The removal of rock at sites such as this will typically require the use of pneumatic hammers (hoe ram) or ripping. The removal of weathered rock or rock in confined excavations, such as for utilities, can often be extremely difficult and require the use of pneumatic hammers.

4.2 SITE PREPARATION RECOMMENDATIONS

4.2.1 Subgrade

The area of the proposed building and pavements has been previously graded and covered in crushed aggregate. If construction is to occur in areas outside the prepared pad area, then stripping will be required. Site stripping, where required, should include the removal of vegetation, topsoil, unsuitable fill, rock and fragments greater than 6 inches. The stripping operations should extend a minimum of 5 feet beyond the limits of proposed pavement areas and 10 feet beyond building footprints. These areas should be observed by a geotechnical engineer upon grading to confirm the recommendations in this report are followed.

After the completion of stripping operations and excavation to reach the planned subgrade elevation, we recommend that the subgrade be proofrolled with a fully-loaded, tandem-axle dump truck or other pneumatic-tired construction equipment of similar weight. The geotechnical engineer or his representative should observe proofrolling. Areas judged to perform unsatisfactorily (e.g., pumping and/or rutting) by the engineer should be undercut and replaced with structural soil fill or remediated at the geotechnical engineer's recommendation. Areas to receive structural soil fill should also be proofrolled prior to the placement of new fill. Proofrolling operations should extend a minimum distance of 10 feet beyond the building perimeter and 5 feet beyond pavement areas.

4.2.2 Structural Soil Fill

If variably weathered shale or other degradable rock materials are to be used as engineered fill, it is imperative this material be reduced to a soil/gravel gradation during compaction. If the material size is not adequately reduced, it may subsequently degrade when exposed to water causing losses in soil volume and strength that could adversely affect the proposed structure.

Material considered suitable for use as structural fill should be clean soil free of organics and other deleterious material, containing no rock fragments greater than 6 inches in dimension. Preferably, structural soil fill material should have a standard Proctor maximum dry density of 90 pounds per cubic foot (pcf), or greater, and a PI value of 35 percent, or less. The material to be used as structural fill should be tested by the geotechnical engineer to confirm that it meets the project requirements before being placed. The existing site soils which are free of excessive deleterious materials appear suitable for reuse as new fill; however,

moisture conditioning will likely be required to reach the range of moisture contents recommended for compaction.

Structural fill should be placed in loose, horizontal lifts not exceeding 8 inches in thickness. Each lift should be compacted to at least 98 percent of the soil's maximum dry density per the standard Proctor method (ASTM D 698) and within the range of minus (-) 2 percent to plus (+) 3 percent of the optimum moisture content. Each lift should be tested by geotechnical personnel to confirm that the contractors' method is capable of achieving the project requirements before placing subsequent lifts. Areas which have become soft or frozen should be removed before additional structural fill is placed.

4.2.3 Dense Graded Aggregate

Dense Graded Aggregate (DGA) fill may be used as backfill in undercut excavations and in utility trench excavations. The DGA used for this section should be Type A and Grading D or E in accordance with Section 903.05 of the Tennessee Department of Transportation (TDOT) specifications. The DGA fill should be placed in loose, horizontal lifts not exceeding 8 inches in loose thickness. Each lift should be compacted to at least 98 percent of maximum dry density per the standard Proctor method (ASTM D 698). Each lift should be compacted, tested by geotechnical personnel and approved before placing subsequent lifts.

4.3 FOUNDATION RECOMMENDATIONS

4.3.1 Shallow Foundations

Foundations for the proposed construction are expected to bear in new structural soil fill or firm, or better residual soils which have been tested and approved as recommended. The recommended allowable soil bearing pressure for the design of the foundations is 2,000 pounds per square foot (psf). Undercutting and replacement of lower consistency soils will be required if encountered at the foundation bearing elevation.

We recommend that continuous foundations be a minimum of 18 inches wide and isolated spread footings be a minimum of 24 inches wide to reduce the possibility of a localized punching shear failure. Exterior foundations should be designed to bear at least 18 inches below finished exterior grade to develop the design bearing pressure and to protect against frost heave.

The available lateral capacity of shallow foundations includes a soil lateral pressure and coefficient of friction as described in the IBC, Section 1806. Footings will be embedded in material similar to those described as Class 5 in Table 1806.2. Where footings are cast neat against the sides of excavations, an allowable lateral bearing pressure of 100 psf per foot depth below natural grade may be used in computations. Resistance to lateral sliding represented by a value of adhesion of 130 psf may be used for clays similar to those described as soil Class 5. An increase of one-third in the allowable lateral capacity may be considered for transient load combinations, including wind or earthquake, unless otherwise restricted by design code provisions.

A geotechnical representative should be retained to perform foundation subgrade tests to confirm that the recommendations provided in this report are consistent with the site conditions encountered. A dynamic cone penetrometer (DCP) is commonly utilized to provide information that is compared to the data obtained in the geotechnical report. Where unacceptable materials are encountered, the material should be remediated at the geotechnical engineer's direction.

Based on the results of the geotechnical exploration and our analyses, we estimate maximum total and differential foundation settlements of less than 1-inch and ½ of an inch, respectively. The settlement values were estimated considering maximum column and continuous wall foundation loads on the order of 75 kips and 3 kips per linear foot (kpf), respectively, and an allowable bearing pressure of 2,000 psf. Additionally, this information assumes that the site is prepared in accordance with our recommendations provided in this report. If, during the design of the building, these parameters are determined to be incorrect, we should be notified to reevaluate the settlements for the building.

4.3.2 Slabs-on-Grade

Following the recommended site preparation activities, it is our opinion that the floor slab can be grade supported on structural soil fill materials or suitable residual soils. Observing proofrolling of the subgrade, as discussed earlier in this report, should be performed to identify soft or unstable soils which should be undercut from the floor slab area prior to fill placement or floor slab construction.

We recommend that a minimum 4-inch thick granular mat be placed beneath the floor slab to enhance drainage and provide a capillary break. The subgrade should be proofrolled and approved prior to the placement of the crushed stone. Based on the conditions encountered on this site, we recommend that the

floor slabs be designed using a subgrade modulus of 100 pounds per cubic inch (pci). This modulus is appropriate for small diameter loads (i.e. a 1ft x 1ft plate) and should be adjusted for wider loads.

4.4 SEISMIC DESIGN CRITERIA

In accordance with the International Building Code (IBC), 2018, we are providing the following seismic design information. After evaluating the SPT N-value data from the soil test borings and considering the changes to the site and foundation types, it was determined that the subsurface conditions at the site most closely matched the description for "Seismic Site Class C" or "Very Dense Soil and Soft Rock Profile". Table 2 provides the spectral response accelerations for both short and 1-second periods, which may be used for design.

Table 2 – Seismic Design Parameters

Structure	S_s g	S_1 g	S_{DS} g	S_{D1} g
GEARS Facility	0.546	0.127	0.467	0.127

The short and 1-second period values indicate the structure should be assigned a Seismic Design Category "C" using the published information. The provided values are based on the results of our field exploration and the assumption that the structure will be designed utilizing a Risk Category I, II or III. If these assumptions are incorrect, we should be contacted to reevaluate the seismic design information.

In accordance with IBC 2018 sections 1803.5.11 and 1803.5.12, we have provided a discussion on the following geologic and seismic hazards: slope instability, liquefaction, total/differential settlement, and surface displacement due to faulting or seismically induced lateral spread or lateral flow.

Liquefaction occurs when soil, primarily saturated cohesionless soils, undergo a loss in strength due to monotonic, transient, or repeated disturbance that commonly occurs during a seismic event (Kramer 1996). This loss of strength occurs due to increased pore water pressures caused by an undrained condition. The increase in pore water pressure decreases the effective stress in the soil, thus reducing the soils ability to support any applied loads. For liquefaction to occur, there must be an increase in pore

pressure meaning the soil must be saturated and be able to behave in an undrained condition. According to the NHI 2011 Reference Manual on LRFD Seismic Analysis and Design of Transportation Geotechnical Features and Structural Foundations, if any of the following criteria are satisfied then a significant liquefaction hazard does not exist:

- The geologic materials underlying the site are either bedrock or have very low liquefaction susceptibility according to the relative susceptibility ratings shown in the Estimated Susceptibility of Sedimentary Deposits to Liquefaction During Strong Ground Motion table presented by Youd and Perkins in 1978.
- The soils below the groundwater table at the site are one of the following:
    - Clayey soils which have a clay content greater than 15%, liquid limit greater than 35%, or natural water content less than 90% of the liquid limit.
    - Sand with a minimum corrected SPT $(N_1)_{60}$ value of 30 blows/foot.
    - The water table is deeper than 50 feet below the ground surface or proposed finished grade at the site.

We note that the borings encountered plastic soils having clay contents above 15 percent and weathered rock. Additionally, based on experience in this geologic region and immediate vicinity of the site, it is our opinion that a liquefaction hazard does not exist for the subject development. As such, we do not expect significant additional total and differential settlement, lateral soil movement, reduction in bearing capacity or lateral soil reaction, permanent increase in soil lateral pressure, or flotation of buried structures in accordance with Sections 1803.5.11 and 1803.5.12 of the 2018 IBC.

We also noted mapped faults on the geologic maps we reviewed for this project vicinity of the site. However, the known faults within the East Tennessee valley are generally ancient, with no known active faults reaching the surface. Therefore, it is our opinion that surface displacement due to faulting or seismically induced lateral spreading or lateral flow, is not a seismic hazard that will affect the subject development. In addition, seismically induced slope instability is also not expected to be a seismic hazard that will affect the subject development.

4.5 LATERAL EARTH PRESSURES

For the design of cast-in-place concrete retaining walls, we have provided equivalent fluid pressures for two backfill conditions for cantilever-type walls. These are 1) active earth pressure for granular backfill (clean sand or gravel) and 2) at-rest earth pressure for granular backfill. The equivalent fluid pressures provided have assumed a level backfill and a wall with a vertical face. The designer should confirm other aspects of retaining wall design, including an evaluation of local and global stability, with respect to the proposed walls and site design.

The provided parameters should not be used for the design of other wall types, such as walls that will retain in-situ materials. Alternative wall types such as mechanically stabilized earth (MSE), soldier pile or others should be designed by a specialty contractor or proprietary wall manufacturer. No other information has been provided at this time regarding the use of retaining walls.

