

Health and Safety Plan
for
Remedial Investigation
and
Risk Assessment
at
Site 7 RTC Silk Screening Area
and
Site 17 Pettibone Creek/Boat Basin

Naval Training Center
Great Lakes
Great Lakes, Illinois



Southern Division
Naval Facilities Engineering Command
Contract No. N62467-94-D-0888
Contract Task Order 0154

July 2001
Revised July 2002

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PITT-05-2-055

July 8, 2002

Project 3939/4278

Commander, Southern Division
Naval Facilities Engineering Command
Attn: Mr. Anthony Robinson (ES 31)
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order 0154/0263

Subject: Health and Safety Plan Additions
Site 7 Hot Spot Removal
Naval Training Center Great Lakes
Great Lakes, Illinois

Dear Mr. Robinson:

Please find attached two copies of subject additions. Please insert these pages into the Health and Safety Plan Appendix VII of the Quality Assurance Project Plan for Site 7 and 17 dated July 2001. Copies have also been distributed as indicated below.

If you have any questions, please call Aaron Bernhardt at 412-921-8433 or me at 412-921-7251.

Sincerely,

Robert F. Davis, P.E.
Task Order Manager

RFD/kf

Enclosure

- cc: D. Fleming/M. Schultz, NTC Great Lakes (2 copies)
- B. Conrath, IEPA (3 copies)
- D. Wroblewski, TtNUS (Cover Letter Only)
- Mark Perry/File 3939, TtNUS (1 copy)
- A. Bernhardt, TtNUS (1 copy)
- File 7278, TtNUS (1 copy)

Mr. Anthony Robinson
Naval Facilities Engineering Command
July 8, 2002 – Page 2

bcc: B. Balkovec, TtNUS (1 copy)
A. Scheetz, TtNUS (1 copy)
T. Jackman, TtNUS (1 copy)
B. Stewart, TtNUS (letter only)
R. Haynie, TtNUS (letter only)
S. Staffen, TtNUS (letter only)

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**HEALTH AND SAFETY PLAN
for
REMEDIAL INVESTIGATION
and
RISK ASSESSMENT
at
SITE 7 RTC SILK SCREENING AREA
and
SITE 17 PETTIBONE CREEK/BOAT BASIN
NAVAL TRAINING CENTER GREAT LAKES
GREAT LAKES, ILLINOIS**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION-NAVY (CLEAN) CONTRACT**

**Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406**

**Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, Pennsylvania 15220**

**CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0154**

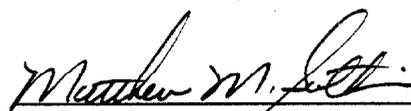
**JULY 2001
Revised July 2002**

**PREPARED UNDER THE
SUPERVISION OF:**



**ROBERT DAVIS, P.E.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA**

APPROVED FOR SUBMITTAL BY:



**MATTHEW M. SOLTIS, CIH, CSP
CLEAN HEALTH & SAFETY MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA**

- Ground water sampling
- New permanent monitoring wells
- Surface water/sediment sampling
- Equipment decontamination
- Aquifer Testing – Slug Testing
- Ground water level measurements
- Investigation-derived waste handling and disposal
- Site Restoration
- Land Surveying of Sample Locations

Revision 1 – July 2002

- The excavation and removal of PAH contaminated soils at Site 7.

Compliance: The elements of this HASP are intended to be in compliance with the requirements established by:

- OSHA 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER)
- Applicable sections of 29 CFR 1926 "Safety and Health Regulations for Construction."
- Tetra Tech NUS Health and Safety Program
- Applicable NTC Great Lakes Policy and procedures

Modifications/Changes: The following conditions are considered sufficient basis for change and will serve as triggers to institute review and possible changes to this document

- The addition of activities outside of those specified in Section 4.0, Scope of Work.
- Task Modifications to those activities specified within Section 4.0, Scope of Work.
- New information becomes available through the course of the investigation and/or from outside sources.

All changes to this HASP will be requested through the Task Order Manager (TOM) to the Tetra Tech NUS Health and Safety Manager (HSM) using the Tetra Tech NUS, Inc. Field Task/Health & Safety Plan Modification Request Form. It is the responsibility of the TOM to notify all affected personnel of all changes to this HASP. Changes to the HASP will be documented using a Document Review Record.

1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: NTC Great Lakes **Address:** EFA Midwest
Building 1A, Code N457
201 Decatur Avenue
Great Lakes, IL 60088

NTC Great Lakes Point of Contact: Mr. Dan Fleming or Mr. Mark Schultz

Phone Number: Dan - (847) 688-5997 x61 **E-Mail:** flemingdm@EFDSOUTH.NAVFAC.NAVY.mil
Phone Number: Mark - (847) 688-5997 x 40 **E-Mail:** schultzmr@pwcgl.navfac.navy.mil
Fax Number: (847) 688-2319

U.S. Navy Remedial Project Manager/Engineer-In-Charge: Anthony Robinson (Code 18511)

Address: 2155 Eagle Drive **Phone Number:** (843) 820-7339
North Charleston, South Carolina 29406 **Fax Number:** (843) 820-7465
E-mail Address: robinsonab@efdsouth.navfac.navy.mil

Base Pass and Security: Building 130 (near Main Gate); Hours of Operation 0600 – 1800
Phone Number: (847) 688-5648

Note: See Section 9.5.1 for Base Access Information.

Purpose of Site Visit: This activity is divided into a multi-task operation (see Section 4.0), including Direct Push Technology [DPT] soil borings, monitoring well and piezometer installation, and multi-media sampling, and other related activities.

