PROJECT NAME ____
408 PERMIT NO_____

Drilling Program Plan

SAMPLE

Prepared by

_____

Date

_____

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1. Purpose of Exploratory Work or Objective and Justification

_____ is proposing to construct and operate the _____ Project that involves construction of _____ on the U.S. Army Corps of Engineers (USACE) property. The proposed project is _____. The _____ Project was constructed by the US Army Corps of Engineers (USACE) and ownership was turned over to _____.

The objective of the proposed drilling program is _____. Previous borings have been completed _____. The additional borings will _____. However, a drilling plan that is in conformance with ER 1110-1-1807 *Drilling in Earthen Embankment Dams and Levees* is required. The plan presented in this document meets those requirements.

2. Exploration Team

The project team includes _____.

[List members of the exploration team used in developing the DPP. Include name, organization, title, registration, and years of experience.]

3. Existing Information Review

The soil profile at the site generally consists of _____.

[Summarize all relevant existing information for the site and list the documents that were reviewed.]

4. Essential Geologic and Engineering Drawings

A plan and profile drawing showing the location of the proposed project and our current understanding of the soil and bedrock profile is included in Appendix A.

[The information on the plan, profile and sections must be detailed and include a summary of all data significant to the analytical and exploration needs. Refer to the ER for specifics]

5. Drilling Scope and Methodology

5.1. Permitting

Prior to the field exploration, application for well permits to perform the borings / CPT's will be submitted to the following agencies:

_____County Department of Environmental Health
City of_____, Public Utilities
[Include any other relevant agencies]

5.2. Exploratory Borings – Equipment, Methods and Dimensions

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A total of __ borings are proposed, with the borings being drilled from ____ [location in relation to USACE project]. The exploratory borings will be drilled with a truck-mounted hollow stem auger rig using continuous flight auger that brings soil cuttings to the ground surface. The diameter of the borings will be approximately __ inches. Ring samples, Standard Penetration Test (SPT) samples, and bulk samples will be taken from the borings. The target depth of the borings ranges from approximately ____ feet to ___ feet. The table included as Attachment B identifies the details of the location and depths of all borings.

Drill rig operators will have a minimum of __ years of experience drilling with the equipment and procedures described in the drilling program. All drilling activities will be conducted in the presence of a licensed professional geologist who will be responsible for maintaining the integrity of the levee.

5.3. Cone Penetration Test (CPT) - Equipment, Methods and Dimensions

A total of ___ Cone Penetration Tests (CPTs) probes are proposed, with all the CPTs being performed from _____ [location in relation to USACE project]. The exploratory CPTs will be performed with a __-ton CPT rig manufactured by _____, using a ___ -square centimeter piezocone. The piezocone will be pushed at a rate of ___ cm/sec. Soil tip resistance, soil-sleeve friction, and immediate dynamic pore water pressure response will be recorded at ____-inch intervals. The ___ -ton rig is climate-controlled and has an on-board computer and printer for real time CPT data plotting and analyses. The target depth of the CPTs is approximately __ feet. The table included as Attachment B identifies the details of the location and depths of all CPTs.

5.4. In-Situ Testing and Sampling

Relatively undisturbed samples and bulk samples of encountered soils will be obtained from the borings for examination and laboratory testing. Standard Penetration Tests (SPT) will be conducted using a 1.4- inch I.D. standard penetration test sampler driven with a 140-pound auto-trip hammer dropping about 30-inches in general accordance with ASTM D1586 procedures. Relatively undisturbed in-situ samples will be obtained by utilizing a 2.4-inch I.D. ring sampler in general conformance with ASTM D3550. The sampler will be driven using the same hammer as for the SPT testing. Sampling will be generally performed at vertical intervals of ___ feet to a depth of about ___ feet, and at intervals of __ feet at deeper depths.

5.5. Proposed Laboratory Testing

For evaluation of geotechnical engineering properties of the on-site subsurface soils, the following laboratory tests will be performed on selected soil samples with applicable ASTM standards:

[List all proposed lab testing for the investigation]

5.6. Instrumentation and Field Testing

In-situ field permeability testing will performed [Location] per [Standard]. A __-inch-diameter perforated PVC pipe with __-inch-diameter holes will be installed in ___ drilled boreholes for the in-situ field permeability tests. The PVC pipe will be installed with a solid cap at the

SAMPLE

bottom end in each boring. The PVC casing will be wrapped in a protective cloth sock to limit the migration of soil particles into the pipe. The pipe will be surrounded by a gravel pack with a hydraulic conductivity larger than that of the surrounding soils. Upon completion of the permeability tests, the PVC pipes will be removed and/or over-drilled, and backfilled with cement-bentonite grout as described in the "Borehole and CPT Completion and Abandonment" section of this document.