Condition 1 - The active earth pressure for granular backfill will result in an equivalent fluid pressure of 35 pounds per cubic foot (pcf). If the granular backfill is to develop active earth pressure conditions, walls must be flexible and/or free to rotate or translate at the top approximately one inch laterally for every 20 feet of wall height.

Condition 2 - The at-rest earth pressure for granular backfill will result in an equivalent fluid pressure of 55 pcf. For retaining walls that will not rotate or translate, such as building walls or other walls rigidly connected to structures, at-rest conditions will develop.

The wedge of clean aggregate backfill should have a minimum width of 1 foot at the base of the wall or the width of the footing heel, whichever is greater, and increase in width a minimum of 0.6 feet per foot of wall height. The aggregate should be fully encapsulated with a properly designed geotextile (filter fabric) to prevent migration of the adjacent soils into the aggregate. Aggregate placed behind the retaining wall should be placed in accordance with the compaction recommendations of this report. However, we caution that operating compaction equipment directly behind the wall can create lateral earth pressures far in excess of those recommended for design. Therefore, we recommend using hand operated, smaller compaction equipment in non-vibratory modes within 5 feet of the front of the wall.

For rigid, cast-in-place concrete walls, an ultimate friction factor of 0.35 between foundation concrete and the bearing soils may be used when evaluating friction. Also, an ultimate passive earth pressure resistance of well-compacted soil fill can be approximated by a uniformly acting resistance of 1,000 psf. However, to limit deformation when relying on passive strength, we recommend using a minimum safety factor of 3.0 applied to the ultimate passive resistance value.

4.6 PAVEMENT DESIGN RECOMMENDATIONS

Following site preparation as previously recommended, the pavements can be grade supported on suitable residual soils or structural soil fill. Proofrolling of the subgrade be performed to identify soft or unstable soils which should be undercut from the pavement area prior to fill placement or pavement construction.

4.6.1 Flexible Pavement Design

AASHTO flexible pavement design methods have been utilized for pavement recommendations. Our recommendations are based on the assumptions that the subgrade has been properly prepared as described previously which will require subgrade stabilization to improve support conditions at this site. Based on our experience with similar developments, we recommend the following light and heavy-duty flexible pavement sections:

Table 3 - Flexible Pavement Recommendations

Pavement Materials	Light-Duty (in)	Heavy-Duty (in)
Bituminous Asphalt Surface Mix	1.5	1.5
Bituminous Asphalt Base Mix	2.0	3.0
Compacted Crushed Aggregate Base	6.0	8.0

For reference, the light-duty section is expected to support approximately 28,000 18-kip Equivalent Single Axle Loads (ESAL) over a period of 20 years, while the heavy-duty section is expected to support 148,000 ESAL over the same period. We recommend the light-duty section only be used in areas where semi-tractor trailer or other loaded truck traffic is not anticipated. These values assume a California Bearing Ratio (CBR) of 3 will be representative of the subgrade conditions.

We recommend a base stone equivalent to a Type A and Grading D in accordance with Section 903.05 of the TDOT specifications. The bituminous asphalt pavement should be Grading "E" as per Section 411 for the surface mix and Grading "BM" as per section 307 for the binder mix. Compaction requirements for the crushed aggregate base and the bituminous asphalt pavement should generally follow TDOT specifications.

4.6.2 Rigid Pavement Design

AASHTO rigid pavement design methods have been utilized for the rigid pavement recommendations. In areas of trash dumpster pads or areas where large trucks will traverse, we recommend the use of a concrete pavement section. Our recommendations are based on the assumptions that the subgrade has been properly prepared. Based on our experience with similar developments, we recommend the following rigid pavement section:

Table 4 - Rigid Pavement Recommendations

Pavement Materials	Light-Duty (in)	Heavy-Duty (in)
4,000 psi Type I Concrete	6.0	8.0
Compacted Crushed Aggregate Base	4.0	6.0

The concrete for rigid pavement should be air-entrained and have a minimum flexural strength (third point loading) of 550 pounds per square inch (psi) which could likely be achieved by a concrete mix having a compressive strength of at least 4,000 psi at 28 days. As part of the bid package, the contractor should submit a concrete mix design for the pavement concrete which includes laboratory test data to verify that the mix can produce a flexural strength of 550 psi.

Concrete should be reinforced with welded wire fabric or reinforcing bars to assist in controlling cracking from drying shrinkage and thermal changes. Sawed or formed control joints should be included for each 150 square feet of area or less (about 12 feet by 12 feet). Saw cuts should not cut through the welded wire fabric or reinforcing steel and dowels should be utilized at formed and/or cold joints.

4.6.3 General

Our recommendations are based upon the assumption that the subgrade has been properly prepared as described in previous sections and that if used, off-site soil borrow to be used to backfill to the final subgrade meets the requirements of the structural fill section.

The paved areas should be constructed with positive drainage to direct water off-site and to minimize surface water seeping into the pavement subgrade. The subgrade should have a minimum slope of 1 percent. In down grade areas, the basestone should extend through the slope to allow water entering the basestone to exit. For rigid pavements, water-tight seals should also be provided at formed construction and expansion joints.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 FOUNDATION CONSTRUCTION

Foundation excavations should be opened, the subgrade evaluated, remedial work performed (if required), and concrete placed in an expeditious manner. Exposure to weather often reduces foundation support capabilities, thus necessitating remedial measures prior to concrete placement. It is also important that proper surface drainage be maintained both during construction (especially in terms of maintaining dry footing trenches) and after construction. Soil backfill for footings should be placed in accordance with the recommendations for structural fill presented herein.

5.2 EXCAVATIONS

Weathered rock was encountered in each of the borings of this exploration. The weathered rock was encountered at depths ranging from 1 to 9.5 feet below the existing ground surface (elevation 851 to 862.5 feet MSL). Materials sufficiently hard to cause refusal to the power auger were encountered in each of the borings at depths ranging from 10.3 to 14.1 feet below the existing ground surface. These depths correspond to elevations of 846.5 to 853.2 feet MSL. Where excavations extend to where auger refusal was encountered in the borings then excavation difficulty should be anticipated.

Typically, soils penetrated by augers can be removed with conventional earthmoving equipment. However, excavation equipment varies, and field refusal conditions may vary. Generally, the weathering process is erratic and variations in the rock profile can occur in small lateral distances. It is, therefore, possible that some partially weathered rock, rock boulders, pinnacles or ledges requiring difficult excavation techniques may be encountered at more shallow depths between our boring locations. The materials on which the borings of this exploration refused will likely require the use of heavy excavation equipment using rippers or pneumatic hammers (hoe-ram) for removal. Confined excavations in weathered rock materials can also be difficult to remove using conventional excavation equipment and the use of pneumatic hammers may be required.

Based on our understanding of the project, it appears the depths where the auger refusal materials were encountered will generally be below proposed finished grades; however, deeper confined excavations such as for utilities could encounter weathered rock or refusal materials.

Excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service, and under no circumstances should GEOServices be assumed responsible for construction site safety.

5.3 MOISTURE SENSITIVE SOILS

The plastic fine-grained soils encountered at this site will be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Construction traffic patterns should be varied to prevent the degradation of previously stable subgrade. In addition, the soils at this site which become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. We caution if site grading is performed during the wet weather season; increases in the undercut volumes should be expected.

Further for site fills, methods such as discing and allowing the material to dry will be required to meet the required compaction recommendations. It will, therefore, be advantageous to perform earthwork and

foundation construction activities during dry weather. However, November through March is typically the difficult grading period due to the limited drying conditions which exist.

5.4 DRAINAGE AND SURFACE WATER CONCERNS

To reduce the potential for additional undercut and construction induced sinkholes, water should not be allowed to collect in the foundation excavations, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, subsurface water, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slab. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

5.5 SINKHOLE RISK REDUCTION AND CORRECTIVE ACTIONS

Based on our experience, corrective actions can also be performed to reduce the potential for sinkhole development at this site. These corrective actions would decrease but not eliminate the potential for sinkhole development. Much can be accomplished to decrease the potential of future sinkhole activity by proper grade selection and positive site drainage.

In general, the portions of a site that are excavated to achieve the desired grades will have a higher risk of sinkhole development than the areas that are filled, because of the exposure of relic fractures in the soil to rainfall and runoff. On the other hand, those portions of a site that receive a modest amount of fill (or that have been filled in the past) will have a decreased risk of sinkhole development caused by rainfall or runoff because the placement of a cohesive soil fill over these areas effectively caps the area with a relatively impervious "blanket" of remolded soil. Therefore, the recommendations that follow incorporate a modest remedial treatment program designed to make the surface of the soil in excavated areas less permeable.

Although it is our opinion that the risk of ground subsidence associated with sinkhole formation cannot be eliminated, we have found that several measures are useful in site design and development to reduce this potential risk. These measures include:

- Maintaining positive site drainage to route surface waters well away from structural areas both during construction and for the life of the structure.
- The scarification and re-compaction of the upper 6 to 10 inches of soil in earthwork cut areas.
- Verifying that subsurface piping beneath structures is carefully constructed and pressure tested prior to its placement in service.
- The use of pavement or geosynthetic clay lined ditches, particularly in cut areas, to collect and transport surface water to areas away from structures.

Site grades in areas prone to sinkhole development should provide positive surface drainage of water away from proposed building and parking areas both during and after construction. The risk of sinkhole development will be greater if water is allowed to pond. Backfill in utility trenches or other excavations should consist of compacted, well-graded material such as dense graded aggregate or compacted on site soils. The use of an open graded stone (such as No. 57 stone) is not recommended unless the stone backfill is provided an exit path and not allowed to pond. If sinkhole conditions are observed, the type of corrective action is most appropriately determined by GEOServices on a case by case basis.