Proposed Dates of Work: June 2001 until completed

Project Team:

Tetra Tech NUS Personnel:	Discipline/Tasks Assigned:	Phone No.
<u>Robert Davis, P.E.</u>	<u>Task Order Manager</u>	<u>(412) 921-7251</u> <u>davisb@ttnus.com</u>
<u>Aaron Bernhardt</u>	<u>Assistant Task Order Manager/Ecological</u>	<u>(412) 921-8433</u> <u>bernhardta@ttnus.com</u>
<u>Matthew M. Soltis, CIH, CSP</u>	<u>CLEAN Health and Safety Manager</u>	<u>(412) 921-8912</u> <u>soltism@ttnus.com</u>
<u>Thomas M. Dickson, CSP</u>	<u>Project Health and Safety Officer</u>	<u>(412) 921-8457</u> <u>dickson@ttnus.com</u>
<u>Bob Balkovec</u>	<u>Project Geologist/Field Operations Leader (FOL)</u>	<u>(412) 921-8616</u> <u>balkovecb@ttnus.com</u>

IL Office of Chemical Safety

Environmental Toxicologist: Morrow, Leslie
Address: 1021 N. Grand Avenue East
Springfield, IL 62702

Phone Number: (217) 782-9292
Fax Number: (217) 782-3258
E-mail: les.morrow@epa.state.il.us

Hazard Assessments (for purposes of 29 CFR 1910.132) and HASP preparation conducted by:

Thomas M. Dickson, CSP

2.3.4 Excavation Activities (Revision 1 – July 2002)

The potential emergencies that could result during this activity are primarily physical in nature. They include the following: struck by equipment, associated traffic hazards, falling into the open excavation(s), encountering/contact with underground utilities, and excavation collapse taking equipment or personnel into the excavation(s) as a result of the collapse. The control measures to be put in place to minimize these occurrences are as follows:

- **Traffic Patterns in and around the dig area** – Traffic for heavy equipment and pedestrians shall be separated by flow patterns. All heavy equipment (excavator, dump trucks, etc.) shall be routed in a singular direction to minimize backing, U-turns and other maneuvers that could result in an accident. A demarcation area shall be placed in plain view, so all personnel recognize the extent of the swing pattern of the excavator and shall be directed to stand clear. No operation shall permit the swing of the bucket over persons, when engaged in loading or positioning of the equipment.
- **Falling into the open excavation** – The following control measures shall be instituted to protect against the potential for persons or equipment to fall in an open excavation where equipment or structural supports have been removed. The control measures employed will be as follows:
 - All excavation openings greater than 4-feet in depth, shall have physical barriers placed surrounding the opening when not physically blocked by equipment to protect persons from approaching closer than 2 feet to the opening.
 - Traffic control blocks shall be placed to prevent trucks and other (except the excavator digging) heavy equipment from approaching closer than 5-feet to the open excavation, if necessary.
 - All excavations will be physically barricaded or be covered at times when left unattended. This shall include suitable railing or fence to control access; and posting or blinking emergency warning lights placed on all four sides.
 - Close attention shall be paid surrounding the operating excavator for signs of excavation wall collapse. Indications shall include sloughing or undermining of the ground surrounding the point of operation; horizontal cracks approximately $\frac{3}{4}$ of the depth in the distance feet back from the edge will be an indication of this condition. Crane pads or suitable footing support will be used to minimize surface pressure of the working excavator, where necessary, if there

excavation width is wider than the base of the excavator. The soils in this area are a tight silty clay representative of Class B soils as specified in 29 CFR 1926.652. However, all activities associated with this excavation will proceed as Class C soils. A "Competent Person" has not confirmed this classification. A Class C Soil classification shall ensure additional preventive measures of conditions that are pre-disposal in nature to slide/slough. The condition of excavation stability may be further impacted by the depth of the water table.

Entry into the excavations greater than 4-feet will be strictly prohibited without approval of a "Competent Person" and adequate shielding and/or sloping of the excavation.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

2.4.1 Safe Place of Refuge Selection

The FOL and/or the SSO shall identify a safe place of refuge (in the event of an emergency) on the Safe Work Permit (See Attachment IV). This location will be selected and conveyed to the Field Crew, as part of issuing the Safe Work Permit at the beginning of each field task and at each location, where the primary and alternate safe place of refuge may change. Selection will be based on the following considerations:

- A location providing telephone communications and/or shelter.
- A location from which the field crews can provide site security restricting access to the emergency area, however, a point from which the field crew may direct emergency response personnel (i.e., intersection or gate, etc.).

In all cases this location should be positioned a sufficient (safe) distance from the operation whereas not to be impacted by the emergency. This distance is impacted by a number of conditions (i.e., tasks being conducted; chemical, physical, and toxicological properties; potential for fire and explosion; meteorological conditions; terrain). Based on the level of reported contaminants and the types of contaminants, it is not anticipated that the area to be secured in the event of an emergency will extend above those specified in Section 9.1.1 (Exclusion Zone).

**TABLE 2-1
 EMERGENCY CONTACTS
 NTC GREAT LAKES**

AGENCY	TELEPHONE
EMERGENCY (Police, Fire, and Ambulance Services)	911*
Non-Emergency (Police, Fire, and Ambulance Services)	(847) 688-3430
U.S. Navy Remedial Project Manager/Engineer-in-Charge – Mr. Anthony Robinson	(843) 820-7339
U.S. Navy/NTC Great Lakes Point of Contact – Mr. Dan Fleming Or Mr. Mark Shultz	Dan - (847) 688-5997 Ext. 61 Mark - (847) 688-5997 Ext. 40
Great Lakes Naval Hospital (Primary)	911 (Primary) (847) 688-4560 Duty Officer (847) 688-5555 Ambulance (847) 688-5618 Emergency
TtNUS Task Order Manager - Robert Davis	(412) 921-7251
CLEAN Health and Safety Manager – Matthew M. Soltis	(412) 921-8912
Project Health and Safety Officer - Tom Dickson	(412) 921-8457
WorkCare (TtNUS Healthcare Provider)	1-800-455-6155 Ext. 109 Fax (714) 456-2154
Utility Location (15 Working Days Advance Notification Required) Ms. Judy Jarosz (Primary) Mr. Chuck Kelly (Back-up)	(847) 688-2121 Ext. 18 (847) 688-2121 Ext. 10
Utility Emergency – Public Works Dept. – NTC Great Lakes (Monday – Friday 0700 – 1630) Trouble Desk (Holidays and Saturday/Sundays)	(847) 688-3849 (847) 688-4820

* - Cellular communications will be routed through Lake County Dispatch. It is imperative that you inform them that you are calling from the NTC Great Lakes facility. 911 will work from any Base extension.