[Include discussion on any instrumentation or field testing proposed as part of the investigation with justification and details for the installation and/or field testing.]

5.7. Borehole and CPT Completion and Abandonment

Upon completion, all the borings and CPTs will be backfilled/sealed with tremied cement-bentonite grout. Borehole/CPT backfill will be performed in compliance with the USACE guidelines ER 1110-1-1807 *Drilling in Earthen Embankment Dams and Levees*. The mix will consist of __ gallons of water to __ sack (__ lbs) of Type I or Type II Portland cement. Up to ___ percent of powdered bentonite by dry mass of cement will be added to the mix for pumping ease and to reduce shrinkage and cracking after curing. Stage-up tremie grouting method will be used with the casing pulled incrementally to maintain hole stability. The grout will be placed under gravity to avoid hydraulic fracturing. Boreholes instrumented with PVC pipes for field permeability testing will be removed and/or over-drilled and grouted as described herein. Borehole/CPT completion documentation will include the calculated theoretical volume necessary to fill each hole and actual volume of material required to fill each hole. If significant difference exists between the calculated and actual volume of the backfill material, the cause of the difference will be identified and remediated as necessary. If significant grout losses are observed, the grout backfilling will be done in stages allowing the grout to set between stages.

The exploratory borings will be backfilled with cement-bentonite grout and the holes will be capped with a cold asphalt patch in pavement areas. Excess material from the borings will be placed in barrels and removed from the site.

6. Risk Evaluation

[Include an evaluation of the risk of hydraulic fracturing, erosion, contamination of drainage features, heave, or any other damage. Refer to ER 1110-1-1807 for details.]

6.1. Underground Utilities and other Levee Penetrations

_____ has reviewed the as-built plans to avoid placement of exploratory borings at locations where utilities and/or levee penetrations exist. Underground Service Alert (USA) will be notified of the exploratory borings locations at least 48 hours prior to drilling. If the proposed boreholes are located within the limits of utilities and/or levee penetrations, the proposed boreholes will be relocated in the field. Additionally, at each borehole location the upper ___ feet will be excavated using a hand auger to further verify that there is no conflict with the buried utilities.

6.2. Heave and Sample Disturbance

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6.3. **Hydraulic Fracturing**

6.4. **Erosion**

6.5. **Contamination of Filter / Drainage Feature**

7. Site Access and Traffic Control

8. Staging Plan

Drill/CPT rigs will be staged at the drilling/CPT locations only during working hours. The equipment will be demobilized off the site upon completion of daily work. Excavated soils will be temporarily drummed and stockpiled at the site and later disposed of the site to an appropriate waste facility after results of chemical testing on the soil cuttings are available.

9. Access to Facility, Notification and Safety

Access to the levee will be through locked gates maintained by _____. No modification to the ground surface will be required to allow for access. Temporary traffic control with cones, signs and caution tape will be established as necessary.

It is anticipated that _____ staff will be present at the mobilization for this work and be on-site intermittently during the project. Similarly, USACE staff is expected to periodically visit and observe the investigation program. Therefore, once the drilling and CPT program is scheduled, a detailed drilling and CPT day-by-day schedule will be generated and distributed to ____ and USACE to assist with their scheduling of on-site visits. The schedule will be periodically updated to adjust for the actual progress of the work. As a minimum, the schedule will be distributed as follows:

_____County Representative Name___Cell and office No_____
_____County Representative Name___Cell and office No_____

A Health and Safety Plan (HASP) will be implemented for all field activities at the site. A daily tailgate safety meeting will be held prior to start of the field work. The HASP is included in the attachment.

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ATTACHMENTS

Attachment A – Essential Geologic and Engineering Drawings
Attachment B – Aerial Map and Boring/CPT Data Sheets
Attachment C – Site Location with Access Route Plan
Attachment D – Boring and CPT Diagram
Attachment E – As-Built Plans and profile with boring depth & Locations
Attachment F – Health and Safety Plan
Attachment G – Geotechnical Group Activity Hazard Analyses (AHAs)
Attachment H - Safety Data Sheets (SDSs)

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Attachment A

Essential Geologic and Engineering Drawings

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Attachment B

Aerial Map and Boring/CPT Data Sheets

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Attachment C

Site Location with Access Route Plan

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Appendix D

Boring and CPT Diagram

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Attachment E

As-Built Plans with boring Depth & Locations

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Attachment F

Health and Safety Plan

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	Health & Safety Plan	

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Attachment G

Geotechnical Group Activity Hazard Analyses (AHAs)