6.0 LIMITATIONS

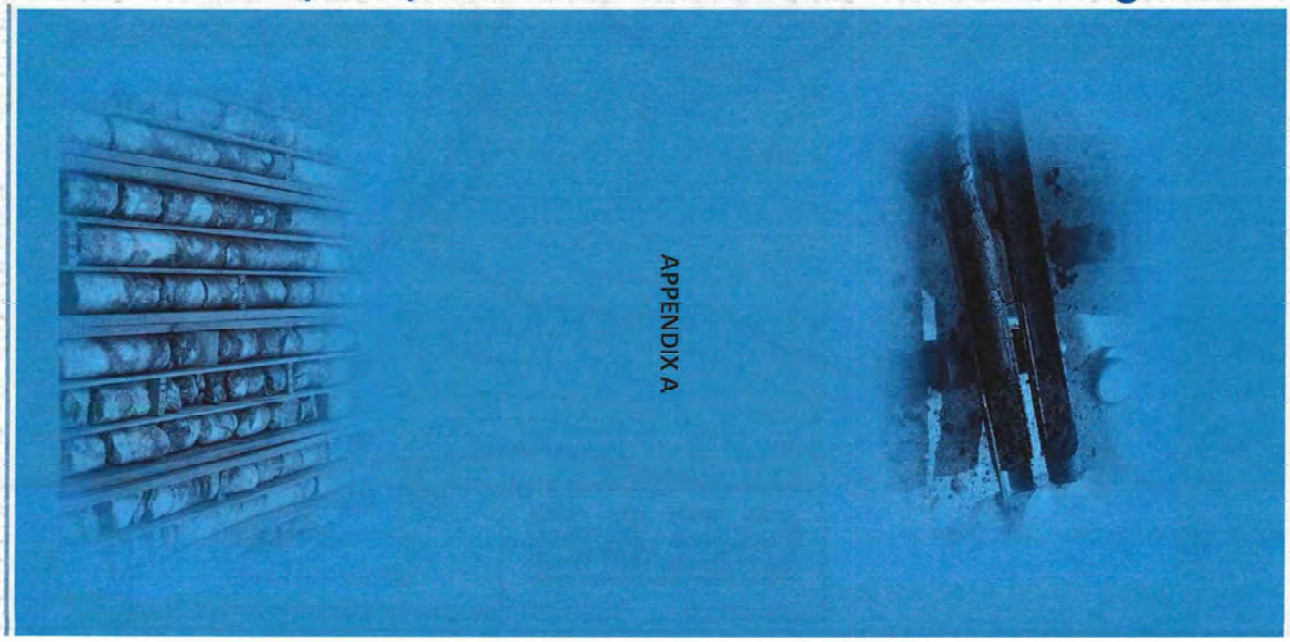
This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. This report is for our geotechnical work only, and no environmental assessment efforts have been performed. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the exploration. The nature and extent of variations between the borings will not become evident until construction. We recommend that GEOServices be retained to observe the project construction in the field. GEOServices cannot accept responsibility for conditions which deviate from those described in this report if not retained to perform construction observation and testing. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location

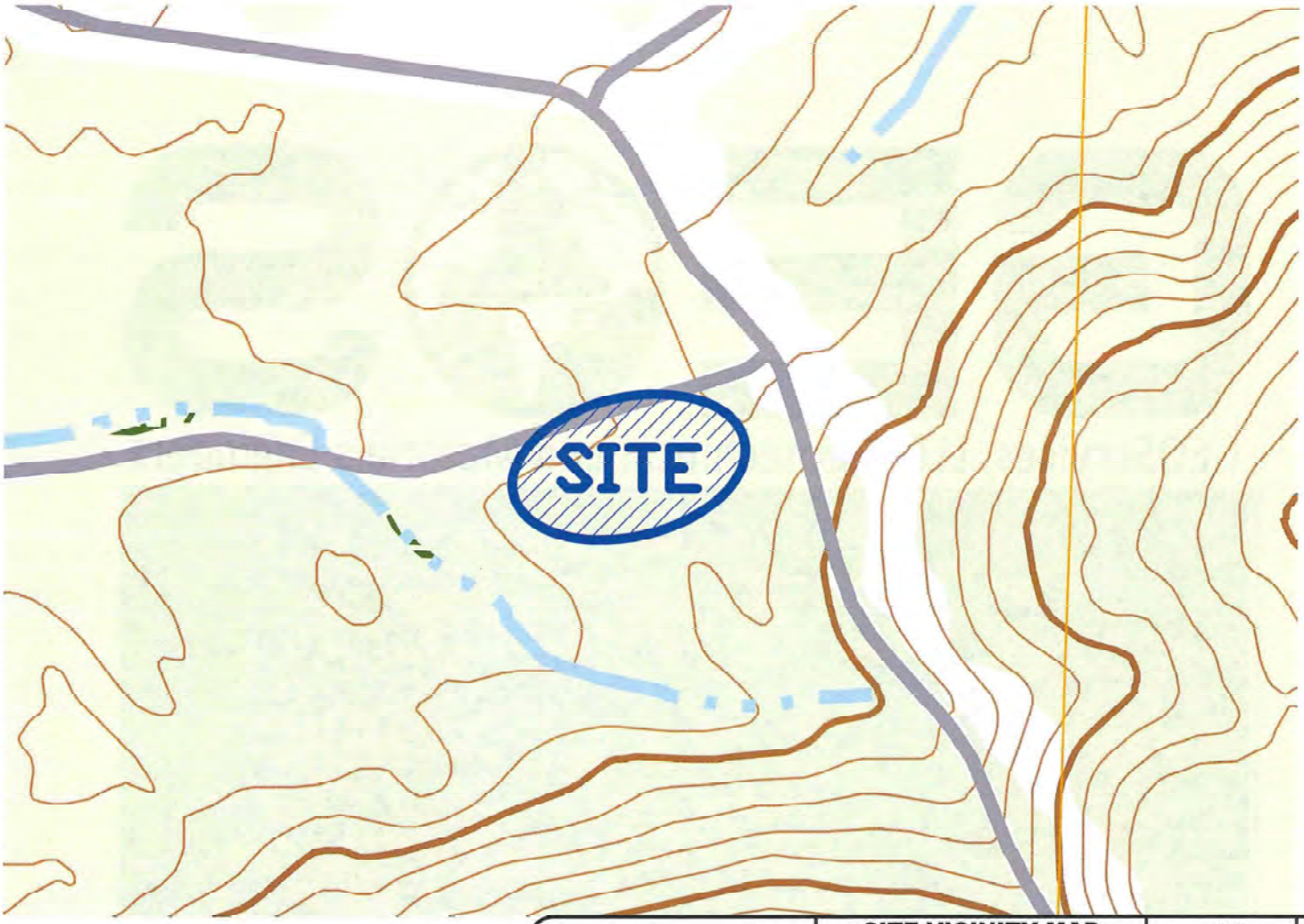
of the structures are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed, and conclusions modified or verified in writing. Also, if the scope of the project should change significantly from that described herein, these recommendations may need to be re-evaluated.

GEOS

GEOServices, LLC, Geotechnical and Materials Engineers



APPENDIX A



NOTES:

1.) BASE MAP: USGS QUADRANGLE (BETHEL VALLEY, TENNESSEE)

GEOS
GEOServices, LLC, Geotechnical and Materials Engineers
2561 Willow Point Way
Knoxville, Tennessee 37931
Office: 865-539-8242
Fax: 865-539-8252

SITE VICINITY MAP

PROPOSED ORNL

GEARS BUILDING

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN 37830

DRAWN BY:	KSR
APPROVED BY:	MBH
SCALE:	N.T.S.
JOB NO.:	21-Z2875
DATE:	7/5/22

FIGURE 1

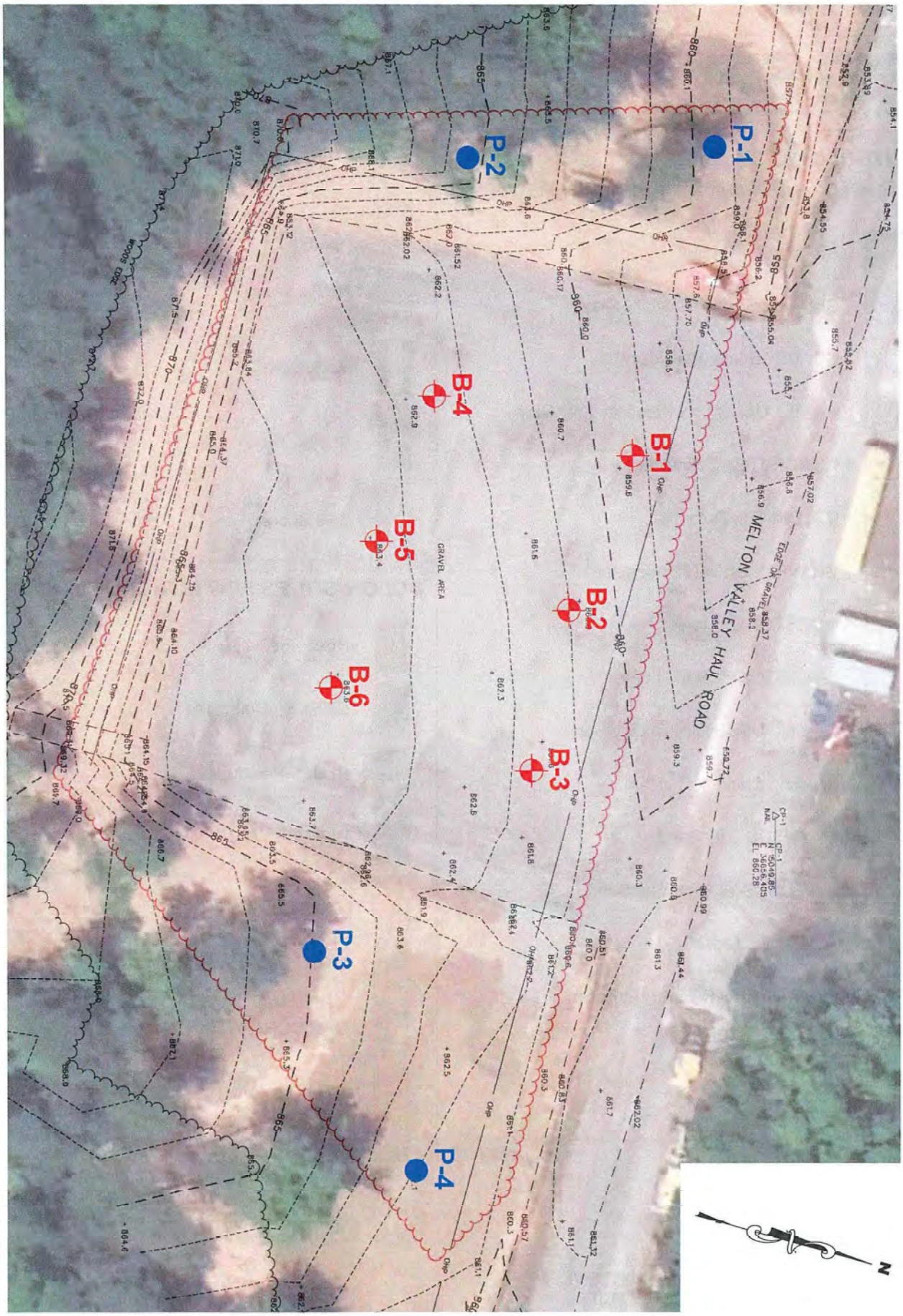


Figure 2

GEOServices, LLC, Geotechnical and Materials Engineers

7581 Willow Point Way, Knoxville, Tennessee 37921 | Office: 865-938-8783 | Fax: 865-938-8231

DRAWN BY:	KSR
APPROVED BY:	MBH
SCALE:	N.T.S.
JOB NO.:	21-22875
DATE:	6/10/22

SOIL TEST BORING LOCATION PLAN

PROPOSED ORNL GEARS BUILDING

OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TN 37830

NOTES:

1.) BORING AND PERCOLATION LOCATIONS ARE SHOWN IN GENERAL ARRANGEMENT ONLY.
2.) DO NOT USE BORING OR PERCOLATION LOCATIONS FOR DETERMINATIONS OF DISTANCES OR QUANTITIES.
3.) BASE MAP PROVIDED BY: Barge Design Solutions

LOCATION OF SOIL TEST BORINGS
LOCATION OF PERCOLATION TEST

GEOServices, LLC, Geotechnical and Materials Engineers

KEY TO SYMBOLS

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

- ASPHALT: Asphalt
- CH: USCS High Plasticity Clay
- CL: USCS Low Plasticity Clay
- CL-ML: USCS Low Plasticity Silty Clay
- CONCRETE: Concrete
- DOLOMITE: Dolomite
- GRAVEL: Gravel / Basestone
- LIMESTONE: Limestone
- SANDSTONE: Sandstone
- SC-SM: USCS Silty Clayey Sand
- SHALE: Shale
- SM: USCS Silty Sand
- SW: USCS Well-graded Sand
- TOPSOIL: Topsoil
- WEATHERED ROCK: Bedrock

SAMPLE SYMBOLS

- Grab Sample
- No Recovery
- Rock Core
- Shelby Tube
- Split Spoon
- AUGER: Auger Probe

COLOR CODES FOR LITHOLOGIC SYMBOLS

- RED: Fill
- GREEN: Cultivated
- BLUE: Residuum
- PURPLE: Alluvium
- PINK: Colluvium
- LIGHT GRAY: Weathered Rock
- DARK GRAY: Rock Core
- YELLOW: Void

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)
TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION
▽ Water Level at Time Drilling, or as Shown
▼ Water Level at End of Drilling, or as Shown
▼ Water Level After 24 Hours, or as Shown

GENERAL NOTES

FINE AND COARSE GRAINED SOIL PROPERTIES

PARTICLE SIZE

BOULDERS:	GREATER THAN 300 mm
COBBLES:	75 mm to 300 mm
GRAVEL:	4.74 mm to 75 mm
COARSE SAND:	2 mm to 4.74 mm
MEDIUM SAND:	0.425 mm to 2 mm
FINE SAND:	0.075 mm to 0.425 mm
SILTS & CLAYS:	LESS THAN 0.075 mm

COARSE GRAINED SOILS (SANDS & GRAVELS)

N-VALUE	RELATIVE DENSITY
0 - 4	VERY LOOSE
5 - 10	LOOSE
11 - 30	MEDIUM DENSE
31 - 50	DENSE
OVER 50	VERY DENSE

FINE GRAINED SOILS (SILTS & CLAYS)

N-VALUE	CONSISTENCY	Qu, PSF
0 - 2	VERY SOFT	0-500
3 - 4	SOFT	500 -1000
5 - 8	FIRM	1000 - 2000
9 - 15	STIFF	2000 - 4000
16 - 30	VERY STIFF	4000 - 8000
OVER 31	HARD	8000 +

STANDARD PENETRATION TEST (ASTM D1586)

THE STANDARD PENETRATION TEST AS DEFINED BY ASTM D1586 IS A METHOD TO OBTAIN A DISTURBED SOIL SAMPLE FOR EXAMINATION AND TESTING AND TO OBTAIN RELATIVE DENSITY AND CONSISTENCY INFORMATON. THE 1.4 INCH I.D./2.0 INCH O.D. SAMPLER IS DRIVEN 3-SIX INCH INCREMENTS WITH A 140-LB. HAMMER FALLING 30 INCHES. THE BLOW COUNTS REQUIRED TO DRIVE THE SAMPLER THE FINAL 2 INCREMENTS ARE ADDED TOGETHER AND DESIGNATED THE N-VALUE. AT TIMES, THE SAMPLER CAN NOT BE DRIVEN THE FULL 18 INCHES. THE FOLLOWING REPRESENTS OUR INTERPRETATION OF THE STANDARD PENETRATION TEST WITH VARIATIONS.

BLOWS/FOOT (N-VALUE)	DESCRIPTION
25	25 BLOWS DROVE SAMPLER 12" AFTER INITIAL 6" SEATING
75/10"	75 BLOWS DROVE SAMPLER 10" AFTER INITIAL 6" SEATING
50/PR	PENETRATION REFUSAL OF SAMPLER AFTER INITIAL 6" SEATING

SAMPLING SYMBOLS

ST:	UNDISTURBED SAMPLE
SS:	SPLIT SPOON SAMPLE
CORE:	ROCK CORE SAMPLE
AU:	AUGER OR BAG SAMPLE

SOIL PROPERTY SYMBOLS

N:	STANDARD PENETRATION, BPF
M:	MOISTURE CONTENT %
LL:	LIQUID LIMIT %
PI:	PLASTICITY INDEX%
Qp:	POCKET PENETROMETER VALUE, TSF
Qu:	UNCONFINED COMPRESSIVE STRENGTH, TSF
DUW:	DRY UNIT WEIGHT, PCF

ROCK PROPERTIES

ROCK QUALITY DESIGNATION (RQD)

PERCENT	QUALITY
90 TO 100	EXCELLENT
75 TO 90	GOOD
50 TO 75	FAIR
25 TO 50	POOR
0 TO 25	VERY POOR

ROCK HARDNES

VERY SOFT:	ROCK DISINTEGRATES OR EASILY COMPRESSES TO TOUCH: CAN BE HARD TO VERY HARD SOIL.
SOFT:	ROCK IS COHERANT BUT BREAKS EASILY TO THUMB PRESSURE AT SHARP EDGES AND IT CRUMBLES WITH FIRM HAND PRESSURE.
MODERATELY HARD:	SMALL PIECES CAN BE BROKEN OFF ALONG SHARP EDGES BY CONSIDERABLE HARD THUMB PRESSURE: CAN BE BROKEN BY LIGHT HAMMER BLOWS.
HARD:	ROCK CAN NOT BE BROKEN BY THUMB PRESSURE, BUT CAN BE BROKEN BY MODERATE HAMMER BLOWS.
VERY HARD:	ROCK CAN BE BROKEN BY HEAVY HAMMER BLOWS.

GEOServices, LLC, Geotechnical and Materials Engineers

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-1

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** ---
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 859 ft **PROPOSED FFE** ---
NORTHING / EASTING ---
REFUSAL Depth 12.5 ft / Elev 846.5 ft
TOP OF ROCK ---
GROUND WATER LEVELS:
BEGAN CORING ---
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 12.5 ft / Elev 846.5 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	859.0		Gravel (12 Inches)						
			(CL) **Lean CLAY** - with gravel, sand and trace organics - brown, black, yellowish brown and reddish brown - moist (FILL)	SS 1		3-3-3 (6)			
			(CL) **Lean CLAY** - with shale-like structure - yellowish brown, brown and black - moist - firm to stiff (RESIDUUM)	SS 2		3-3-5 (8)			
5	854.0			SS 3		4-6-8 (14)			
			Weathered ROCK - shale - yellowish brown, brown, reddish brown and black - slightly moist - stiff (RESIDUUM)	SS 4		4-5-7 (12)			
10	849.0								

Refusal at 12.5 feet.
Bottom of borehole at 12.5 feet.

NOTES:

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-2

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** ---
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 861 ft **PROPOSED FFE** ---
NORTHING / EASTING ---
REFUSAL Depth 12.0 ft / Elev 849.0 ft
TOP OF ROCK ---
GROUND WATER LEVELS:
BEGAN CORING ---
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 12.0 ft / Elev 849.0 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	861.0		Gravel (12 Inches)						
			(CL) **Lean CLAY** - with gravel - brown, black and yellowish brown - moist (FILL)	SS 1		1-2-6 (8)			
5	856.0		(CL) **Lean CLAY** - with shale-like structure - yellowish brown and black - slightly moist - stiff to very stiff (RESIDUUM)	SS 2		3-5-6 (11)			
				SS 3		5-7-10 (17)			
10	851.0		**Weathered ROCK** - shale - yellowish brown, brown, reddish brown and black - slightly moist - very stiff (RESIDUUM)	SS 4		11-9-13 (22)			

Refusal at 12.0 feet.
Bottom of borehole at 12.0 feet.

NOTES:

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-3

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** ---
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 862 ft **PROPOSED FFE** ---
NORTHING / EASTING ---
REFUSAL Depth 12.3 ft / Elev 849.7 ft
TOP OF ROCK ---
GROUND WATER LEVELS:
BEGAN CORING ---
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 12.3 ft / Elev 849.7 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	862.0		Gravel (12 Inches)						
			(CL) **Lean CLAY** - with gravel - brown, gray and black - moist (FILL)	NR 1		2-3-2 (5)			
			(CL) **Lean CLAY** - with shale-like structure - brown, yellowish brown and black - slightly moist - very stiff (RESIDUUM)	SS 2		5-7-9 (16)			
5	857.0			SS 3		10-10-10 (20)			
				SS 4		5-10-19 (29)			
10	852.0		**Weathered ROCK** - shale - brown, reddish brown and gray - slightly moist - very stiff (RESIDUUM)						

Refusal at 12.3 feet.
Bottom of borehole at 12.3 feet.