- DI water rinse
- Air dry

All dedicated sampling and PPE equipment will be rinse to remove gross contamination. Then pending the sampling results be disposed of accordingly.

The above listing represents a summarization of the tasks as they may apply to the scope and application of this HASP. For more detailed description of the associated tasks, refer to the Sampling and Analysis Plan (SAP). Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. The TOM or a designated representative will submit all requested modifications to this document to the HSM.

4.6 EXCAVATION (HOT SPOT REMOVAL) AT SITE 7 (Revision 1; July 2002)

This activity shall include the excavation and removal of an area 10x15x10-foot area near Site 7. The intent is to excavate and remove petroleum contaminated soils from an estimated depth of 4-10-feet. This task shall proceed as follows:

Task 1- Excavate non-petroleum impacted soils - specified area 10x15x4-feet (an estimated 23 cubic yards) and place on plastic sheeting to be used as back fill.

Task 2- Excavate petroleum impacted soils under the initial 4-feet of top cover – specified area 10x15x6-feet (an estimated 33 cubic yards).

Task 3 – Site Restoration – Back-fill and compact the excavation cavity. This will be done using gravel placed in eight to twelve inch lifts and compacted using a remote control vibratory compactor. This procedure shall be repeated using the non-petroleum impacted soils to ground surface.

Task 4 – Transportation of Non-hazardous Soils – This tasks includes providing

- Weight tickets (payment is based on tonnage) and manifests for the roll-off containers
- Transportation of non-hazardous soils for disposal.

Task 5 - Transportation of Hazardous Soils - This tasks includes providing

- Weight tickets (payment is based on tonnage) and manifests for the roll-off containers
- Transportation of hazardous soils for disposal.

5.2.3 After Drilling

- All equipment used within the exclusion zone will undergo a complete decontamination and evaluation by the SSO to determined cleanliness prior to moving to the next location, exiting the site, or prior to down time for maintenance.
- All motorized equipment will be fueled prior to the commencement of the day's activities. During fueling operations all equipment will be shutdown and bonded to the fuel provider.
- When not in use all drill/direct push rigs will be shutdown, emergency brakes set, and wheels chocked.
- All areas subjected to subsurface investigative methods will be restored to equal or better condition than original to remove any contamination brought to the surface and to remove any physical hazards. In situations where these hazards cannot be removed these areas will be barricaded to minimize the impact on field crews working in the area.

5.3 EXCAVATION SAFE WORK PRACTICES

5.3.1 Before Excavation Activities

- Identify all underground utilities and buried structures before the commencement of excavation activities. Use the Utility Locating and Excavation Clearance Standard Operating Procedure provided in Attachment II of this HASP. This includes an evaluation of the intended loading areas to insure swing patterns of excavators are not nearing any overhead power lines. A minimum clearance of 20 feet must be maintained from overhead power lines unless positive control of the energy source may be obtained. See Attachment II for additional information.
- All excavation boundaries will be demarcated with appropriate signage warning of construction activities in progress. Signs shall be used also for informational purposes to direct personnel regarding area of operation and PPE requirements.
- All heavy equipment will be subjected to an equipment inspection, upon arrival on-site and prior to leaving. This inspection will be recorded on the Equipment Inspection Checklist provided in Attachment III of this HASP.

- Establish traffic patterns for equipment and the loading of trucks. This pattern should form a loop to minimize the need for backing up (an activity when many accidents occur).
- Establish traffic patterns for foot and small vehicular traffic out of the pattern for heavy equipment.
- All traffic patterns for heavy equipment will be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls (excavation boundaries) Note: The standard (29 CFR 1926 Subpart P) stipulates 2 feet distance from unsupported walls for resource staging. However, a maintenance distance of 10 feet will be maintained until soil classification is complete supporting a closer distance.
- Excavation along thoroughfares will require the use of signage, barricades and flag-persons for alteration of traffic patterns, as necessary.
- All ground personnel will be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment.

5.3.2 During Excavation Activities

- Ground activities such as the loading of trucks and directing the operators actions should be supported with a ground spotter controlling the actions of the truck to be loaded as well as the loader. The operators will be instructed that they are to follow only the instructions provided by the ground spotter unless another party is otherwise authorized and identified.
- All access into the excavation shall be prohibited. Access to excavations deeper than four feet or trenches shall be denied unless approved by a Competent Person in accordance with 29 CFR 1926 Subpart P.
- All routes other than those traffic patterns established shall be controlled or barricaded to focus entry and exiting through control points.

5.3.3 After Excavation Activities

- Sampling within the foot-print of the excavation will occur to confirm/deny contamination has been successfully removed. If the excavation is greater than 4-feet deep the sampling will occur by removing the sample from the bucket of the excavator.

5.3.4 Transportation of Excavated Materials

- TtNUS oversight shall insure that all persons participating in the removal of soils are appropriately qualified.
 - Personnel involved in the transportation of non-hazardous and hazardous materials shall meet training and certification requirements as specified in 49 CFR Department of Transportation Regulatory Requirements. Certification shall be confirmed through providing CDLs with appropriate classification identified on the license or some other form of documentation. Copies will be made and retained at the project site.
- For each load to be removed from the site the following measures shall be employed:
 1. Ensure all latches and gates are secured and no discharge of any sort is coming from the roll-off container.
 2. Ensure that the PTO for raising and lowering the bed is disengaged. A number of damages have occurred on a number of construction sites when dump trucks pulled away with the PTO engaged which caused the beds to raise. During the travel, phone and power lines were torn down by elevated beds. This will be accomplished as a check confirmed by the ground spotter and documented on the Load Inspection Checklist.
 3. Complete a Load Inspection Checklist – This list shall document measures to prevent
 - Unauthorized personnel from operating vehicles
 - Leaking loads leaving the site.
 - Potential Overweight Loads leaving the site.