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ACTIVITY HAZARD ANALYSIS

Activity: Geotechnical Investigation — Exploration Borings and CPTs

Analyzed By: _____

Date: _____

Principal Steps	Potential Safety and Health Hazards	Recommended Controls
Identify the principal steps involved and the sequence of work activities	*Analyze each principal step for potential hazards*	*Develop Specific Control for Potential Hazard*
1. 34 borings to depths of approximately 30 to 50 feet. 2. 98 CPTs to depths of 50 feet.	1. Slip, Trip Fall 2. Heat Stress 3. Moving parts of drill rig 4. Leaking oil from drilling rig 5. Potential Sub-surface Soil Contaminants: gasoline, diesel fuel, crude oil, creosote (see GTG RF SWP#3)	1. Carry cell phone 2. Carry Plenty of Water 3. Access to first aid kit 4. Wear Hard Hat and all Level-D PPE 5. Develop safety exclusion zone around drill rig (i.e. based on mast height) 6. If oil leak develops mitigate by repairing and/or laying visqueen under rig and oil pan to catch waste 7. Conduct periodic air monitoring near bore hole for potential soil contaminants using photoionization detector (PID).

Equipment to be Used	Inspection Requirements	Training Requirements
List Equipment to be used in the work activity	*List inspection requirements for the work activity*	*List training requirements, including hazard communication*
1. Hollow stem auger drill rig. 2. CPT rig 3. Field books, logs, GPS.	1. Inspect equipment daily for leaks and observe that safe practices are following in vicinity of drill rig. 2. Conduct periodic air monitoring using PID. Frequency is based on conditions observed (discolored soil or odors require more frequent monitoring). Move away from source if sustained concentration exceeds 5 ppm for unknown contaminants (see GTG RF SWP3 for more details).	1. General knowledge of safe geologic mapping procedures. 2. General PPE requirements. 3. Site Health & Safety Plan (HASP). 4. Selected workers are first aid and fire extinguisher trained.

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Appendix H

Safety Data Sheets (SDSs)

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	HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT	

Project Name

408 Permit Number

I have read and understand the health and safety plan indicated above and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the plan.

Name	Signature	Employer	Date

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	DAILY SITE LOG	
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Site Name: Date:

Coordinator: 408 Permit No:

Name (print)	Company	I have received site-specific training	Time	
			In	Out

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Comments:

SAFETY MEETING

Project Description _____ Address _____ Date _____

Work Activities _____

Anticipated Hazards

Physical _____

Chemical _____

Protective Measures

Clothing/Equipment _____

Procedures _____

Emergency Procedures

General Emergency Procedures _____

Hospital _____ Location _____

Hospital Phone _____

Emergency Phone Numbers _____

Other

Attendees

Name (print)	Name (print)
1. _____	5. ___
2. _____	6. ___
3. _____	7. ___
4. _____	8. ___

Conducted by: _____

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	CHECKLIST	
		Page 1 of 3

Project Name:_____ 408 Project No.: _____

Field Location: _____ Completed by: _____

Project Manager:_____ Site Safety Coordinator: _____

General Items		In Compliance?		
Health and Safety Plan Requirements		Yes	No	NA
1	Approved health and safety plan (HASP) on site or available			
2	Names of on-site personnel recorded in field logbook or daily log			
3	HASP compliance agreement form signed by all on-site personnel			
4	Material Safety Data Sheets on site or available			
5	Designated site safety coordinator present			
6	Daily tailgate safety meetings conducted and documented			
7	On-site personnel meet HASP requirements for medical examinations, fit testing, and training (including subcontractors)			
8	Compliance with specified safe work practices			
9	Documentation of training, medical examinations, and fit tests available from employer			
10	Exclusion, decontamination, and support zones delineated and enforced			
11	Windsock or ribbons in place to indicate wind direction			
12	Illness and injury prevention program reports completed (California only)			
Emergency Planning				
13	Emergency telephone numbers posted			
14	Emergency route to hospital posted			
15	Local emergency providers notified of site activities			

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16	Adequate safety equipment inventory available			
17	First aid provider and supplies available			
18	Eyewash stations in place			
Air Monitoring				
19	Monitoring equipment specified in HASP available and in working order			
20	Monitoring equipment calibrated and calibration records available			
21	Personnel know how to operate monitoring equipment and equipment manuals available on site			
23	Environmental and personnel monitoring performed as specified in HASP			

Safety Items		In Compliance?		
Personal Protection		Yes	No	NA
1	Splash suit			
2	Chemical protective clothing			
3	Safety glasses or goggles			
4	Gloves			
5	Overboots			
6	Hard hat			
7	Dust mask			
8	Hearing protection			
9	Respirator			
Instrumentation				
10	Combustible gas meter			
11	Oxygen meter			

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12	Organic vapor analyzer	YES	NO	N/A
Supplies				
13	Decontamination equipment and supplies			
14	Fire extinguishers			
15	Spill cleanup supplies			
Corrective Action Taken During Audit:				
Corrective Action Still Needed:				

Note: NA = Not applicable

Auditor's Signature

Site Safety Coordinator's Signature

Date

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