NOTES:

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-4

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** —
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 962.5 ft **PROPOSED FFE** —
NORTHING / EASTING ---
REFUSAL Depth 12.2 ft / Elev 950.3 ft
TOP OF ROCK —
GROUND WATER LEVELS:
BEGAN CORING —
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 12.2 ft / Elev 950.3 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	962.5		Gravel (12 Inches)						
			Weathered ROCK - shale - brown, reddish brown and yellowish brown - slightly moist - very stiff to stiff (RESIDUUM)	SS 1		9-4-6 (10)			
5	957.5			SS 2		6-6-15 (21)			
				SS 3		4-11-17 (28)			
10	952.5			SS 4		10-9-5 (14)			

Refusal at 12.2 feet.
Bottom of borehole at 12.2 feet.

NOTES:

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-5

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** ---
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 963 ft **PROPOSED FFE** ---
NORTHING / EASTING ---
REFUSAL Depth 14.1 ft / Elev 948.9 ft
TOP OF ROCK ---
GROUND WATER LEVELS:
BEGAN CORING ---
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 14.1 ft / Elev 948.9 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	963.0		Gravel (12 Inches)						
			(CL) **Lean CLAY** - with shale-like structure - brown, yellowish brown and black - slightly moist - stiff (RESIDUUM)	SS 1		2-4-6 (10)			
			Weathered ROCK - shale - brown, black, reddish brown and gray - slightly moist - soft to hard (RESIDUUM)	SS 2		7-10-15 (25)			
5	958.0			SS 3		6-9-10 (19)			
				SS 4		6-1-3 (4)			
10	953.0			SS 5		35-50/1"			

Refusal at 14.1 feet.
Bottom of borehole at 14.1 feet.

NOTES:

GEOServices, LLC, Geotechnical and Materials Engineers

BORING NUMBER B-6

PROJECT NAME Proposed ORNL GEARS Building
GEOServices PROJECT# 21-22875
DATE 6/27/22
PROJECT LOCATION ORNL, Oak Ridge, TN 37830
DRILLING CONTRACTOR M&W Drilling
LOGGED BY KSR **ON-SITE REP.** ---
DRILLING METHOD Geoprobe 6620DT
LATITUDE / LONGITUDE ---
GROUND ELEVATION 963.5 ft **PROPOSED FFE** ---
NORTHING / EASTING ---
REFUSAL Depth 10.3 ft / Elev 953.3 ft
TOP OF ROCK ---
GROUND WATER LEVELS:
BEGAN CORING ---
AT END OF DRILLING --- Dry
FOOTAGE CORED (LF) ---
AFTER 1 HOUR --- Backfilled
BOTTOM OF HOLE Depth 10.3 ft / Elev 953.3 ft
AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
0	963.5		Gravel (12 Inches)						
			Weathered ROCK - shale with limestone lense at depth - gray, brown, black and reddish brown - slightly moist - stiff to very stiff (RESIDUUM)	SS 1		1-4-5 (9)			
				SS 2		9-9-8 (17)			
5	958.5			SS 3		10-10-7 (17)			
				SS 4		1-5-15 (20)			
10	953.5								

Refusal at 10.3 feet.
Bottom of borehole at 10.3 feet.

NOTES:

P&H Contractor Information

Contract for Service
&
Wastewater Disposal Facility Acceptance Approval Letter/Permit

Purchase Order 4000197697

Switch to summary view

General Info

Vendor 237627 FUSION SITE SERVICES	*Order Type* Commercial Items	*Competition Code* NON-COMPETITIVE SB <= $250K	*Date Created* 02/18/2022
Buyer 26 Miracle McCullah	*Buyer Phone* 865-241-1926	*Buyer FAX*	*Buyer E-Mail* 6q0@ornl.gov
Description Porta-Potty Rental		*Print Format* Purchase Order	*Performance Term Incentive* No
Period of Performance 01/21/2022 - 12/31/2023	*Subcontractor-Held Property* No	*Closeout Status* ACTIVE	*License Agreement* No
Incremental Funding Date			

Funded Value:
Total Value: 11,200.00
Option Value:
Total Value Incl Options:

Attachments
None

General Information
Terms and Conditions - Commercial Item Technical Direction The clause, Technical Direction (Jan 2006), is incorporated by reference
and amended as follows: "Performance under this subcontract is subject to the technical direction of the Company's Technical Project
Officer (TPO):" TPO Name.....: Jessica Langstaff TPO Telephone #...:865-241-4752 TPO Email Address.: langstaffjb@ornl.gov COVI
D-19 Related ORNL Site Access Restrictions, Face Coverings on Campus, TPO Guidance, and Travel Restrictions for Work Performed under
UT-Battelle, LLC Agreements (Oct 2020)[2022-02-17T18:27:44Z-nm6]
Porta-Potty Rental

General Provisions
General Terms and Conditions - Commercial Item (CI August 10, 2021)

Item 1. Supply porta-potty and monthly servicing

Expected Deliv Date	Quantity	Unit Price	Extended Price	Material Group
12/31/2023	2,040.000 USD	1.00	2,040.00	10 Rental - Equipuipmen

Goods Recipient/Invoice Approver	Unloading Point/Task Auth.
00962913 Jessica B Langstaff	2519 315

GL Account	WBS Element	IAN
42000650	3126SSCO Sewage Collection (Indirect (not OH))	

Agency	MAC & Responsible Person	IAN Exp. Date
	X03 025506 Jimmy E Stone	

Electrical Item	NRTL-Listed
No	N/A

Tracking No.	Vendor Part No.	Requisition Item	MSDS	Tax Description
		3400347746-00001		Tennessee State Tax - A/P

Inspection Required	Quality - Significant	ES&H Review Required	Invoice Approval Required	Tax Calculation
No	No	Yes	No	Fully Taxable

Qty Received	Value Received	Last Receipt Date	Goods Receipt Indicator

Qty Invoiced	Value Invoiced	Last Invoice Date

Item Text/SOW/Specification
Supply porta-potty and monthly servicing at Hawk's Nest.

Item 2. Supply porta-potty and biweekly servicin

Expected Deliv Date	Quantity	Unit Price	Extended Price	Material Group
12/31/2023	4,080.000 USD	1.00	4,080.00	10 Rental - Equipuipmen

Goods Recipient/Invoice Approver	Unloading Point/Task Auth.
00962913 Jessica B Langstaff	2519 315

GL Account	WBS Element	IAN
42000650	3126SSCO Sewage Collection (Indirect (not OH))	

Agency	MAC & Responsible Person	IAN Exp. Date
	X03 025506 Jimmy E Stone	

Electrical Item	NRTL-Listed
No	N/A

Tracking No.	Vendor Part No.	Requisition Item	MSDS	Tax Description
		3400347746-00002		Tennessee State Tax - A/P

Inspection Required	Quality - Significant	ES&H Review Required	Invoice Approval Required	Tax Calculation
No	No	Yes	No	Fully Taxable

Qty Received	Value Received	Last Receipt Date	Goods Receipt Indicator

Qty Invoiced	Value Invoiced	Last Invoice Date

Item Text/SOW/Specification
Supply porta-potty and biweekly servicing at Melton Valley Steam Plant.

Item 3. Supply porta-potty and biweekly servicin

Expected Deliv Date	Quantity	Unit Price	Extended Price	Material Group
12/31/2023	4,080.000 USD	1.00	4,080.00	10 Rental - Equipuipmen

Goods Recipient/Invoice Approver	Unloading Point/Task Auth.
00962913 Jessica B Langstaff	2519 315

GL Account	WBS Element		IAN
42000650	3126SSCO Sewage Collection (Indirect (not OH))		
	Agency	MAC & Responsible Person	IAN Exp. Date
		X03 025506 Jimmy E Stone	

Electrical Item	NRTL-Listed
No	N/A

Tracking No.	Vendor Part No.	Requisition Item	MSDS	Tax Description
		3400347746-00003		Tennessee State Tax - A/P

Inspection Required	Quality - Significant	ES&H Review Required	Invoice Approval Required	Tax Calculation
No	No	Yes	No	Fully Taxable

Qty Received	Value Received	Last Receipt Date	Goods Receipt Indicator

Qty Invoiced	Value Invoiced	Last Invoice Date

Item Text/SOW/Specification
Supply porta-potty and biweekly servicing at Rubb Tent/Reservoir Area.

Item 4. Supply porta-potty and servicing should

Expected Deliv Date	Quantity	Unit Price	Extended Price	Material Group
12/31/2023	1,000.000 USD	1.00	1,000.00	10 Rental - Equipuipmen

Goods Recipient/Invoice Approver	Unloading Point/Task Auth.
00962913 Jessica B Langstaff	2519 315

GL Account	WBS Element			IAN
42000650	3126SSCO Sewage Collection (Indirect (not OH))			
	Agency	MAC & Responsible Person		IAN Exp. Date
		X03 025506 Jimmy E Stone		
Electrical Item	NRTL-Listed			
No	N/A			
Tracking No.	Vendor Part No.	Requisition Item	MSDS	Tax Description
		3400347746-00004		Tennessee State Tax - A/P
Inspection Required	Quality - Significant	ES&H Review Required	Invoice Approval Required	Tax Calculation
No	No	Yes	No	Fully Taxable
Qty Received	Value Received	Last Receipt Date	Goods Receipt Indicator	
Qty Invoiced	Value Invoiced	Last Invoice Date		

Item Text/SOW/Specification
Supply porta-potty and servicing should a special project require additional toilets or should utility outage require portable toile
ts.