Task/Operation/Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment	Decontamination Procedures																				
<p>Excavation of contaminated and non-contaminated Soils at Site 7.</p> <p>Method of Excavation - A back-hoe will be used to remove overburden, then the contaminated soils.</p> <p>In addition to the excavation activity, this hazard assessment also includes</p> <p>Back-filling</p> <ul style="list-style-type: none"> - Placed in eight to twelve inch lifts using gravel then non-contaminated soils <p>Action</p> <p>Action of back-fill will take place using a remote controlled vibratory compaction unit. Under no circumstances shall any person enter the excavation.</p>	<p>Chemical hazards:</p> <p>1) Previous derived sampling information indicates the following compounds as potential contaminants of within the excavation area</p> <p>Surface soils - Inorganics - (max concentrations - mg/kg)</p> <table border="0"> <tr><td>Cadmium</td><td>2.5</td></tr> <tr><td>Nickel</td><td>20.7</td></tr> <tr><td>Lead</td><td>569</td></tr> <tr><td>Zinc</td><td>2080</td></tr> </table> <p>Subsurface Soils - PAHs (max concentrations - µg/kg)</p> <table border="0"> <tr><td>Benzo(a)Anthracene</td><td>7100</td></tr> <tr><td>Benzo(a)Pyrene</td><td>4200</td></tr> <tr><td>Benzo(a)Fluoranthene</td><td>4700</td></tr> <tr><td>Benzo(k)Fluoranthene</td><td>5000</td></tr> <tr><td>Dibenzo(a,h)Anthracene</td><td>470</td></tr> <tr><td>Indeno(1,2,3-cd)Pyrene</td><td>1200</td></tr> </table> <p>For toxicological and exposure purposes a single cumulative value of 22,670µg/kg for Total PAH.</p> <p>Other contaminants have been identified within the area. However, these are not considered pertinent during this activity as the materials were not reported within the boundaries of the excavation.</p> <p>Table 6-1 provides additional information about each of the identified contaminants of concern.</p> <p>2) Transfer of contamination into clean areas or onto persons.</p> <p>Physical hazards:</p> <p>3) Heavy equipment/machinery hazards (moving equipment, struck by hazards, etc.)</p> <p>4 Collapse of the excavation</p> <p>5) Energized systems (contact with underground or overhead utilities)</p> <p>6) Noise in excess of 85 dBA</p> <p>7) Vehicular and equipment traffic</p> <p>8) Strains from heavy lifting</p> <p>9) Slips, trips, and falls</p> <p>10) Load Weights</p> <p>Natural hazards:</p> <p>11) Inclement weather</p>	Cadmium	2.5	Nickel	20.7	Lead	569	Zinc	2080	Benzo(a)Anthracene	7100	Benzo(a)Pyrene	4200	Benzo(a)Fluoranthene	4700	Benzo(k)Fluoranthene	5000	Dibenzo(a,h)Anthracene	470	Indeno(1,2,3-cd)Pyrene	1200	<p>Chemical hazards:</p> <p>1) The primary contaminants in question are either particulate in nature or have an affinity for particulate and bind to them. As a general rule, avoiding contact with contaminated media (air, water, soils, etc.) will be a universal control measure. As the materials in question are solids and/or bound to particulates, dust/particulate suppression will be the next control measure employed to minimize potential exposure. If concentrations exceed 2 mg/m³ (visible dust) use area wetting methods. In addition, good work and personal hygiene measures will be employed to control exposure through ingestion. Avoid hand to mouth contact to the extent possible wash hands and face or use hygienic wipes to remove potential contaminants from hands and face prior to breaks or lunch or other hand to mouth activities.</p> <p>2) Transfer of contamination - Restrict the cross use of equipment and supplies between locations and activities without first going through a suitable decontamination. Work practices including</p> <ul style="list-style-type: none"> - Excavating from the furthest point on the identified working out - If possible position the excavator and trucks up or cross gradient of the wind direction to the excavation. This will minimize tracking contaminated materials over clean areas. - A rigid decontamination procedure should be employed between handling dirty and clean gravel and soils during backfill. This will ensure materials are not carried and deposited in unaffected areas. - Restriction of non-essential vehicles will be employed to minimize the spread of this material during transportation into unaffected areas. - Excavated materials should be segregated. Top 4-feet should be placed on polyethylene sheeting away from the rest of the materials to be removed. This top 4-foot removed shall serve as final or top cover when back-filling. The remainder shall be placed in lined (polyethylene sheeting) roll-off boxes and covered. In all cases the soils removed from the excavation will be evaluated visually and employing monitoring instruments as a general screen. Positive results indicates positive detection of contamination. Segregation is based on previous analytical results and field screening. - Prior to each load of soils leaving the site a Load Inspection Checklist will be completed. One of the intents of this checklist is to ensure that the load is secure and not leaking. The load Inspection Checklist can be found in Attachment VIII. <p>Physical hazards:</p> <p>3) Heavy equipment/machinery hazards (moving equipment, struck by hazards, etc.) - All equipment to be employed will be:</p> <ul style="list-style-type: none"> - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,601, 602), and manufacturer's design, and documented as such using Equipment Inspection Checklist provided as Attachment III. - Equipment operation will be conducted by knowledgeable operators and coordinated by experienced ground crew, as applicable. - Used within safe work zones, with routes of approach clearly demarcated. All personnel directly supporting this operation will remain at least the length of a fully extended boom + 5-feet with a minimum distance of 25-feet from the point of operation during excavation. The FOL may, as necessary, restrict associated activities downwind during this operation. As necessary employ dust suppression. <p>In addition to equipment considerations, the following safe operating procedures will be incorporated:</p> <ul style="list-style-type: none"> - Only manufacturer-approved equipment may be used in conjunction with equipment repair procedures (e.g., lifting attachments, etc.). - Work areas will be kept clear of clutter and unnecessary personnel. - All self-propelled equipment shall be equipped with movement warning systems. - See additional safe work procedures for excavation activities in Section 5.3 of this HASP. <p>4) Collapse of the Excavation - All excavations shall be in conformance with requirements established under 29 CFR 1926.650 - .652 concerning sloping, shoring, storage, and movement on and over and around trenches and excavations.</p> <ul style="list-style-type: none"> - No personnel associated with this field effort will enter any excavations. - All supplies, clean fill, vehicular traffic will be maintained at a minimum distance of 10 feet from the excavation until soil classification can be determined or side-wall restraining devices are employed. - The teeth of the bucket will have a flat bar or cutting bar attached to the teeth also known as a sand bar to prevent the teeth of the backhoe from snagging any undetected or unidentified utility. - Site control boundaries during excavation will be accomplished through the use of barricade tape and weighted poles and signs indicating excavation in progress <p>5) Energized Systems - All utility clearances shall be obtained prior to any excavation activities. All utility location and excavation clearance activities completed prior to the excavation activities, will proceed in accordance with the Utility Locating and Excavation Clearance SOP located in Attachment II of this HASP.</p> <p>6) Noise in Excess of 85 dBA - Hearing protection will be used during all subsurface activities during the excavator operation. As a general rule of thumb</p> <p><i>Excessive noise levels are being approach when you have to raise your voice to talk to someone within 2 feet of your location.</i></p> <p>In this situation hearing protection must be used.</p> <p>7) Vehicular and Equipment Traffic - Traffic and equipment considerations are to include the following:</p> <ul style="list-style-type: none"> - Establish safe zones of approach (i.e., Boom + 5 feet) for operational support. - All self-propelled equipment shall be equipped with movement warning systems. - Operator(s) will wear seat belts during equipment operation. <p>See Section 5.3.1 through 5.3.3 of this HASP for associated Safe Work Practices concerning excavation.</p> <p>8) Strains from Heavy Lifting - Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. See mobilization/demobilization for lifting recommendations.</p> <p>9) Slips, Trips, and Falls - The following additional provisions shall be employed to minimize hazards of this nature</p> <ul style="list-style-type: none"> - Avoid working/walking too close to excavation and other areas of unsure footing. A Minimum distance of 3-feet for pedestrian pathways should be maintained from excavation edges. 	<p>General Contaminant Screening</p> <p>PAHs General Screening</p> <p>>10 ppm (10 minute sustained duration in BZ) stop operation, remove to an unaffected area, notify PHSO.</p> <p>Visual Observation - Site contaminants may adhere to or be part of airborne dusts or particulates generated during site activities. Generation of dusts should be minimized to avoid inhalation of contaminated dusts or particulates. Evaluation of dust concentrations will be performed by observing work conditions for visible dust clouds. Potential exposure to contaminated dust will be controlled using water suppression, by avoiding dust plumes, or evacuating the operation area until dust subsides.</p> <p>7) Noise Monitoring - Monitoring of excessive noise levels during this activity will not be accomplished. This decision is based on the short duration of this activity and previously accumulated data. Protection from excessive noise levels during this activity will be facilitated through the use of hearing protection.</p> <p>10) Inclement Weather includes -</p> <ul style="list-style-type: none"> - Electrical storms and heavy rains - Temperature extremes <p>The SSO and/or the FOL shall Terminate all site activities in the event of an electrical storm of high winds.</p> <p>Heat Stress Monitoring - Heat stress monitoring is not currently required. However, should conditions make it necessary, the following provisions will apply: Equipment Required: oral thermometer, ambient temperature thermometer, watch with second indication, and weight scale. Heat Stress Action Levels (Regardless of PPE levels temperatures and humidity in excess of 90°F and 60% or above, respectively or at SSO Discretion require heat stress monitoring) Oral Temperature - >99.6 to 100.6°F at the beginning of the rest period Action - Reduce next work period by 33% >100.6°F at the end of a rest period Action - Restrict re-entry, implement more aggressive cooling measures.</p> <p>Heart Rate by Pulse - >110 beats/minute Action - Reduce next work period by 33%. >110 beats/minute at the end of a rest period Action - Restrict re-entry, implement more aggressive cooling measures, monitor conditions. If there are little indication of the pulse rate declining, seek medical support, notify the PHSO.</p> <p>Body Weight Loss - 1.5% body weight over a shift. Persons based on the level of physical exertion should be encouraged to drink 2-3 4 oz. Cups of water every 15-20 minutes to maintain or 1-1.5 gallons per day to avoid dehydration. This is a recommendation based on the results indicating weight loss over a day. Visual monitoring for signs of heat stress Headaches, Dizziness/Light Headedness, Weakness, Mood Changes (Irritable, Or Confused/Can't Think Straight), Feeling Sick To Your Stomach, Vomiting/Throwing Up, Decreased And Dark Colored Urine, Fainting/Passing Out, And Pale Clammy Skin.</p>	<p>Excavation activities will be initiated in Level D - (Minimum Requirements) protection</p> <p>Ground Support - Screening and Sampling Staff</p> <ul style="list-style-type: none"> - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses - Surgical style gloves (double-layered if necessary) - Hard hat - Hearing protection - Reflective vest for Ground Crew - <i>Chemical Resistant boot covers</i> <p>Operator</p> <ul style="list-style-type: none"> - Standard field attire including sleeved shirt and long pants - Safety shoes (Steel toe/shank) - Safety glasses unless in an enclosed cab - Hearing protection (as necessary) - Hardhat if Cab or ROPS is not provided <p>Note: The Safe Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.</p> <p><i>(Items in italics are deemed optional as conditions or the FOL or SSO dictate.)</i></p>	<p>Personnel Decontamination</p> <p>- This decontamination procedure for Level D protection will consist of</p> <ul style="list-style-type: none"> - Soap/water wash and rinse of outer gloves, boots as applicable - Removal of PPE in the following order: Boot covers, Outer gloves, coveralls, and inner gloves as applicable. - Wash hands and face, leave contamination reduction zone <p>As the predominant pathway for exposure is hand to mouth (ingestion) good work hygiene practices are imperative.</p> <p>Equipment Decontamination -</p> <p>All heavy equipment decontamination will take place at a centralized decontamination pad utilizing a steam cleaner or pressure washer. All roll off boxes will require the removal of any loose debris associated with loading activities. If necessary via pressure washing the outside prior to permitting the vehicle to leave the site. Roadways shall be cleared of any debris resulting from the on-site activity.</p> <p>During excavation activities the primary concern with contamination is the bucket and boom, wheels and tires (due to direct contact with contaminants).</p>
Cadmium	2.5																								
Nickel	20.7																								
Lead	569																								
Zinc	2080																								
Benzo(a)Anthracene	7100																								
Benzo(a)Pyrene	4200																								
Benzo(a)Fluoranthene	4700																								
Benzo(k)Fluoranthene	5000																								
Dibenzo(a,h)Anthracene	470																								
Indeno(1,2,3-cd)Pyrene	1200																								

Task/Operation/ Location	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring - Type and Action Levels	Personal Protective Equipment	Decontamination Procedures
		<ul style="list-style-type: none"> - Back filling activities should proceed in 8-inch lifts and allow compaction with the vibratory compactor. Improper/inadequate compaction may result in areas settling and creating trip and fall hazards. - Ruts, roots, and other tripping hazards should be eliminated approaching excavation edges should be minimized to the extent possible to avoid trips and falls when approaching excavation edges or boundaries. - Maintain a clutter free work area. - As part of site control efforts construct fences or other means of demarcation (i.e. signs and postings) to control and isolate traffic in the work area. Means of demarcation shall also be constructed isolating resource and/or staging areas. - All heavy equipment shall be constructed with 3-point mounting system. <p>10) Loading/Transport</p> <ul style="list-style-type: none"> - All trucks loaded to transport will be calculated to 75% of the determined acceptable road weight. For example, when calculating the weight of soils (The following is an example) Earth (wet) (Roll-off measurements 20x7x4-feet) If the roll off is filled up to 4-feet = 20x7x4x100 lbs/Ft³ = 56000 pounds or 28 tons (In this example the truck is overloaded!) <p>Other common weights are included on the Load Inspection Checklist provided in Attachment IX.</p> <ul style="list-style-type: none"> - All loads shall be approved through the Load Inspection Checklist found in Attachment IX, completed by the SSO. <p>11) Inclement Weather – To minimize hazards of this nature, the following provisions shall be employed:</p> <ul style="list-style-type: none"> - Wear appropriate clothing for weather conditions. - Provide acceptable shelter and replacement liquids for field crews as relief from excessive ambient temperatures. - Under conditions of elevated levels of PPE, periods of acclimatization, excessive ambient temperature extremes, or if you believe someone is suffering from a heat/cold related disorder, it may be necessary to conduct heat/cold stress monitoring as prescribed in the monitoring section. - Electrical storms/high winds - Suspend or terminate operations until directed otherwise by SSO. <p>Follow the provisions as specified in Section 4.0 of the Tetra Tech NUS, Inc. Health and Safety Guidance Manual regarding the identification and evaluation of heat/cold stress related conditions.</p>	<p>Heat stress response:</p> <ul style="list-style-type: none"> • Move the person to a cool shaded area to rest. Don't leave the person alone. If the person is dizzy or light headed, lay them on their back and raise their legs about 6-8 inches. If the person is sick to their stomach lay them on their side. • Loosen and remove any heavy clothing. • Have the person drink some cool water (a small cup every 15 minutes) if they are not feeling sick to their stomach. • Try to cool the person by fanning them. Cool the skin with a cool spray mist of water or wet cloth. • If the person does not feel better in a few minutes call for emergency help (See Table 2-1). <p>(If heat exhaustion is not treated, the illness may advance to heat stroke.):</p>		