Document Reviews

HMIS Review Not required

Approvals

Type	Status	Approvers	Date	Time
Ariba Auto Approval	Approved	ACI	02/18/2022	07:51:54

Reload page with texts in fixed-width font (to improve display of tables)

Switch to summary view

Knoxville Utilities Board

Industrial Wastewater Discharge Permit

Permit No: LC020119

In accordance with all terms and conditions of the Rules and Regulations of the Wastewater Division of the Knoxville Utilities Board (KUB), including the Industrial Pretreatment Program and its accompanying Enforcement Response Guide (the "Rules and Regulations"), this permit, and any applicable provisions of Federal, State, or local law, rule, or regulation;

Authorization is hereby granted to:

East Tennessee Portable, LLC.
6618 Rutledge Pike
Knoxville, TN 37924

Contact: Charlie Seivers or JB Turnmire
Telephone: Mr. Seivers: (865) 522-9958 office
Dr. Turnmire: (865) 588-6355 office
NAICS No: 562998 – Misc. Waste Management Services
SIC No: 4959
Industry Category: Noncategorical – Portable Toilet Service

Industry Description: East Tennessee Portables is a portable toilet service. Facility is permitted based on risk to wastewater system . Local limits apply.

to discharge portable toilet waste only into the KUB wastewater collection system at this location in accordance with effluent limitations, monitoring requirements, other conditions or requirements set forth in this permit, and KUB Wastewater Division's Rules and Regulations. This permit is for collected portable toilet wastewater only. Discharge of all other collected wastewater types is prohibited.

This Permit shall become effective on April 1st, **2021**. This permit and the authorization to discharge shall expire at midnight, **March 31, 2024**.

Signed this 25th day of March, 2021.

Leslie Glover
Industrial Pretreatment Program Coordinator
Safety and Regulatory Services

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A. MONITORING REQUIREMENTS

1. Sampling Location

When required by KUB, the owner of any property served by a building or plant sewer or sewers carrying commercial or industrial wastes shall install a suitable manhole to facilitate observation, sampling, and measurement of the combined wastes and/or process waste as required from the premises. Such manhole, or other appurtenance where a representative sample can be taken shall be:

a. Accessibly and safely located
b. Constructed in accordance with plans approved in writing by KUB
c. Installed by the owner at his expense
d. Maintained by the owner so as to be safe and accessible at all times

2. Sampling Methods

Based on the sampling method given for each pollutant listed on the effluent limit table provided with this permit, the following methods may be used:

a. Grab samples
An individual sample taken from a wastestream without regard to the flow in the wastestream and collected over a period of time not exceeding fifteen (15) minutes, and must be representative of the discharge. The samples must be maintained at ≤ 6° Celsius and/or preserved as specified in 40 CFR Part 136. Grab samples should be used for instantaneous limitations, homogenous batch discharges, and pollutants subject to degradation (i.e. total oil and grease, petroleum grease, pH, cyanide, phenols, sulfides, and volatile organic compounds). If multiple grab samples are composited prior to analysis, appropriate EPA guidance must be used. For cyanide, total phenols, and sulfides the samples may be composited in the laboratory or in the field; for volatile organics and oil and grease the samples must be composited in the laboratory.

b. Composite samples
A composite sample is a collection of individual grab samples obtained at regular intervals (collected manually or by use of automatic sampling equipment), either based on time intervals or flow intervals (e.g., every two hours during a 24-hour period or every 1000 gallons of process wastewater produced). Each individual grab sample is either combined with the others or analyzed individually and the results averaged.

Composite samples must be proportioned by flow at the time of sampling, unless time-proportioned composite sampling is authorized by KUB. The samples must be maintained at ≤ 6° Celsius and/or preserved as specified in 40 CFR Part 136. The composite sample should be collected over the duration of discharge for a workday. Samples must be representative of the discharge during actual hours of process discharge. If a facility operates and discharges 24-hours per day, then the sample should be taken as a 24-hour composite. If a facility operates 24-hours per day but only discharges wastewater for six hours, a six-hour composite sample should be collected. Samples may be collected automatically or manually grabbed and composited per an approved process.

For any composite technique, the volume of each aliquot shall be at least 100 milliliters and total composite volume shall be at least two liters. In no case may a composite sample consist of fewer than four aliquots.

i. Time-Proportional Composite
Time-proportional composite samples are composed of constant volume aliquots collected in one container at constant time intervals (ex. 250 ml aliquots collected every 15 minutes). The time period between aliquots shall not exceed one hour. This method provides representative samples when the process wastewater flow is relatively constant.

ii. Flow-Proportional Composite (two methods)
    1. Constant volume aliquots are collected in one container at frequencies proportional to discharge flow (ex. 250 ml aliquots collected every 1,000 gallons discharged). This is the preferred method using a flow-integrated, automatic sampler.
    2. Aliquots with volumes proportional to discharge flow are collected in one container at equal time intervals (ex. Aliquots collected every 30 minutes with the volume of the aliquot increasing as the discharge increases). This is the preferred method for manually composited samples. The time period between aliquots shall not exceed one hour.

3. Sample Analysis

   Samples shall be analyzed per methods stated in 40 CFR Part 136.

4. Automatic Resampling

   If the results of the permittees' wastewater analysis indicate a violation or upset has occurred, the permittee must notify KUB within 24 hours of becoming aware of the violation or upset by calling the Industrial Pretreatment Program at (865) 594-8367 or by email to the Pretreatment Coordinator. This notification must include the parameter which violated, the date and time the sample was taken, and an explanation of the upset. A repeat sample and pollutant analysis must be performed, and the results of the analysis be submitted, in writing, within 30 days after becoming aware of the violation or upset. Where KUB has performed the sampling and analysis in lieu of the industrial user, KUB may perform the repeat sampling and analysis unless it notifies the industrial user of the violation and requires them to perform the repeat analysis.

5. Continuous pH Monitoring

   Continuous pH monitoring may be conducted for operational purposes only. All compliance pH samples shall be analyzed per methods stated in 40 CFR Part 136 and reported on the monthly monitoring report.

6. Effluent Limit Calculations and Best Management Practices

   a. Local Limits – Local limits are specific prohibitions or limits on pollutant parameters developed in accordance with State law. A user may not introduce into a wastewater facility pollutants that will cause *Pass Through* or *Interference* as defined in KUB's Wastewater Rules and Regulations.

   b. Categorical Limits – Categorical Limits are on the process only unless the Combined Waste Formula (CWF) was used to calculate a limit based upon all the waste streams to the sanitary sewer. Therefore, in some cases two sampling points are required. In other cases,

the same stream can be used for both purposes – when there is no significant difference in flow between the sampled stream and the combined total streams.

c. Best Management Practices - In cases where the pretreatment standard requires compliance with a Best Management Practice (or pollution prevention alternative), the *user* shall submit documentation required by *KUB* to determine the user's compliance status. In case where an industrial discharge permit requires compliance with a Best Management Practice or pollution prevention alternative, the *user* must submit reports based on sampling and analysis performed in the period covered by the report, and in accordance with the techniques described in 40 CFR Part 136 and amendments thereto to determine the user's compliance status.

7. Dilution

No user shall ever increase the use of process water, or in any way attempt to dilute a discharge, as a partial or complete substitute for adequate treatment to achieve compliance with a discharge limitation unless expressly authorized by an applicable pretreatment standard or requirement. KUB may impose mass limits on users who are using dilution to meet applicable pretreatment standards or requirements, or in other cases when imposition of mass limits is appropriate.

B. REPORTING REQUIREMENTS

1. Periodic Compliance Reporting

All industrial users subject to the Pretreatment Standards must submit to KUB a Periodic Compliance Report by the 10th day of the month following sample collection unless instructed otherwise by KUB. Any requirement for continuous monitoring also requires a report by the 10th day of the following month. The reports shall be signed by a duly authorized representative as defined in 40 CFR Part 403.12(l). Each Periodic Compliance Report shall include the following:

a. The precise nature and concentrations of the regulated pollutants in its discharge
b. The average and maximum daily flow rates of the facility where required
c. The methods used by the indirect discharger to sample and analyze the data
d. A certification that these methods conformed to those methods outlined in the regulations. See 40 CFR Part 403.12; 40 CFR Part 136.
e. A copy of each sample's chain of custody and laboratory report showing sample collection date and analysis results.
f. In cases where the pretreatment standard or KUB requires compliance with a Best Management Practice (or pollution prevention alternative), for KUB to determine compliance status, the industrial user shall submit reports or documentation required by KUB. The reports should be based on sampling and analysis performed in the period covered by the report, and in accordance with the techniques described in 40 CFR Part 136 and amendments thereto. Sampling and analysis may be performed by KUB in lieu of the industrial user. For additional reporting requirements required to comply with Best Management Practices, see section D.2.

2. Extra Sampling

If an *industrial user* subject to the reporting requirement in Tennessee Rule 0400-4-14-.12(7)(f) monitors any *pollutant* more frequently than required by *KUB*, using the procedures prescribed in

paragraph (g)(5) of 40 CFR Part 403.12, the results of this monitoring shall be included in the industry's self-monitoring report.

Routine monitoring required by KUB is outlined in the Effluent Limit Table of this permit. In addition to this routine monitoring and the requirements found in section A.4, if an *industrial user* continues to be in non-compliance, additional routine monitoring may be required. These additional requirements will be communicated to the industry by KUB in a "Notice of Non-compliance" or "Notice of Violation". All additional monitoring must be included in the industry's self-monitoring report.

3. Report Forms

   Copies of the recommended forms will be delivered for your use. If a different report format is desired, please submit it to KUB for approval.

4. Signatory Requirement

   The reports required in this section shall include the following certification statement as set forth in 40 CFR Part 403.6(a)(2)(ii):

   > I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

   and shall be signed as follows:

   a. By a responsible corporate officer, if the *industrial user* submitting the reports required by paragraphs (b), (d) and (e) of 40 CFR Part 403.12 is a corporation. For the purpose of this paragraph, a responsible corporate officer means:

      i. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or

      ii. A manager of one or more manufacturing, production, or operation facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations, can ensure that the necessary systems are established or actions taken to gather complete and accurate information for control mechanism requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. By a general partner or proprietor if the *industrial user* submitting the reports required by paragraphs (b), (d) and (e) of 40 CFR Part 403.12 is a partnership or sole proprietorship respectively.

c. By a duly authorized representative of the individual designated above if:

i. The authorization is made in writing by this individual;

ii. The authorization specifies either an individual or a position having responsibility for the overall operation of the facility from which the industrial discharge originates, such as the position of plant manager, operator of a well, or well field superintendent, or a position of equivalent responsibility, or having overall responsibility for environmental matters for the company; and

iii. The written authorization is submitted to *KUB*.

d. If an authorization is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for environmental matters for the company, a new authorization satisfying the requirements of this section must be submitted to KUB prior to or together with any reports to be signed by an authorized representative.