- Pesticides/PCBs including

- 4,4'-DDD
- 4,4'-DDE
- 4,4'-DDT
- Chlordane
- Dieldrin
- Endrin
- Heptachlor
- Delta-BHC
- Aroclor - 1254

Revision 1; July 2002 - Based on previous sampling efforts the reported concentrations of PAHs and metals within the excavation boundaries are as follows:

Surface soils - Inorganics –

(max concentrations - mg/kg)

Cadmium 2.5

Nickel 20.7

Lead 569

Zinc 2080

Subsurface Soils - PAHs

(max concentrations - µg/kg)

Benzo(a)Anthracene 7100

Benzo(a)Pyrene 4200

Benzo(a)Fluoranthene 4700

Benzo(k)Fluoranthene 5000

Dibenzo(a,h)Anthracene 470

Indeno(1,2,3-cd)Pyrene 1200

For toxicological and exposure purposes a single cumulative value of 22,670µg/kg for Total PAH.

There are several considerations to note, both regarding the types of contamination and the reported concentrations. These are as follows:

7.3 INSTRUMENTS TO BE USED FOR HAZARD MONITORING

The following instrument may be used for monitoring the hazards identified above.

Each task as specified in Table 5-1 will indicate the need for monitoring.

7.3.1 Metrosonics dB-307 Noise Dosimeter/or Equivalent

The db-307 is a dual purpose sound level meter and noise dosimeter. The instrument is calibrated in accordance with manufacturers instructions using a 102dBA acoustical calibrator. The instrument is calibrated pre- and post to monitoring activities in accordance with the Hearing Conservation program provided in Attachment VI of this HASP. Information regarding calibration is recorded either on the Noise Dosimetry Log or the Sound Level Measurement Log, relative to the type of monitoring being performed. Use of this instrument is currently based on the discretion of the PHSO and/or the SSO.

7.3.2 Chemical Contaminant Monitoring

Monitoring for airborne chemical contaminants released from environmental media will be performed during the following intrusive activities:

- Soil boring
- Excavation

Chemical air monitoring may be performed by the SSO using a photo-ionization detector (PID) as a primary screening instrument. Instruments will be used primarily to monitor source points and worker breathing zone areas, while observing instrument action levels. Action levels where applicable are discussed in Table 5-1 as they may apply to a specific task or location. As was indicated earlier, the relative response ratio/correction factor for the compounds in question that can be detected varies. For example if a substance has a 40% relative response ratio/correction factor. Therefore, results obtained on these instruments should be multiplied by 0.4 to obtain actual values. For example:

10 ppm (instrument reading) x 0.4 (correction factor) = 4.0 ppm (adjusted value)

Revision 1 July 2002, Excavation Activities

A correction factor of 0.4 will be used for the excavation activity based on analytical results and identified contaminants (primarily PAHs). This correction factor has been computed and included in the action level specified for Table 5-1.

Note: Caution should be used when employing correction factors regarding the accuracy. A plus/minus of 25% should be incorporated as a buffer to the conservative.

Prior to the commencement of any field activities, the background levels of the site must be determined and noted. Daily background readings will be taken away from any areas of potential contamination. These readings, any influencing conditions (i.e., weather, temperature, humidity) and site location must be documented in the field operations logbook or other site documentation (e.g., sample log sheet).

7.3.2.1 Dusts and Particulates

As the majority of contaminants in question are solids or are likely to bind to particulates, visual observation will be employed to determine dust and particulate levels. Visual dust levels become evident at concentration approaching 2 mg/m^3 , at 5 mg/m^3 vision is obscured. Providing all dust levels are maintained below these levels, there are minimal potential for exposure.

7.4 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the TtNUS Equipment Manager or commercial provider. Operational checks and field calibration will be performed on all instruments each day, prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations (for example, the PID must be field calibrated daily and an additional field calibration must be performed at the end of each day to determine any significant instrument drift). These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (copies of which can be found in the Health & Safety Guidance Manual which will be maintained on site for reference). All calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that all of the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

Direct push operations – The height of the fully extended mast plus five feet or 25 feet, whichever is greater. This boundary demarcation has been selected based on removal of personnel from hazards associated with this operation. In this case our primary concern is physical hazards pressurized lines and systems and noise. By establishing the line at least at 25 feet will provide a sufficient distance for protection from flying projectiles associated with pressurized systems as well as providing sufficient distance impacting noise intensity.

Groundwater sampling – 10-feet surrounding the well and discharge receptacle container.

Sediment sampling – 5-feet surrounding the point of operation.

Decontamination – Using pressure washers/steam cleaners 25-feet surrounding the point of operation or 15-feet surrounding a constructed pad.

Excavation Activities – Length of a fully extended boom + 5-feet

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone will be split to represent two separate functions. The first function will be a control/supply point for supporting exclusion zone activities. The second function, which may take place a sufficient distance from the exclusion zone, is the decontamination of personnel and heavy equipment.

In order to move from the exclusion zone to a separate location the following activities will be used:

- As samplers move from location to location during sampling activities, dedicated sampling devices and PPE will be removed, separated, and bagged. Personnel will use hygienic wipes, such as Handy Wipes, as necessary to clean hands and face until they can access soap and water.
- Muddy over-boots and gloves may be required to go through a gross contamination wash at the exclusion zone or be bagged until they can be cleaned at a central decontamination location.

10.0 SPILL CONTAINMENT PROGRAM

10.1 SCOPE AND APPLICATION

It is not anticipated that quantities of bulk potentially hazardous materials (greater than 55-gallons) will be handled during the site activities conducted as part of the scope of work. Significant quantities of waste water (decontamination, purge and development) and soil cuttings to be collectively referred to as Investigative-Derived Wastes (IDW) may be generated, as part of site activities. It is not anticipated, however, that spillage of these materials would constitute a significant danger to human health or the environment.

Revision 1; July 2002 Excavation Activities

Based on this added task, bulk quantities of non-hazardous and hazardous materials will be handled. It is not anticipated, however, that spillage of these materials would constitute a significant danger to human health or the environment. However, provisions to control releases including use of liners, tarps, roll-off inspections shall be implemented.

At the termination of field efforts, composite samples of soil cuttings will be collected and analyzed to characterize the material and determine appropriate disposal measures. All purge and development waters will be profiled based on the information derived from the sampling data. Once characterized they can be removed from the staging area and disposed of in accordance with Federal, State and local regulations.

Pending receipt of sample results disposable items such as PPE (gloves, Tyvek™), disposable tubing, and trowels will be stored in 55-gallon drums.

If it is determined that all sample results indicate that sample media is not hazardous:

- These disposable items (PPE, tubing, etc.) shall be disposed of as general refuse.
- Soil cutting shall be spread over the ground surface from the site where they came or some other designated site by NTC Great Lakes Representative.