5. Notification of Hazardous Discharge

The industrial user shall notify KUB, the Environmental Protection Agency (EPA) Regional Waste Management Division Director, and State hazardous waste authorities in writing of any discharge into KUB's wastewater system of a substance which, if otherwise disposed of, would be a hazardous waste under 40 CFR Part 261. Such notification must include the name of the hazardous waste as set forth in 40 CFR Part 261, the EPA hazardous waste number, and the type of discharge (continuous, batch, or other). If the industrial user discharges more than 100 kilograms of such waste per calendar month to KUB, the notification shall also contain the following information to the extent such information is known and readily available to the industrial user: an identification of the hazardous constituents contained in the wastes, an estimation of the mass and concentration of such constituents in the waste stream discharged during that calendar month, and an estimation of the mass of constituents in the waste stream expected to be discharged during the following 12 months. See 40 CFR Part 403.12(p). The notification requirement in this section does not apply to pollutants already reported under the self-monitoring requirements of this permit.

In the case of new regulations under Section 3001 of RCRA identifying additional characteristics of hazardous waste or listing any additional substance as a hazardous waste, the industrial user must notify KUB, the EPA Regional Waste Management Division Director, and State hazardous waste authorities of the discharge of such substance within 90 days of the effective date of such regulations.

6. Notification of Changed Discharge

All industrial users shall promptly notify KUB in writing in advance of any substantial change in the volume or character of pollutants in their discharge, including the listed or characteristic hazardous wastes for which the industrial user has submitted initial notification as stated above.

7. Where to send reports

Compliance reports and other permit-related information must be mailed with original signatures. Emails and faxes may only be sent to meet the reporting deadline of the 10th day of the following month and must be immediately followed by a hard copy with an original signature.

KUB Regulatory Compliance
Attn: Industrial Pretreatment Program Coordinator (Mailstop - JK16)

PO BOX 59017 Knoxville, TN 37950	or	835 East Jackson Ave. Knoxville, TN 37915

Fax number (865) 594-8316

C. STANDARD CONDITIONS

1. Record Keeping

Any industrial user required by this permit to conduct monitoring on their waste stream, or that monitors any pollutant more frequently than required by KUB, shall maintain records of all information resulting from any such monitoring activities. Such records shall include the following monitoring information for all samples:

a. A chain of custody containing the date, exact place, method, time of sampling, and the names of the persons taking the samples
b. The dates analyses were performed
c. The certified laboratory that performed the analyses
d. The analytical techniques/methods used. All sampling and analysis required by this permit shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto.
e. The results of such analyses.

2. Records Retention

Industrial users shall be required to retain for a minimum of three (3) years any records, reports, and/or results of monitoring (whether or not such monitoring activities are required by this permit) required by these rules (including documentation associated with Best Management Practices) and shall make such records available for inspection and copying by KUB, the State, or EPA. This period of retention shall be extended during the course of any unresolved litigation regarding the industrial user or when requested by KUB, the State, or the EPA.

3. Inspection and Entry

KUB's identified representatives and employees shall be granted all necessary access to the customer's premises at all times for the purpose of reading meters, testing, inspecting, repairing, removing, and replacing all equipment belonging to KUB, and for inspecting customer's plumbing and premises generally in order to determine compliance with KUB's Wastewater Rules and Regulations. Inspections may be made at unannounced times.

4. Enforcement Responses for Violations of Rules, Permit Conditions or Order

a. Any person who is in noncompliance and/or violates any provision of KUB's Wastewater Rules and Regulations, these permit conditions, or a compliance order shall be subject to an enforcement response, including but not limited to a civil penalty in an amount not to exceed ten thousand ($10,000) dollars per offense, the possibility of water and/or wastewater service termination. Civil penalties or termination of water and/or wastewater service may be appealed in accordance with Section XV of KUB's Wastewater Rules and Regulations. The following situations are subject to an enforcement response by KUB:

    i. Unpermitted discharge;
    ii. Non-permitted discharge (permit required);
    iii. Exceedance of Local or Federal Standard Permit Limit
    iv. Failure to complete or failure to properly complete a filing or report requirement;
    v. Failure to perform or properly perform any required monitoring and/or failure to properly report any required monitoring;
    vi. Improper sampling
    vii. Failure to install monitoring equipment
    viii. Missing a milestone in a compliance schedule and/or violation of a final order or determination of KUB's Chief Operating Officer
    ix. Denial of site visits by KUB employees or representatives for sampling or inspection.
    x. Dilution of wastestreams in lieu of treatment
    xi. Failure to mitigate noncompliance or halt production
    xii. Failure to properly operate and maintain pretreatment facility
    xiii. Illegal discharges
    xiv. Failure to sample properly
    xv. Inadequate record keeping
    xvi. Failure to report any monitoring conducted in addition to permit requirements

b. Each separate violation shall constitute a separate offense, and each day of violation shall constitute a separate offense.

5. Significant Noncompliance

a. Chronic violations of wastewater discharge limits, defined here as those in which sixty-six percent or more of all of the measurements taken during a six-month period exceed (by any magnitude) a numeric pretreatment standard or requirement, including instantaneous limits, as defined by state rules;
b. Technical Review Criteria (TRC) violations, defined here as those in which thirty-three percent or more of all of the measurements for each pollutant parameter taken during a six-month period equal or exceed the product of the numeric pretreatment standard or requirement, including instantaneous limits, as defined by state rules multiplied by the applicable TRC (TRC=1.4 for BOD, TSS, fats, oil, and grease, and 1.2 for all other pollutants except pH). TRC calculations for pH are not required by this rule.
c. Any other violation of a pretreatment standard or requirement as defined by state rules (daily maximum, long-term average, instantaneous limit, or narrative standard) that KUB determines has caused, alone or in combination with other discharges, interference or pass through (including but not limited to endangering the health of KUB personnel or the general public);
d. Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the KUB's exercise of its emergency

authority under section IV of KUB's Wastewater Rules and Regulations Appendix A, "Dangerous Discharge Reports," to halt or prevent such a discharge;

e. Failure to meet, within 90 days after the schedule date, a compliance schedule milestone contained in a local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance;
f. Failure to provide, within 30 days after the due date, required reports such as baseline monitoring reports, 90-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules;
g. Failure to accurately report noncompliance;
h. Any other violation or group of violations, which may include a violation of Best Management Practices, which *KUB* determines, will adversely affect the operation or implementation of KUB's Wastewater Rules and Regulations Appendix A.

6. Provisions Governing Fraud and False Statements

   a. The reports and other documents required to be submitted or maintained under these rules shall be subject to:
   b. The provisions of 18 U.S.C. Section 1001 relating to fraud and false statements
   c. The provisions of Sections 309(c)(4) of the Federal Clean Water Act, as amended, governing false statements, representation of certification
   d. The provisions of Section 309(c)(6) regarding responsible corporate officers.

7. Limitation on Permit Transfer

   Wastewater discharge permits are issued to a specific user for a specific operation. If a transfer of ownership occurs, a copy of the permit must be provided to the new owner or operator. A wastewater discharge permit shall not be reassigned, transferred, or sold to a new owner, new user, or for different premises, unless approved by KUB. If the transfer is approved by KUB, the new owner, however, must execute a new Acknowledgement of Receipt.

8. Permit Expiration/Renewal

   Prior to permit expiration an "Industrial Waste Survey and Permit Application Form" (IWS) will be mailed to your organization. It must be completed and returned by the due date. Failure to complete and return the IWS is a reporting violation. After thirty (30) days past the due date, your permit renewal can be denied. After forty-five (45) days past the due date, the water service can be terminated.

9. Prohibited Discharges

   A user may not discharge any pollutant(s) which cause pass through or interference. These prohibitions apply to each industrial user discharging pollutants whether or not the user is subject to other National Pretreatment Standards or any, national, State, or local pretreatment requirements. Notwithstanding discharges that are prohibited by other provisions of the Rules and Regulations and applicable federal, state and local laws and regulations, no user shall discharge or cause to be discharged to a sanitary sewer any of the following described substance materials, water or wastes:

   a. Any gasoline, benzene, naphtha, fuel oil or mineral oil, or other flammable or explosive liquid, solids or gas. *Pollutants* which create a fire or explosion hazard in the *POTW*, including, but not limited to, waste streams with a closed cup flashpoint of less than 140

degrees Fahrenheit or 60 degrees Celsius using the test methods specified in 40 CFR Part 261.21.

b. Any waters or wastes, acid or alkaline in reaction, or having corrosive properties capable of causing damage or hazard to structures, equipment and personnel of the wastewater system. Free acids and alkalis of such wastes must be neutralized at all times to a pH within the local limits of the plant receiving the discharge. This includes pollutants which will cause corrosive structural damage to the treatment plant or collection system, but in no case discharges with pH lower than 5.0.
c. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, paunch manure, hair and fleshings, entrails, lime slurry, lime residues, beer or distillery slops, chemical residues, paint residues, cannery waste bulk solids, grease and oil or other solid or viscous substances capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the POTW.
d. Any pollutant, including oxygen demanding pollutants (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the treatment plant and/or collection system.
e. Heat in the amount, which will inhibit biological activity in the treatment plant or result in interference, but in no case heat in such quantities that the temperature at the treatment plant's influent exceeds one hundred (100) degrees Fahrenheit (thirty-seven (37) degrees Celsius).
f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.
g. A user may not introduce into the POTW any pollutants, which will cause a toxic pass through or interference or result in the presence of toxic gases, vapors, or fumes within the treatment plant or collection system in a quantity that may cause acute worker health and safety problems.
h. Any trucked or hauled pollutants, except at discharge points designated by KUB.
i. Any material in violation of the customer's pretreatment permit or authorization issued by KUB.

10. Slug Discharge Plan

A "Slug Discharge Control Plan" (SDCP) is required by 40 CFR Part 403 and may be re-evaluated by KUB at any time, but in no case less frequently than every two (2) years.

A slug is defined as any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge, which has a reasonable potential to cause *interference* or *pass through*, or in any other way violate KUB's regulations, local limits or permit conditions. The results of such activities shall be available to the State of Tennessee upon request. *Significant Industrial Users* are required to notify KUB immediately of any changes at its facility affecting potential for a *slug* discharge. A slug discharge control plan is necessary and should contain, at a minimum, the following elements:

a. Description of discharge practices, including non-routine batch discharges
b. Description of stored chemicals
c. Procedures for immediately notifying KUB of slug discharges, including any discharge that would violate a specific prohibition listed under Standard Conditions, Section 9 of this permit, with procedures for follow-up written notification within five (5) days
d. Procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or

equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment for emergency response

e. Follow-up practices to limit the damage suffered by KUB's collection system and wastewater treatment plant or the environment

f. A notice shall be permanently posted on the user's bulletin board, or other prominent place, advising employees to call the KUB Wastewater Plant Operations immediately at (865) 594-7622 and the Pretreatment Program Coordinator at (865) 594-8367 in the event of a dangerous discharge. Employers shall ensure that all employees who may cause or suffer such a dangerous discharge to occur are advised of the emergency notification procedure.

   Any person causing or suffering any discharge, whether accidental or not, which presents or may present an imminent or substantial endangerment to the health and welfare of persons, to the environment, or which is likely to cause interference with or damage to KUB, shall notify KUB Wastewater Plant Operations immediately by telephone at (865) 594-7622 and the Pretreatment Program Coordinator at (865) 594-8367. The industrial user shall notify KUB immediately by telephone of any slug loading.

g. Within five (5) days following such occurrence, the user shall provide KUB with a detailed written report describing the cause of the dangerous discharge and measures to be taken by the user to prevent similar future occurrences. Such notification shall not relieve the user of any expense, loss, damage, or other liability which may be incurred as a result of damage to KUB, fish kills, or any other damage to person or property; nor shall such notification relieve the user of any fines, civil penalties, or other liability which may be imposed by KUB's Wastewater Rules and Regulations, this permit, or applicable federal, state, or local law, rule, or regulation.

11. New Construction or Addition of Facilities

All commercial or industrial users of the wastewater facilities who elect or are required to construct new or additional facilities for pretreatment, equalization, or other process necessary for compliance with the provisions of this article shall submit plans, specifications, and other pertinent information relative to the proposed construction to KUB for approval. Plans and specifications submitted for approval must bear the seal of a registered (in Tennessee) professional engineer if significant construction. Written approval of KUB must be obtained before construction of new or additional facilities may begin. The plans, specifications, and other pertinent information submitted to KUB for approval will be retained as file material for future reference.

12. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

13. Permit Modification

a. This permit may be modified for good causes including, but not limited to, the following:
   i. To incorporate any new or revised Federal, State or local pretreatment standards, rules, regulations or requirements
   ii. Material or substantial alterations or additions to the discharger's operational processes, or discharge volume or character which were not considered in drafting the effective permit

iii. A change in any condition in either the industrial user or at KUB that requires either a temporary or permanent reduction or elimination of the authorized discharge
iv. Information indicating that the permitted discharge poses a threat to KUB's collection and treatment systems, personnel or the receiving waters
v. Violation of any terms or conditions of this permit
vi. Misrepresentation or failure to disclose fully all relevant facts in the permit application or in any required reporting
vii. Revision of or a grant of variance from such categorical standards pursuant to 40 CFR Part 403.13
viii. To correct typographical or other errors in the permit
ix. To reflect transfer of the facility ownership and/or operation to a new owner/operator
x. Upon request of the permittee, provided such request does not create a violation of any applicable requirements, standards, laws or rules and regulations.

b. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changed or anticipated noncompliance does not stay any permit conditions.

14. Pretreatment Bypass

a. Definitions
   i. Bypass means the intentional diversion of waste streams from any portion of an industrial user's treatment facility.
   ii. Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass Not Violating Applicable Pretreatment Standards or Requirements
   i. An industrial user may allow any bypass to occur which does not cause Pretreatment Standards or requirements to be violated, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of paragraphs (c) and (d) of this section

c. Notice
   i. If an industrial user knows in advance of the need for a bypass, it shall submit prior notice to KUB, if possible at least ten (10) days before the date of the bypass.
   ii. An industrial user shall submit oral notice of an unanticipated bypass that exceeds applicable Pretreatment Standards to KUB within 24 hours from the time the user becomes aware of the bypass. A written submission shall also be provided within five (5) days of the time the user becomes aware of the bypass. The written submission shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times, and, if the bypass has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass. KUB may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

d. Prohibition of Bypass

i. Bypass is prohibited, and KUB may take enforcement action against an industrial user for a bypass, unless;
   1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage
   2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance
   3. The industrial user submitted notices as required under paragraph (c) of this section.

e. KUB may approve an anticipated bypass, after considering its adverse effects, if KUB determines that it will meet the three conditions listed in paragraph (d) of this section.

D. BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are defined in 40 CFR Part 122.2 as scheduled activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce pollution. BMPs can also include treatment requirements, operating procedures, sludge or waste disposal, or drainage from raw material storage, and practices to control plant site runoff, spillage, or leaks. Federal, State, and KUB rules now allow BMPs to be enforceable as local limits, as an alternative to numerical limits, or as a supplement to local limits. As such, the following BMPs shall be enforceable per KUB's Wastewater Rules and Regulations and the Industrial Pretreatment Program Enforcement Response Guide.

If your facility has specific requirements for Best Management Practices or pollution prevention alternatives, they will be listed in this section.

1. Industry-Specific Best Management Practices - See Reporting Requirements below.

2. Reporting Requirements for Best Management Practices

Report of Collected Portable Toilet Wastewater

a. Industrial users permitted to discharge collected portable toilet wastewater are required to provide a report to KUB by the 10th of the following month detailing the origin of such waste on a monthly basis. This report shall contain the following information:
   i. Date the portable toilet wastewater was collected
   ii. Name and address of each site where portable toilet wastewater was collected

Created By: Leslie H. Glover

East Tennessee Portables, LLC.

6618 Rutledge Pike
Knoxville, TN 37924
Permit Number LC020119
Effluent Limit Table

Pollutant[1]	*Daily Limits* mg/l	*Monthly Limits* mg/l	*Sampling Frequency*[2]	*Sample Type*	*Rationale* (Categorical or local limit)
BENZENE	0.114	0.114	1 / month	Grab	Local Limit
CADMIUM	0.288	0.288	1 / month	Composite	Local Limit
CARBON TETRACHLORIDE	0.552	0.552	1 / month	Grab	Local Limit
CHLOROFORM	1.958	1.958	1 / month	Grab	Local Limit
CHROMIUM	3.623	3.623	1 / month	Composite	Local Limit
COPPER	4.378	4.378	1 / month	Composite	Local Limit
CYANIDE	0.647	0.647	Not Required		
ETHYL BENZENE	0.350	0.350	1 / month	Grab	Local Limit
FLOW			Measured or estimated daily, report following month	NA	
LEAD	0.876	0.876	1 / month	Composite	Local Limit
LEL (<%)	5.000	5.000	Not Required		
MERCURY	0.002	0.002	Not Required		
METHYLENE CHLORIDE	0.842	0.842	1 / month	Grab	Local Limit
NAPHTHALENE	0.109	0.109	Not Required		
NICKEL	2.388	2.388	1 / month	Composite	Local Limit
NITRITE	5.000	5.000	Not Required		
OIL AND GREASE, TOTAL[3]	100	100	Not Required		
PETROLEUM GREASE[3]	50	50	Not Required		
pH (SU) (Must be within acceptable range)	6.0 – 9.0	6.0 - 9.0	1 / Day	Grab	Local Limit
PHENOLS	3.980	3.980	Not Required		
SILVER	0.258	0.258	1 / month	Composite	Local Limit
T-1,2 DICHLOROETLENE	0.066	0.066	1 / month	Grab	Local Limit
TETRACHLOROETHENE	1.216	1.216	1 / month	Grab	Local Limit
TOLUENE	1.876	1.876	1 / month	Grab	Local Limit
TOTAL PHTHALATES	3.765	3.765	Not Required		
TPH (Sum of GRO and DRO analyses)	10.0	10.0	Not Required		
TRICHLOROETHANE-1,1,1	2.189	2.189	1 / month	Grab	Local Limit
TRICHLOROETHENE	0.876	0.876	1 / month	Grab	Local Limit
ZINC	4.378	4.378	1 / month	Composite	Local Limit

1 - Pollutants for which monitoring is not required must still comply with KUB's Local Limits.
2 - Semi-Annual Periods are April-September and October-March. Your facility is encouraged to collect samples often in the required monitoring period and always allow time for additional sampling in the event of a violation. Hard copy reports for required monitoring with original signed certification statements must be delivered to KUB by the 10th day of the month following any sample collection or monitoring.
3 - Total Oil and Grease and Petroleum Grease must be analyzed on the same sample. Petroleum Grease is only required when Total Oil and Grease is greater than or equal to 50 mg/l.

ACKNOWLEDGEMENT OF RECEIPT

I, [signature] , of

East Tennessee Portables, LLC.
6618 Rutledge Pike
Knoxville, TN 37924

Being duly authorized to sign this document, do hereby acknowledge receipt of the final Industrial Wastewater Discharge Permit for the referenced facility and have reviewed the permit with a KUB representative.

I understand that it is my duty to comply with all provisions of this permit and KUB's Rules and Regulations, including general discharge prohibitions. It is also my duty to comply with all applicable Federal and State pretreatment standards including those that become effective during the term of this permit and that compliance with this permit is not a defense for violation of applicable Federal and State pretreatment standards.

Any addition or change to a process or operation must be presented to KUB for approval prior to commencing discharge from the added or changed process or operation.

Additionally, it has been explained to me that the above facility is regulated under the provisions of the Rules and Regulations of the Knoxville Utilities Board and that the Knoxville Utilities Board can take enforcement actions, up to and including termination of service for violation of such Rules and Regulations and/or the terms of this permit.

Signed this 22 day of March , 2021.

[signature]
(Signature)

General Manager
(Title)