**SAFE WORK PERMIT
EXCAVATION ACTIVITIES
NTC GREAT LAKES, GREAT LAKES, ILLINOIS**

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

- I. Work limited to the following (description, area, equipment used): Excavation utilizing a Back-hoe of PAH contaminated soils and loading out materials into roll-off boxes or dump trucks. This activity shall also include back-filling and compaction utilizing a remote controlled vibratory compactor.
- II. Required Monitoring Instruments: Visual observation for dust; PID with 10.6 eV lamp
- III. Field Crew: _____
- IV. On-site Inspection conducted Yes No Initials of Inspector TINUS

SECTION II: General Safety Requirements (To be filled in by permit issuer)

- | | | |
|--|--|--|
| V. Protective equipment required | Respiratory equipment required | |
| Level D <input checked="" type="checkbox"/> Level B <input type="checkbox"/> | Full face APR <input type="checkbox"/> | Escape Pack <input type="checkbox"/> |
| Level C <input type="checkbox"/> Level A <input type="checkbox"/> | Half face APR <input type="checkbox"/> | SCBA <input type="checkbox"/> |
| Detailed on Reverse | SAR <input type="checkbox"/> | Bottle Trailer <input type="checkbox"/> |
| | Skid Rig <input type="checkbox"/> | None <input checked="" type="checkbox"/> |

Modifications/Exceptions: Minimum requirement include sleeved shirt and long pants, safety footwear, safety glasses, hard hats, and hearing protection will be worn when working near or in the vicinity of the operating equipment

VI. Chemicals of Concern	Action Level(s)	Response Measures
<u>PAHs and Metals</u>	<u>>2 mg/m³</u>	<u>Dust Suppression/Area Wetting</u>
<u>PAHs (General Screening)</u>	<u>10 ppm (sustained 10 minutes In breathing zone)</u>	<u>Remove to unaffected area, notify PHSO</u>

- VII. Additional Safety Equipment/Procedures
- | | | | |
|--------------------------------|---|----------------------------------|---|
| Hard-hat | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Hearing Protection (Plugs/Muffs) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Safety Glasses | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Safety belt/harness(Seat Belts) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Chemical/splash goggles | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Radio | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash Shield | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No | Barricades | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| Splash suits/coveralls | <input type="checkbox"/> Yes <input type="checkbox"/> No | Gloves (Type - Nitrile) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| Steel toe Work shoes or boots | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | Work/rest regimen | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| Chemical Resistant Boot Covers | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No | | |

Modifications/Exceptions: Reflective vests for high traffic areas (Ground Spotters or operators who will leave their cab) to increase visual recognition. All operators and truck drivers will employ seat belts when operating designated equipment. Variations have been noted between operator and ground personnel. Review Table 5-1 for clarification as necessary.

VIII. Procedure review with permit acceptors	Yes	NA	Yes	NA
Safety shower/eyewash (Location & Use)	<input type="checkbox"/>	<input type="checkbox"/>	Emergency alarms	<input checked="" type="checkbox"/> <input type="checkbox"/>
Procedure for safe job completion	<input type="checkbox"/>	<input type="checkbox"/>	Evacuation routes	<input checked="" type="checkbox"/> <input type="checkbox"/>
Contractor tools/equipment/PPE inspected	<input type="checkbox"/>	<input type="checkbox"/>	Assembly points ()	<input checked="" type="checkbox"/> <input type="checkbox"/>

IX. Site Preparation	Yes	No	NA
Utility Locating and Excavation Clearance completed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicle and Foot Traffic Routes Cleared and Established	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Physical Hazards Barricaded and Isolated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency Equipment Inspected and Staged (Fire Extinguishers, First Aid Kit, etc.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- X. Additional Permits required (Utility Locating and Excavation Clearance – Attachment II)..... Yes No
If yes, complete permit required or contact Health Sciences, Pittsburgh Office

XI. Special instructions, precautions: Follow the safe work practices for excavation specified in Section 5.0 of this HASP. Complete an Equipment Inspection Checklist for the heavy equipment used in the excavation upon arrival to the site, and then every 10 day shift thereafter or after major repairs. The Ground Spotter will exercise complete control over the area in which the excavation activities are being conducted. No one will enter those areas without the expressed permission of the ground spotter. Traffic patterns will be constructed to facilitate one-way travel to minimize backing where possible. All operators will wear seat belts when operating equipment or trucks. All personnel will employ proper decontamination procedures to remove residual dusts, washing face and hands prior to breaks and or lunch. A load inspection checklist shall be completed for each truck load leaving the site. Calculate weights of each load leaving the site as indicated in Load Inspection Checklist for this activity. Care should be exercise concerning adjacent utilities when using the vibratory compactor. This activity can break and/or weaken joints or structures. NO ENTRY INTO EXCAVATION PERMITTED!

Permit Issued by: _____ Permit Accepted by: _____

LOAD INSPECTION CHECKLIST

(COMPLETE THIS ATTACHMENT WHENEVER BULK SHIPMENTS (DUMP TRUCKS, ROLL-OFF CONTAINERS, ETC.) ARE TRANSPORTED OVER PUBLIC THOROUGHFARES/HIGHWAYS).

Waste Stream: _____ Facility Disposal No.: _____ Cum Load No.: _____
 (by waste stream)

Trucking Company: _____ Date: _____

Truck No.: _____ Permit No.: _____

License Plate No.: _____ Permit No.: _____

Is truck certified to transport hazardous waste in (List State)? _____

Drivers Name (Print): _____

Drivers Signature: _____

Applicable State CDL Driver Certificate No.: _____

Driver Physically fit to Drive? _____

Driver has documentation of H&S Training (DOT HM-181): _____ CDL Designations: _____

Is the drivers log book current?: _____

Is a valid certificate of insurance in force?: _____

Manifest No.: _____ Bill of Lading No.: _____

Manifest complete and accurate?: _____

Are proper DOT approved shipping containers being used? _____

Is labeling in accordance with 40 CFR?: _____

Overall condition of trailer of shipping containers: _____

Is Truck properly lined (plastic) and tarped? _____

Is Tailgate Seal in good condition? _____ Tailgate turn buckles being used?: _____

Is trailer or containers leaking?: _____

Inspector Name: _____

Inspector Signature: _____

Additional comments: _____

Confirmed PTO is disengaged? Yes No
 The following represent common weights of materials for estimating load capacity when portable or fixed scales are not available.

Material	Weight lbs/ft ³	Weight lbs/yd ³
Earth (Wet)	~100	2700
Earth (Dry loam)	~78	2106
Sand (wet)	~130	3240
Concrete (Limestone Aggregate)	~148	3996
Steel (Cast)	~490	13,230
Steel (Rolled)	~495	13,365
Oil (Petroleum)	~55	1485
Water	62.4	1684.8